United States Department of Agriculture

Pinto Valley Mine

Final Environmental Impact Statement

Volume 1 (Chapters 1–7)

Forest Service Tonto National Forest MB-R3-12-09 April 2021

Pinto Valley Mine
Final Environmental Impact Statement

Tonto National Forest | Gila County, Arizona

Lead Agency:	USDA Forest Service
Cooperating Agencies:	U.S. Bureau of Land Management U.S. Environmental Protection Agency Arizona Game and Fish Department
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Abstract: The Pinto Valley Mine is an existing open pit copper and molybdenum mine located approximately 8 miles west of Miami, Arizona in Gila County. Pinto Valley Mining Corp. submitted a mining plan of operations proposing to expand mining operations onto National Forest System lands to access mineralization that extends onto claims on National Forest System lands, to extend the mine life for approximately 19 years, to address existing Open Pit slope instability in the southeastern portion of the pit, and to consolidate prior authorizations that are reasonably incident to extraction, transportation, and processing of mineral deposits.

Approval of the proposed mining plan of operations under applicable regulations (Title 36 part 228.5 of the Code of Federal Regulations [CFR]) is considered a major Federal action subject to the National Environmental Policy Act. Accordingly, the Forest Supervisor determined that preparation of an environmental impact statement was necessary to identify the scope of issues associated with the mining plan of operations, identify and assess reasonable alternatives to the mining plan of operations in order to minimize adverse effects on National Forest System surface resources to the extent feasible, and evaluate and disclose the potential significant environmental effects.

The Tonto National Forest issued a notice of intent to prepare the Pinto Valley Mine environmental impact statement in the Federal Register on March 28, 2017, initiating the public scoping period. The scoping process identified air quality, biological resources, cultural resources, recreation, social and economic conditions, geotechnical stability, and water resources as key issues for analysis. On December 13, 2019, the Tonto National Forest published a notice of availability for the Pinto Valley Mine draft environmental impact statement in the Federal Register. Written comments were accepted for a 45-day public comment period from December 13, 2019 to January 27, 2020. The Forest Service considered all comments received while preparing this final environmental impact statement.

The Forest Supervisor of the Tonto National Forest released a draft record of decision concurrently with the final environmental impact statement. The draft record of decision identifies changes and additions to the mining plan of operations necessary to avoid, minimize, compensate for, or reduce adverse environmental impacts from the project on National Forest System lands. The final environmental impact statement and draft record of decision are subject to 36 CFR 218, "Project-Level Pre-decisional Administrative Review Process." Those who have provided specific written comments during the formal scoping or draft environmental impact statement comment periods may object to the decision pursuant to 36 CFR 218.

Executive Summary

ES-1.0 Introduction

The Tonto National Forest, an administrative unit of the U.S. Department of Agriculture, Forest Service (Forest Service), prepared this final environmental impact statement (EIS) to evaluate and disclose the potential environmental effects from approval of the proposed mining plan of operations for use of National Forest System lands in connection with operations authorized by the United States mining laws submitted by Pinto Valley Mining Corp. for the Pinto Valley Mine (Capstone Mining Corp. 2016a). The Pinto Valley Mine is an existing open pit copper and molybdenum mine located in Gila County, Arizona, approximately 8 miles west of the Town of Miami on both private lands and National Forest System lands in the Globe Ranger District. Pinto Valley Mining Corp. (a wholly owned subsidiary of Capstone Mining Corp.) operates the mine. Pinto Valley Mining Corp. proposes to expand existing mining operations onto National Forest System lands to access mineralization that extends onto claims on National Forest System lands, to extend the mine life for approximately 19 years, to address existing Open Pit slope instability in the southeastern portion of the pit, and to consolidate prior authorizations that are reasonably incident to extraction, transportation, and processing of mineral deposits.

Existing facilities at Pinto Valley Mine include, but are not limited to, the Open Pit and adjacent milling and processing operations, tailings storage facilities, and waste rock disposal areas (map 1-1 in appendix A). Existing surface disturbance associated with the Pinto Valley Mine currently encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands and 566 acres are on National Forest System lands. Accounting for reclamation of existing disturbance, the mining plan of operations proposes an additional 1,317 acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands) for a total estimated surface disturbance of 5,231 acres (4,436 acres on private land and 795 acres on National Forest System lands). Pinto Valley Mining Corp. proposes to expand existing mining operations onto National Forest System lands to access mineralization that extends onto claims on National Forest System lands, to extend the mine life for approximately 19 years, to address existing Open Pit slope instability in the southeastern portion of the pit, and to consolidate prior authorizations that are reasonably incident to extraction, transportation, and processing of mineral deposits.

The Forest Service is the lead agency conducting the National Environmental Policy Act review of Pinto Valley Mining Corp.'s proposed mining plan of operations. The Bureau of Land Management, U.S. Environmental Protection Agency, and Arizona Game and Fish Department are serving as cooperating or participating agencies due to their regulatory or enforcement jurisdiction or special expertise on certain aspects of the project. These cooperating agencies do not have any decision-making responsibility in the record of decision.

Approval of the proposed mining plan of operations under applicable regulations (Title 36, Part 228.5 of the Code of Federal Regulations [CFR]) is considered a major Federal action subject to the National Environmental Policy Act. Accordingly, the Forest Supervisor determined that preparation of an EIS was necessary to identify the scope of issues associated with the proposed mining plan of operations, identify and assess reasonable alternatives to the proposed mining plan of operations in order to minimize adverse effects on National Forest System surface resources to the extent feasible, and evaluate and disclose the potential significant environmental effects. The Forest Supervisor of the Tonto National Forest has considered the beneficial and adverse impacts of each alternative analyzed in the final EIS. The Forest Service has released a draft record of decision that identifies mitigation measures that would be included to minimize potential impacts. Following resolution of objections to the draft record of decision, the Forest Service will issue a final record of decision.

ES-2.0 Purpose of and Need for Action

The Forest Service's purpose is to decide whether to approve Pinto Valley Mining Corp.'s proposed mining plan of operations and, if approved, what requirements are appropriate to minimize impacts on surface resources in accordance with 36 CFR 228, subpart A. After evaluating the proposed mining plan of operations, the Forest Service determined that approving the proposed mining plan of operations would be a major Federal action subject to the National Environmental Policy Act as defined in 40 CFR 1508.1. Accordingly, the Forest Service prepared an EIS to (1) identify the scope of issues associated with the mining plan of operations, (2) identify and assess reasonable alternatives to the proposed mining plan of operations in order to minimize adverse effects, (3) evaluate and disclose the potential significant environmental effects, and (4) ensure compliance with applicable laws, regulations, and policy.

The need for the Forest Service's action is to comply with regulations governing the use of surface resources for operations authorized by the United States mining laws on National Forest System lands under 36 CFR 228, subpart A. These regulations require that the Forest Service respond to parties who submit a proposed plan of operations for approval to conduct operations authorized by the United States mining laws on National Forest System lands for part or all of their planned actions including mining, mineral processing, and uses reasonably incident thereto. In accordance with 36 CFR 228.5, the submittal of Pinto Valley Mining Corp.'s proposed mining plan of operations requires the Forest Service to consider whether to approve the proposed mining plan of operations or to require changes or additions necessary to meet the purpose of the regulations for locatable mineral operations.

ES-3.0 Decision to be Made

The Forest Service is the lead agency in the preparation of this document, in accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act at 40 CFR 1501.5. The Bureau of Land Management, U.S. Environmental Protection Agency, and Arizona Game and Fish Department are cooperating agencies throughout the analysis process. These cooperating agencies do not have any decision-making responsibility in the record of decision.

The Forest Supervisor of the Tonto National Forest is the lead agency responsible official for this National Environmental Policy Act review of the Pinto Valley Mine proposed mining plan of operations. The Forest Supervisor's decision space is in accordance with Forest Service regulations that govern locatable mineral activities on National Forest System lands (36 CFR 228, subpart A) and other applicable laws and regulations. These regulations require that the Forest Service respond to parties who submit a proposed plan of operations for approval to conduct operations authorized by the United States mining laws for part or all of their planned actions including mining, mineral processing, and uses reasonably incident thereto.

The Forest Service's consideration of operations authorized by the United States mining laws on National Forest System lands are governed by the General Mining Law of 1872 as amended, the Organic Administration Act of 1897, and the Surface Resources Act of 1955, among other statutory authorities. The Forest Service's regulations at 36 CFR 228, subpart A set forth the rules through which use of the surface of National Forest System lands in connection with mining and mineral process operations shall be conducted so as to minimize adverse environmental impacts on surface resources where feasible. However, the Forest Service cannot impose unreasonable mitigation on mining activities and cannot impermissibly encroach on legitimate uses incident to operations authorized under the General Mining Law of 1872.

As described in chapter 2, “Proposed Action and Alternatives,” private land activities are not part of the proposed action and are not within the decision space of the Forest Service. However, a description of private land activities is included and analyzed in the direct and indirect impacts analysis sections in chapter 3, “Affected Environment and Environmental Consequences,” of the final EIS because the activities on private land and Federal land constitute interdependent parts of a larger action (that is, an integrated mine). This approach is consistent with Council on Environmental Quality regulations, which define actions as connected when: (1) they automatically trigger other actions that may require an EIS; (2) they cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) they are interdependent parts of a larger action and depend upon the larger action for their justification (40 CFR 1508.25(a)(1)).

Given the purpose and need for the project, the deciding official reviews the proposed action, other alternatives (including the no-action alternative), and their environmental consequences in order to make the following decisions for activities on National Forest System lands:

- To determine which alternative or combination of alternatives to select, as considered in detail in the Pinto Valley Mine EIS. The final decision may be to approve a hybrid of various components of the alternatives considered. Whichever alternative is selected, its operations must be conducted to minimize adverse impacts on National Forest System surface resources where feasible in accordance with 36 CFR 228, subpart A.
- To determine whether selection of an alternative would require any changes or additions to mitigate impacts or satisfy applicable regulatory authorities.
- To determine whether approval of an action alternative would be consistent with the Tonto National Forest Plan (Forest Service 1985), or whether one or more amendments to the forest plan would be required.

ES-4.0 Key Issues for Detailed Analysis

The Forest Service conducted public scoping for the Pinto Valley Mine EIS as summarized in section 1.7, “Public Scoping,” and described in detail in the “Pinto Valley Mine Environmental Impact Statement Final Scoping and Issues Report” (Forest Service 2017a). In April 2017, the Forest Service hosted cooperating agency scoping meetings at the Tonto National Forest Supervisor’s Office in Phoenix, which were attended by the Bureau of Land Management, Arizona Game and Fish Department, and the U.S. Environmental Protection Agency. The Tonto National Forest has also been conducting tribal consultation related to Pinto Valley Mine since 2017, which has focused on identifying issues of tribal concern and possible measures to mitigate the potential adverse effects on those issues. Through external (public, cooperating agencies, and tribes) and internal scoping, the Forest Service identified concerns with the following nine key potential issues for detailed analysis in the Pinto Valley Mine EIS. Refer to the “Final Scoping and Issues Report” (Forest Service 2017a) for additional information on the key potential issues.

- Issue 1: Air Quality Impacts Resulting from Project-Related Emissions and Dust Generated from Project Activity

- Issue 2: Biological Resource Impacts Resulting from Surface Disturbance, Human Activity, and Other Project-Related Effects on Ecosystems and Ecosystem Components
  - Issue 2A: Impacts on Special Status Species, including Federally Listed Species, Arizona Game and Fish Department Species of Greatest Conservation Need, and Forest Service Sensitive Species
  - Issue 2B: Impacts on Fish and Wildlife Species Resulting from Project-Related Activity and Project Components
  - Issue 2C: Impacts on Habitat, Soils, Vegetation Communities, and Ecosystem Components that Result in Adverse Impacts on Wildlife, Fish, and Plants
- Issue 3: Long-Term Impacts on Landscape Productivity and Function Resulting from Surface Disturbance and Other Project Activity
- Issue 4: Cultural Resource Impacts Resulting from Project-Related Activity, Facilities, and Surface Disturbance
- Issue 5: Impacts on Public Health and Safety from Construction, Operation, and Reclamation of the Pinto Valley Mine Project
- Issue 6: Impacts on Recreation and Recreational Access from Project-Related Traffic, Surface Disturbance, and Other Project Activities
- Issue 7: Impacts on Social and Economic Conditions, including Environmental Justice Resulting from Expansion and Operation of the Pinto Valley Mine Project
  - Issue 7A: Impacts on Social Conditions
  - Issue 7B: Impacts on Economic and Fiscal Conditions
  - Issue 7C: Environmental Justice Impacts
- Issue 8: Potential Risk to Resources from Geotechnical or Stability Issues Associated with Expansion of the Tailings Storage Facilities and Open Pit
- Issue 9: Impacts on Groundwater and Surface Water in the Pinto Creek Watershed during Construction, Operation, Reclamation, Closure, and Post-Closure of the Pinto Valley Mine Project
  - Issue 9A: Impacts on Groundwater Quantity
  - Issue 9B: Impacts on Groundwater Quality
  - Issue 9C: Impacts on Surface Water Quantity in the Pinto Creek Watershed
  - Issue 9D: Impacts on Surface Water Quality in the Pinto Creek Watershed
  - Issue 9E: Impacts on Water Rights
  - Issue 9F: Impacts on Surface Water and Groundwater Quality and Quantity as a Result of Post-Mine Pit Lake

ES-5.0 Alternatives

ES-5.1 Alternatives Considered in Detail

The Pinto Valley Mine final EIS analyzed three alternatives in detail including the no-action alternative, alternative 1, and the proposed action. The alternatives that are described in detail in chapter 2, "Proposed Action and Alternatives," generally do not include the mitigation measures that are identified in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation." These mitigation measures were identified based on the potential adverse impacts associated with the alternatives carried forward for detailed analysis and would be part of the selected action in the record of decision, unless the no-action alternative is selected.

ES-5.1.1 No-Action Alternative (Environmentally Preferable Alternative)

The no-action alternative provides a baseline for comparison of the environmental consequences of alternative 1 and the proposed action. The no-action alternative included in the final EIS was added after release of the draft EIS based on the Forest Service's consideration of public comments on the draft EIS and further review of the previous authorizations and permits for the Pinto Valley Mine. The no-action alternative from the draft EIS is now identified as alternative 1 and is described in section 2.3.2, "Alternative 1 – Authorization of Existing Uses of National Forest System Lands."

Under the final EIS no-action alternative, the Forest Service would not authorize use of National Forest System lands for the Pinto Valley Mine except those activities necessary for mine closure and reclamation. The previously authorized rights-of-way and special use permits on National Forest System lands that have expired would not be authorized (see table 1-1 in chapter 1) and reclamation would be required under the existing plans of operations and in accordance with State requirements. On the date the record of decision for Pinto Valley Mine's proposed mining plan of operations is issued, use of previous authorizations would be limited to those activities required to initiate shutdown of mine operations, transition to reclamation and closure, and conduct ongoing reclamation and post-closure care and maintenance. Under the no-action alternative scenario, reclamation and closure of facilities on both National Forest System lands and private lands would occur almost immediately. This closure would occur because there would be no authorization of the mine's water supply pipelines and the electrical lines that cross National Forest System lands, and there is no alternative delivery system for water or electricity to the private land that is necessary to operate the mine, as it is an inholding (see map 2-1 in appendix A).

The no-action alternative includes the following:

- The Forest Service would allow the temporary continued use of existing facilities on National Forest System land that are necessary to ensure proper closure and reclamation (such as water pipelines, transmission lines) until the Forest Service determines reclamation is complete and releases the reclamation bond.
- Following the record of decision, all activities and operations at the Pinto Valley Mine would begin transitioning to closure and reclamation. The Forest Service assumes that it would take approximately 6 months to transition the mine from active production to beginning closure and reclamation. The 6-month transition period would include two phases: phase 1 is estimated to last approximately 2 months and would include active mining and tailings deposition, and phase 2 is estimated to last approximately 4 months and would include preparing the mine for closure and reclamation.

- Existing encroachments on approximately 29 acres of National Forest System lands that are not necessary for orderly closure and reclamation would be decommissioned and reclaimed after the 6-month transition period.
- The Peak Well field would supply water needed during the 2 months of active mining operations. After that, sufficient water (up to 300 gallons per minute) of water for dust control during reclamation and closure would be sourced from select wells at the toe of Tailings Storage Facility No. 4, or from the reclaim water pond on Tailings Storage Facility No. 4.
- Cessation of active mining operations at the Pinto Valley Mine within 6 months of the record of decision would require construction of (1) a robust Pregnant Leach Solution pumping and conveyance system from Gold Gulch 1A to the Open Pit, (2) power lines and pumping infrastructure to convey collected seepage from draindown of the Pregnant Leach Solution to the Open Pit, and (3) perpetual maintenance of a decant pond pumping system and pipeline from the tailings storage facilities to the Open Pit.
- Tailings Storage Facility No. 4 would continue to be used for tailings deposition during the first 2 months of the transition period, resulting in an estimated 10 acres of additional disturbance on private land (map 2-1 in appendix A). There would be no other planned expansion of the Open Pit or tailings storage facilities onto National Forest System lands.
- Any new roads, pipelines, or other infrastructure needed for closure or reclamation would be placed in areas of existing disturbance or in existing corridors.
- Materials needed for reclamation would be sourced from private land and could include excavation of borrow and riprap material from up to 601 acres, including 244 acres in areas of existing disturbance and 357 acres of new disturbance.

Under the no-action alternative, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed.

Table ES-1 presents the approximate acreage of existing disturbance, additional disturbance under the no-action alternative, and the total disturbance. The no-action alternative could result in up to 367 acres of new surface disturbance on private land associated with 10 acres of lateral expansion of Tailings Storage Facility No. 4 during the 2-month active mining period and 357 acres of new surface disturbance associated with excavation of borrow and riprap sources during reclamation. Because Pinto Valley Mine is an ongoing operation, footprints of some active facilities have continued to change during the course of this National Environmental Policy Act process. Estimates of the area of existing surface disturbance reported in this document typically represent the size of facility footprints between submittal of the proposed mining plan of operations in May 2016 (Capstone Mining Corp. 2016a) and the receipt of additional information provided by Pinto Valley Mining Corp. through April 2018. Additionally, some areas proposed for facility expansions would occur in areas of existing disturbance and therefore would not constitute new surface disturbance.

Table ES-1. Estimated surface disturbance for the no-action alternative

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Mining									
Open Pit	746	9	754	-	-	-	746	9	754
Inert Limestone Stockpile	7	-	7	-	-	-	7	-	7
Main Dump	96	-	96	-	-	-	96	-	96
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	-	-	-	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	-	-	-	25	-	25
West Dump	-	-	-	-	-	-	-	-	-
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	601[1]	-	601	623	-	623
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*601*	-	*601*	*1,635*	*84*	*1,719*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1&2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	-	-	-	264	6	270
Tailings Storage Facility No. 4	704	-	704	10	-	10	714	-	714
Leach Piles	654	-	654	-	-	-	654	-	654
Pregnant Leach Solution Pond/ancillary facilities	19	-	19	-	-	-	19	-	19
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	-	-	-	*2,233*	*293*	*2,526*

[1] The 601 acres of surface disturbance for borrow and riprap sources encompasses 244 acres in areas that overlap existing disturbance areas and 357 acres of new surface disturbance.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Transportation[2]									
National Forest System Roads	18	81	99	-	-	-	18	81	99
Access Roads	3	44	47	-	-	-	3	44	47
Subtotal, Transportation Facilities	*21*	*124*	*145*	-	-	-	*21*	*124*	*145*
Utilities									
Electrical Power Lines[3]	37	20	57	-	-	-	37	20	57
Water Supply, Distribution, Use, and Treatment[4]									
Peak Wells[5]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[6]	2	10	11	-	-	-	2	10	11
Water Pipelines (Surface)[7]	26	20	46	-	-	-	26	20	46
Ponds and Reservoirs[8]	55	41	96	-	-	-	55	41	96
Water Storage Tanks[9]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	-	-	-	*86*	*72*	*158*
TOTAL	**3,349**	**566**	**3,915**	**367**	**0**	**367**	**3,717**	**566**	**4,283**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of "existing disturbance" in this EIS are close approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

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[2] Disturbance for National Forest System roads and access roads was calculated based on an assumed width of 25 feet. Disturbance was not calculated for access roads located exclusively on privately owned lands. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[3] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[4] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[5] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[6] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[7] Ibid.

[8] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[9] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

ES-5.1.2 Alternative 1 – Authorization of Existing Uses of National Forest System Lands

This section briefly describes alternative 1, highlighting the key differences from the no-action alternative. Refer to chapter 2, section 2.3.2, "Alternative 1 – Authorization of Existing Uses of National Forest System Lands," for a detailed description of alternative 1. Alternative 1 encompasses the following broad categories of actions that would extend the mine life for approximately 7 more years than the no-action alternative:

- Authorization of existing uses and permitted disturbances at the Pinto Valley Mine (including all State and Federal authorizations on public or private lands), but no new surface disturbance on National Forest System lands. Refer to table 1-1 in chapter 1 for a description of historical and current Federal authorizations at the Pinto Valley Mine.
- Authorization of existing legacy encroachments on approximately 29 acres of National Forest System lands from activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand (map 1-1 in appendix A).
- Continuation of existing mining activities on private land and additional activities on private land that would be conducted to maximize the operational life of the mine without further expansion of facilities onto National Forest System lands. A description of private land activities is included and analyzed in the direct and indirect impacts analysis section in chapter 3 because the activities on private land and Federal land constitute an integrated mine.

Under alternative 1, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed.

The majority of the Pinto Valley Mine is located on patented claims or private land (private Pinto Valley Mining Corp. property). However, some facilities and operations are located on unpatented lode and mill site claims, or other land, on the Tonto National Forest as previously authorized by the Forest Service or the U.S. Department of the Interior, Bureau of Land Management through rights-of-way, plans of operations, special use permits, or letter agreements. The Bureau of Land Management rights-of-way were transferred to the Forest Service in 1989. The authorizations date from as early as the 1940s and have been amended, updated, and reauthorized over the years. However, all previous authorizations have since expired or were nontransferable to the current mine owner. Refer to table 1-1 for a list of prior authorizations at the Pinto Valley Mine that are expired and would not be authorized under alternative 1.

Additionally, some facilities were inadvertently placed or expanded onto unpatented claims held by Pinto Valley Mining Corp.'s predecessor on approximately 29 acres of National Forest System lands without authorization from the Forest Service. These encroachments include roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser. Refer to table 2-1 in chapter 2 and map 1-1 in appendix A for a summary of existing encroachments onto National Forest System lands. These legacy encroachments on National Forest System lands would be authorized as part of alternative 1.

Map 2-2 in appendix A depicts the layout of existing and planned mining facilities and other physical mine components under alternative 1. Table ES-2 summarizes existing, proposed, and total surface disturbance for all project components under alternative 1. Because Pinto Valley Mine is an ongoing operation, footprints of some active facilities have continued to change during the course of this National Environmental Policy Act process. Estimates of the area of existing surface disturbance reported in this document typically represent the size of facility footprints between submittal of the proposed mining plan of operations in May 2016 (Capstone Mining Corp. 2016a) and the receipt of additional information provided by Pinto Valley Mining Corp. through April 2018. Additionally, some areas proposed for facility expansions would occur in areas of existing disturbance and therefore would not constitute new surface disturbance.

Table ES-2. Estimated surface disturbance for alternative 1

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Mining									
Open Pit	746	9	754	219	-	219	965	9	973
Inert Limestone Stockpile	7	-	7	48	-	48	55	-	55
Main Dump	96	-	96	361	-	361	457	-	457
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	(<1)	-	(<1)	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	20	-	20	44	-	44
West Dump	-	-	-	247	-	247	247	-	247
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	601[10]	-	601	623	-	623
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*1,466*	-	*1,466*	*2,499*	*84*	*2,583*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1&2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	30	-	30	294	6	300
Tailings Storage Facility No. 4	704	-	704	269	-	269	973	-	973
Leach Piles	654	-	654	(41)	-	(41)	613	-	613
Pregnant Leach Solution Pond/ancillary facilities	19	-	19	(19)	-	(19)	-	-	-
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	*208*	-	*208*	*2,441*	*293*	*2,733*

[10] The 601 acres of surface disturbance associated with the borrow and riprap sources encompasses 244 acres in areas that overlap existing disturbance areas and 357 acres of new surface disturbance. As a result, only the 357 acres of new disturbance associated with borrow and riprap sources is carried forward for the new surface disturbance totals.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Transportation[11]									
National Forest System Roads	18	81	99	(1)	-	(1)	17	81	99
Access Roads	3	44	47	-	-	-	3	44	47
Subtotal, Transportation Facilities	*21*	*124*	*145*	*(1)*	*-*	*(1)*	*20*	*124*	*145*
Utilities									
Electrical Power Lines[12]	37	20	57	(7)	(1)	(8)	30	19	49
Water Supply, Distribution, Use, and Treatment[13]									
Peak Wells[14]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[15]	2	10	11	(1)	(<1)	(1)	1	9	10
Water Pipelines (Surface)[16]	26	20	46	(1)	(<1)	(1)	25	20	45
Ponds and Reservoirs[17]	55	41	96	(12)	0	(12)	43	41	84
Water Storage Tanks[18]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	(13)	(<1)	(13)	73	71	144
TOTAL	**3,349**	**566**	**3,915**	**909**	**(1)**	**908**	**4,258**	**565**	**4,823**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of "existing disturbance" in this EIS are approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

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[11] Disturbance for National Forest System roads and access roads was calculated based on an assumed width of 25 feet. Disturbance was not calculated for access roads located exclusively on privately owned lands. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[12] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[13] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[14] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[15] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[16] Ibid.

[17] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[18] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

ES-5.1.3 Proposed Action – Authorization of New and Existing Uses of National Forest System Lands (Agency Preferred Alternative)

For the Pinto Valley Mine EIS, the proposed action represents the proposed mining plan of operations originally submitted by Pinto Valley Mining Corp. in May 2016, and accepted as complete in September 2016 by the Forest Service. This section briefly describes the proposed action, highlighting the proposed activities on Forest Service land. Refer to chapter 2, section 2.3.3 ("Proposed Action – Authorization of New and Existing Uses of National Forest System Lands") for a detailed description of the proposed action. The proposed action encompasses the following broad categories of actions that would extend the mine life by approximately 12 years compared to alternative 1 and 19 years[19] compared to the no-action alternative:

- Consolidation and authorization of previously authorized activities and permitted disturbances on National Forest System lands at the Pinto Valley Mine. Power lines, pipelines, roads, and other facilities and infrastructure on National Forest System lands at the Pinto Valley Mine are integral to the mining operations at the mine. As such, their authorization is most appropriate under a consolidated mining plan of operations.
- Authorization of new operations on National Forest System lands including expansion of the Open Pit and Tailings Storage Facilities Nos. 3 and 4, and construction or relocation of linear features (access roads, electrical power distribution lines, pipelines).
- Authorization of existing legacy encroachments on approximately 29 acres of National Forest System lands from prior mine operators associated with activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand (see map 1-1 in appendix A).

Under the proposed action, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed.

Map 2-3 in appendix A shows the layout of existing and planned mining facilities and other physical mine components for the proposed action. Table ES-3 summarizes existing, proposed, and total surface disturbance for all project components under this alternative broken out by total, Forest Service, and private land. As noted previously, Pinto Valley Mine is an ongoing operation and active facility footprints have changed during the National Environmental Policy Act process. Existing surface disturbance reported in this EIS generally corresponds to facility footprints between submittal of the proposed mining plan of operations in May 2016 and additional information provided by Pinto Valley Mining Corp. during the EIS process. Additionally, some surface disturbance resulting from expansion of existing facility footprints would occur in previously disturbed areas and would not constitute new surface disturbance.

[19] The mine life under the proposed action is actually anticipated to be 18 years and 10 months longer than that of the no-action alternative when accounting for the estimated 2 months of continued mine operations under the no-action alternative. For simplicity and ease of comparison, the estimated difference in mine life has been rounded up to 19 years for purposes of this analysis.

Table ES-3. Estimated surface disturbance for the proposed action

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Final Area of Disturbance (acres)		
	Private	***National Forest System***	***Total***	***Private***	***National Forest System***	***Total***	***Private***	***National Forest System***	***Total***
Mining									
Open Pit	746	9	754	219	19	238	965	27	992
Inert Limestone Stockpile	7	-	7	48	-	48	55	-	55
Main Dump	96	-	96	361	-	361	457	-	457
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	(<1)	-	(<1)	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	20	-	20	44	-	44
West Dump	-	-	-	247	-	247	247	-	247
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	668[20]	171	839	691	171	862
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*1,603*	*114*	*1,717*	*2,637*	*198*	*2,835*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1&2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	21	22	43	285	27	312
Tailings Storage Facility No. 4	704	-	704	406	102	508	1,110	102	1,212
Leach Piles	654	-	654	(41)	-	(41)	613	-	613
Pregnant Leach Solution Pond/ancillary facilities	19		19	(19)	-	(19)	-	-	-
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	*362*	*124*	*485*	*2,595*	*416*	*3,011*

[20] The 668 acres of surface disturbance associated with the borrow and riprap sources encompasses 244 acres in areas that overlap existing disturbance areas and 425 acres of new surface disturbance. As a result, only the 435 acres of new disturbance associated with borrow and riprap sources is carried forward for the new surface disturbance totals.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Final Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Transportation[21]									
National Forest System Roads	18	81	99	(1)	-	(<1)	17	81	99
Access Roads	3	44	47	3	7	11	6	51	57
Subtotal, Transportation Facilities	*21*	*124*	*145*	*3*	*7*	*10*	*24*	*132*	*155*
Utilities									
Electrical Power Lines[22]	37	20	57	(7)	(1)	(8)	30	19	49
Water Supply, Distribution, Use, and Treatment[23]									
Peak Wells[24]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[25]	2	10	11	(1)	(<1)	(1)	1	9	10
Water Pipelines (Surface)[26]	26	20	46	(1)	<1	(<1)	25	21	46
Ponds and Reservoirs[27]	55	41	96	(12)	(3)	(15)	43	38	81
Water Storage Tanks[28]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	*(13)*	*(2)*	*(15)*	*73*	*70*	*143*
TOTAL	**3,349**	**566**	**3,915**	**1,087**	**229**	**1,317**	**4,436**	**795**	**5,232**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of “existing disturbance” in this EIS are close approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

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[21] Disturbance for National Forest System roads and access roads was calculated based on an assumed width of 25 feet. Disturbance was not calculated for access roads located exclusively on privately owned lands. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[22] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[23] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[24] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[25] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[26] Ibid.

[27] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[28] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

ES-5.2 Alternatives Considered but Eliminated from Detailed Analysis

Reasonable alternatives include those “that are practical or feasible from technical and economic standpoints and using common sense, rather than simply desirable from the standpoint of the applicant” (Council on Environmental Quality 1981). The Forest Service evaluated a range of reasonable alternatives to the proposed action. A variety of alternatives were eventually eliminated from detailed analysis because they did not meet the following criteria as described in the Forest Service Handbook (Forest Service Handbook 1909.15), Council on Environmental Quality guidance (40 CFR 1500–1508), and other sources such as the Council on Environmental Quality Forty Most Asked Questions Concerning National Environmental Policy Act Regulations (Council on Environmental Quality 1981):

1. Does the alternative meet the purpose and need for the action?
2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?
3. Is the alternative technically feasible?
4. Is the alternative economically feasible?
5. Is the alternative illegal?
6. Does the alternative cause unreasonable environmental harm?
7. Is the alternative available?

The alternatives considered but eliminated from detailed analysis included alternate locations or configurations of the tailings storage facilities (see map 2-4 in appendix A), water supply alternatives, partial backfilling of the Open Pit, using a dry-stack tailings system instead of the current wet tailings slurry system, lowering the rate of mining, and applying higher design standards for Tailings Storage Facilities No. 3 and No. 4. Section 2.4 in chapter 2 provides a summary of alternatives considered but eliminated from detailed study. Refer to section 4.0, “Alternatives Considered but Eliminated from Detailed Analysis,” of the Final Alternatives Report (Forest Service 2019a) for more information.

ES-6.0 Summary of Impacts

Table ES-4 provides a summary and comparison of the potential direct and indirect environmental consequences that could result from implementing the alternatives. The analysis of direct and indirect impacts in chapter 3, “Affected Environment and Environmental Consequences,” that is summarized below presents the potential impacts of the alternatives independent of the monitoring and mitigation measures identified at the end of each section and in Appendix H, “Environmental Protection Measures, Monitoring, and Mitigation.” Refer to chapter 3, “Affected Environment and Environmental Consequences,” for a detailed description and comparison of environmental consequences.

Table ES-4. Comparison of environmental consequences of the alternatives

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
Air Quality	Emissions from stationary sources at Pinto Valley Mine are expected to remain relatively constant during the 6-month transition period. Emissions from mobile sources at Pinto Valley Mine are expected to decrease rapidly as the mine transitions from active mining operations to reclamation and closure within 6 months of the record of decision. Emissions are not expected to cause or contribute to an exceedance of the National Ambient Air Quality Standards. Emissions due solely to the no-action alternative are not expected to affect visibility or acidic deposition in the Superstition Wilderness, Sierra Ancha Wilderness, Tonto National Monument, or the surrounding region as visibility and acidic deposition in these areas is expected to improve over time consistent with recent trends.	Air pollutant emissions during the maximum emissions year for alternative 1 (year 4) would be greater than under the no-action alternative because the mine would continue to operate and emit at existing levels for the entire year (rather than decreasing after the first 2 months). However, air quality modeling indicates that there would be no exceedances of National Ambient Air Quality Standards attributable to alternative 1. Impacts on visibility and acidic deposition would generally be the same as those of the no-action alternative.	All pollutant emissions during the maximum emissions year for the proposed action (year 4) would be greater than under the no-action alternative for all criteria pollutants and greater than alternative 1 for particulate matter of 10 microns diameter and smaller (PM_{10}), particulate matter of 2.5 microns diameter and smaller ($PM_{2.5}$), nitrogen oxides, and carbon monoxide, primarily due to increases in haul truck activity. However, similar to the other alternatives, there are no modeled exceedances of National Ambient Air Quality Standards attributable to the proposed action. The proposed action would increase the maximum ambient pollutant concentrations for all pollutants except for 8-hour carbon monoxide and 1-hour sulfur dioxide, which remain the same, and 3-hour sulfur dioxide, which decreases under the proposed action. Potential effects on visibility and acidic deposition in the Superstition Wilderness, Sierra Ancha Wilderness, Tonto National Monument, and surrounding region would increase compared to the other alternatives. Based on the emissions inventory and air quality modeling, the proposed action complies with the Clean Air Act General Conformity Rule for the nonattainment areas that overlap the project area, as described in appendix I, “General Conformity Determination.”
Biological Resources - Vegetation	The no-action alternative would result in 367 acres of new surface disturbance within existing upland vegetation communities on private lands owned by Pinto Valley Mining Corp. primarily due to closure activities. No direct impacts on riparian or wetland vegetation communities are anticipated from the no-action alternative. Riparian areas along	Alternative 1 would result in 542 more acres of new surface disturbance within existing upland vegetation communities on private lands owned by Pinto Valley Mining Corp. than the no-action alternative. Alternative 1 would also remove an estimated 11 acres of riparian vegetation in Gold Gulch on private lands owned by Pinto Valley Mining Corp., which would not occur	The proposed action would have the greatest impact on upland vegetation communities among the alternatives due to 720 more acres of new surface disturbance on private land than the no-action alternative, 178 more acres of new surface disturbance on private land than alternative 1, and 229 more acres of new surface disturbance on National Forest System

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field and may be a contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat. Final reclamation activities would begin approximately 6 months after issuance of the record of decision.	under the no-action alternative. Riparian areas along perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a slightly greater reduction in baseflow in Pinto Creek that would persist for approximately 7 more years than the no-action alternative. The longer operating life of the mine under alternative 1 would delay the start of final reclamation for most facilities by approximately 7 years compared to the no-action alternative.	lands than both the no-action alternative and alternative 1. The proposed action would remove an estimated 39 acres of riparian vegetation (14 acres on private lands owned by Pinto Valley Mining Corp. and 24 acres on National Forest System lands). Riparian areas along perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a reduction in baseflow in Pinto Creek greater in magnitude than the no-action alternative and similar in magnitude to alternative 1 but persisting for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. The longer operating life of the mine under the proposed action would delay the start of final reclamation for most facilities for approximately 19 years beyond the no-action alternative and 12 years beyond alternative 1.
Biological Resources – Fish and Wildlife	Expansion of mining facilities would result in 367 acres of new surface disturbance within the interior chaparral biotic community. The resulting loss of shelter, breeding sites, and food resources would adversely affect wildlife until vegetation is reestablished through active or passive reclamation. There would be minimal impacts on habitat connectivity because new surface disturbance would occur adjacent to areas disturbed by the Pinto Valley Mine's existing facilities. Wildlife may be killed or injured by mine-related vehicle traffic both within the mine site and along National Forest System Road 287. The predicted long-term reduction of baseflow in Pinto Creek during the post-mining period could reduce the availability of water for fish and wildlife and could adversely affect surface water quality in reaches with low flow, increasing potential for exposure of fish and wildlife to contaminants.	Impacts on wildlife that would occur as a result of surface disturbance would be similar to those under the no-action alternative, except the size of the affected area would be greater (542 more acres of new surface disturbance on private lands owned by Pinto Valley Mining Corp.). Impacts on wildlife from mine-related vehicle traffic would be similar to those under the no-action alternative. The duration of impacts on fish and wildlife from surface disturbance and mine-related vehicle traffic would be approximately 7 years longer than under the no-action alternative. The types of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for the no-action alternative. However, the predicted groundwater drawdown area would encompass an additional 0.18 mile of perennial streams under alternative 1 and continued groundwater pumping would extend the	Impacts on wildlife that would occur as a result of surface disturbance would be similar to those under the no-action alternative and alternative 1, except the size of the affected area would be greater (950 more acres new surface disturbance than the no-action alternative and 408 acres more than alternative 1). Impacts on wildlife from mine-related traffic would be similar to those under the no-action alternative and alternative 1. The duration of impacts on fish and wildlife from surface disturbance and mine-related traffic would be approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1. The types of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for the no-action alternative and alternative 1. However, the groundwater drawdown area would encompass an additional 0.37 mile of perennial

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	Continued pumping of the Peak Well field under the no-action alternative is anticipated to increase the duration of maximum impacts on baseflow in perennial streams by approximately 3 years compared to existing conditions.	duration of maximum impacts on baseflow for approximately 7 more years than the no-action alternative.	streams than under the no-action alternative and 0.18 mile more of perennial streams than under alternative 1, and continued groundwater pumping would extend the duration of maximum impacts on baseflow for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.
Biological Resources – Special Status Species	No new surface disturbance would occur within proposed critical habitat for western yellow-billed cuckoo. Approximately 244 acres and 32 acres of proposed critical habitat within units 26 and 29, respectively, may be affected by groundwater drawdown along Pinto Creek under the no-action alternative. Adverse effects on other threatened and endangered species are unlikely. Areas affected by an estimated 367 acres of new surface disturbance and predicted groundwater drawdown include potential habitat for golden eagle, Forest Service sensitive species, Tonto National Forest management indicator species, and Tonto National Forest migratory bird species of concern (collectively, “special status species”).	Potential impacts on proposed critical habitat for western yellow-billed cuckoo would be as described under the no-action alternative, except approximately 250 acres and 49 acres within proposed critical habitat units 26 and 29, respectively, may be affected by groundwater drawdown (23 more acres total than under the no-action alternative). Groundwater pumping would continue at the existing rate for approximately 7 more years under alternative 1, prolonging potential impacts on proposed critical habitat and delaying recovery of affected physical and biological features. There would be greater adverse impacts on special status species than under the no-action alternative because approximately 542 more acres of potential habitat would be affected and impacts would persist for approximately 7 more years under alternative 1.	Potential impacts on proposed critical habitat for western yellow-billed cuckoo would be as described under the no-action alternative, except approximately 254 acres and 51 acres within proposed critical habitat units 26 and 29, respectively, may be affected by groundwater drawdown (6 more acres total than under alternative 1 and 29 more acres than under the no-action alternative). Groundwater pumping would continue at the existing rate for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, further prolonging potential impacts on proposed critical habitat and delaying recovery of affected physical and biological features. Despite the potential adverse effects on proposed critical habitat for western yellow-billed cuckoo along Pinto Creek, the proposed action is not anticipated to prevent the species’ recovery within the Tonto Basin or throughout its range due to the presence suitable alternative breeding sites. There would be greater adverse impacts on special status species than under alternative 1 and the no-action alternative because a greater habitat area would be affected (950 more acres new surface disturbance than under the no-action alternative and 408 acres more than under alternative 1) and impacts would continue for a longer period of time (approximately 19 more years than under the

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
			no-action alternative and 12 more years than under alternative 1).
Greenhouse Gas Emissions and Climate Change	Estimated cumulative greenhouse gas emissions through the end of the mine life (2 months after record of decision) are estimated to be approximately 1.04 million metric tons of carbon dioxide equivalent. Estimated cumulative greenhouse gas emissions throughout reclamation activities (4 months to 13 years after the record of decision) would be 0.9 million metric ton of carbon dioxide equivalent. Continued mining operations for 2 months following the record of decision and subsequent closure, reclamation, and post-closure would coincide with trends of warming and more frequent heat waves, increasing frequency and severity of extreme precipitation events, as well as a slight overall decrease in precipitation.	Estimated cumulative greenhouse gas emissions through the end of the mine life would be approximately 2.6 million metric tons of carbon dioxide equivalent (1.56 million metric tons more than under the no-action alternative). Estimated cumulative greenhouse gas emissions throughout reclamation activities (7 to 19 years after the record of decision) would be approximately the same as under the no-action alternative but would occur approximately 7 years later. Continued mining operations for approximately 7 years following the record of decision would coincide with climatic trends described under the no-action alternative for a longer period of time, during which the effects would generally intensify.	Estimated cumulative greenhouse gas emissions through the end of the mine life would be approximately 6.3 million metric tons of carbon dioxide equivalent (approximately 5.26 and 3.7 million metric tons more than under the no-action alternative and alternative 1, respectively). Estimated cumulative greenhouse gas emissions throughout reclamation activities would be the same as under the no-action alternative and alternative 1 but would occur approximately 19 years or 12 years later, respectively. Continued mining operations for approximately 19 years following the record of decision would coincide with climatic trends described under the no-action alternative for a longer period of time, during which the effects would generally intensify (such as energy demands under extreme heat, localized dust, and ground-level ozone pollution).
Cultural Resources	There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. Indirect effects from public access and associated risk of theft or vandalism would be the same as under existing conditions, with 14 historic properties within or near existing roads vulnerable to indirect or inadvertent adverse effects resulting from use of the roads.	New surface disturbance on an additional 909 acres of private lands owned by Pinto Valley Mining Corp. would have direct adverse effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. Under alternative 1, undertakings in the area of potential effect would generally be subject to the National Historic Preservation Act section 106 process because alternative 1 includes authorization of activities on National Forest System lands. Potential indirect effects from public access would be the same as described under the no-action alternative except the risk would persist for approximately 7 more years under alternative 1.	New surface disturbance from expansion of mining facilities onto an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. would have direct adverse effects on 14 historic properties, including the three historic properties that would be directly affected under alternative 1. A historic properties treatment plan developed for the proposed action directs that data recovery be completed at these 14 historic properties. Like alternative 1, but in contrast to the no-action alternative, all historic properties would be subject to the section 106 process. Potential indirect effects from public access would persist for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
Resources of Tribal Interest	There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. As a result, there are no anticipated adverse impacts on historic properties of tribal interest. Potential impacts on sacred sites and other resources of tribal interest, including impacts on the Pinto Creek watershed and springs in the area, direct loss of gathering areas and access to gathering areas, and overall impacts on the landscape, would persist until mining activities cease and reclamation is completed. However, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.	New surface disturbance on an additional 909 acres of private lands under alternative 1 would have direct adverse effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands, any of which may be perceived as an adverse impact on resources of tribal interest. Potential impacts on other resources of tribal interest would persist for approximately 7 more years than under the no-action alternative. Similar to the no-action alternative, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.	New surface disturbance on an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. would have direct adverse effects on 14 historic properties, any of which may be perceived as an adverse impact on resources of tribal interest. Potential impacts on other resources of tribal interest would persist for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1. Similar to the no-action alternative and alternative 1, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.
Environmental Justice	No anticipated environmental justice impacts; however, identified minority and low-income communities where many mine employees reside and that experience economic activity resulting from active mining operations could experience disproportionately adverse effects from the commencement of mine closure approximately 2 months after the record of decision is issued and layoff of approximately 400 nonessential personnel during the following month.	No anticipated environmental justice impacts.	No anticipated environmental justice impacts.
Minority and low-income communities	Identified minority and low-income communities where many mine employees reside and that experience economic activity resulting from active mining operations could experience disproportionate adverse effects after the mine transitions from active mining operations to reclamation and closure approximately 2 months after the record of decision.	Continuation of active mining operations for approximately 7 more years than under the no-action alternative, and expansion of mining facilities on private land would alleviate the socioeconomic effects described under the no-action alternative but could result in adverse effects on identified minority and low-income communities (such as continued air pollutant emissions, vehicle traffic, and visual effects);	Continuation of active mining operations for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, and expansion of mining facilities onto private and National Forest System lands would alleviate the socioeconomic effects described under the no-action alternative but could result in adverse effects on identified minority and low-income communities (such as continued air pollutant

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
		however, these communities would not be disproportionately affected.	emissions, vehicle traffic, and visual effects); however, these communities would not be disproportionately affected.
Fire and Fuels Management	Continuation of mining operations during the first 2 months of the 6-month transition period and expansion of mining facilities onto an additional 367 acres of private lands under the no-action alternative would decrease the total amount of vegetative fuels in the analysis area as areas are cleared around existing facilities. After several decades of reclamation and revegetation, total fuel loading in the analysis area may be greater than under existing conditions at the mine.	Continuation of mining operations and expansion of mining facilities onto an additional 909 acres of private lands (an increase of 542 acres) would decrease the total amount of vegetative fuels in the analysis area as areas are cleared around existing facilities. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 7 years later than under the no-action alternative.	Expansion and reclamation of mining facilities under the proposed action would have the same types of impacts on fuel loading described for the no-action alternative and alternative 1, except to a greater degree because the proposed action would result in disturbance of 1,087 acres of private lands and 229 acres of National Forest System lands. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.
Geology, Minerals, and Geotechnical Stability	Due to the relatively minimal expansion of Tailings Storage Facility No. 4, the no-action alternative is not anticipated to alter the geotechnical stability of the tailings storage facilities compared to existing conditions. In addition, Pinto Valley Mining Corp. would continue to maintain and apply its tailings operation, maintenance, and surveillance manual that would reduce the potential for instability issues. During the post-closure period, progressive pit slope failure through time could expand the perimeter of the pit and reduce the overall angle of pit slopes, particularly in areas underlain by weak or highly fractured bedrock and areas with adverse dipping geologic structures. Under the no-action alternative, there would be no further lateral expansion of the Open Pit through active mining. However, sections of the Open Pit where the Pinal Schist are exposed may continue to fail until equilibrium for the rock mass is reached.	Potential loss of shear strength in saturated, slow-draining layers within the tailings pile that supports the raised dam, a phenomenon referred to as static liquefaction, is a particular concern for tailings storage facilities constructed in the upstream manner. The lowest result for static loading was a factor of safety of 1.34 computed for an undrained response assumption, which meets the minimum required factor of safety of 1.30 under the Best Available Demonstrated Control Technology. The lowest result for pseudo-static loading was also found on that same section, with a computed factor of safety of 1.01, which meets the minimum factor of safety of 1.0. These results warrant diligent monitoring of both facilities to ensure that the pore pressure response and shear strength assumptions used in the geotechnical analyses are valid. In general, the types of potential impacts associated with pit slope stability would be the same as those under the no-action alternative. However, alternative 1 would increase the	Similar to alternative 1, potential loss of shear strength in saturated, slow-draining layers within the tailings pile that supports the raised dam, a phenomenon referred to as static liquefaction, is a particular concern for tailings storage facilities constructed in the upstream manner. The lowest calculated factors of safety for both static and pseudo-static loading for the proposed action were found on section B at Tailings Storage Facility No. 3. The lowest result for static loading was a factor of safety of 1.30 for static loading and 1.0 for pseudo-static loading, which are equal to the minimum required factors under the Best Available Demonstrated Control Technology. The lowest result for Tailings Storage Facility No. 4 was 1.34 for static loading and 1.08 for pseudo-static loading. These results warrant diligent monitoring of both facilities to ensure that the pore pressure response and shear strength assumptions used in the geotechnical analyses are valid.

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
		depth of the Open Pit by 90 feet compared to the no-action alternative.	Because the Open Pit would be expanded onto National Forest System lands under the proposed action, potential impacts on National Forest System lands associated with pit stability would be increased compared to the other alternatives. However, the post-closure pit wall stability model for the proposed action (SRK Consulting, Inc. 2020c) indicates that the probability of a deep-seated pit wall failure extending to the pit bottom occurring during the life of mine and the post-closure periods such that it would cause unplanned disturbance to National Forest System land is very low. However, pit creep and continued movement of Pinal Schist within the Schist Hill Creep Monitoring Zone is considered likely. The creep would occur in previously mined areas and on the native slopes south of the Open Pit extending onto National Forest System lands (SRK Consulting, Inc. 2020c).
Paleontology	There are no known paleontological resources within the additional 367 acres of private lands that would be disturbed under the no-action alternative. Impacts on unknown paleontological resources could result from project-related surface-disturbing activities; however, it is unlikely that fossils would be encountered in the geologic units present.	There are no known paleontological resources within the additional 909 acres of private lands that would be disturbed under alternative 1. Alternative 1 would disturb a larger area than the no-action alternative in which unknown paleontological resources may occur; however, it is unlikely that fossils would be encountered.	There are no known paleontological resources within the additional 1,087 acres of private lands and 229 acres of National Forest System lands that would be disturbed under the proposed action. The proposed action would disturb a larger area than the no-action alternative in which unknown paleontological resources may occur; however, it is unlikely that fossils would be encountered.
Hazardous and Nonhazardous Materials	The types and amounts of hazardous and nonhazardous materials used and stored on site at Pinto Valley Mine would remain generally consistent with those listed in appendix G, "Hazardous and Nonhazardous Materials Inventory," during the 6-month transition period from active operations to the start of mine closure. Pinto Valley Mining Corp. would continue to minimize risks of materials release through proper material management	Under alternative 1, Pinto Valley Mining Corp. would continue mining operations approximately 7 years longer than under the no-action alternative, increasing the volume of materials stored on site and the amount of time hazardous and nonhazardous materials would be used and stored on site during active mining operations. Risks associated with materials storage and use would continue for approximately 7 more years than under the no-	Under the proposed action, Pinto Valley Mining Corp. would continue mining operations approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1, increasing the volume of materials stored on site and the amount of time hazardous and nonhazardous materials would be used and stored on site during active mining operations. Risks associated with materials storage and use would continue for a longer

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	and implementation of precautionary measures through post-closure in accordance with current practices.	action alternative. Aside from changes in the location of petroleum products for powering, lubricating, or cooling motor vehicles or transformers within Pinto Valley Mining Corp.'s private lands, storage and use locations for most hazardous and nonhazardous materials are not anticipated to change from existing locations and volumes. Pinto Valley Mining Corp. would minimize the risk of materials release in the same manner as under the no-action alternative.	period of time than under either the no-action alternative or alternative 1. Use of certain mobile and fixed equipment on National Forest System lands that contain regulated materials, such as petroleum-based fuels and lubricants, would increase the potential for inadvertent release of these materials on National Forest System lands. Pinto Valley Mining Corp. would minimize the risk of materials release in the same manner as under the no-action alternative and alternative 1.
Land Ownership	There would be no change in land ownership under the no-action alternative. Previously authorized rights-of-way and special use permits for mining and ancillary facilities on National Forest System lands would not be authorized and final reclamation and closure would be implemented in accordance with existing plans and permits.	There would be no change in land ownership under alternative 1. Under alternative 1, existing encroachments and previous authorizations for uses of National Forest System lands would be authorized on approximately 566 acres of National Forest System lands. Pinto Valley Mining Corp. would further expand the footprints of certain mining facilities within Pinto Valley Mining Corp.'s private lands. No new surface disturbance would occur on National Forest System lands.	There would be no change in land ownership under the proposed action. Under the proposed action, the Forest Service would authorize the use of approximately 795 total acres of National Forest System lands for mining-related use by Pinto Valley Mining Corp. including the 566 acres of existing encroachments and areas of previous authorizations and the 229 acres of additional disturbance due to expansion of the Open Pit, tailings storage facilities, and construction or relocation of linear features under the proposed action (roads and pipelines).
Livestock Grazing	All new surface disturbance under the no-action alternative would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, the no-action alternative would not result in a loss of forage, as measured by animal unit months, and would not reduce the amount of grazing in the allotments. Following the 6-month transition period, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining	Similar to the no-action alternative, all new surface disturbance under alternative 1 would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, alternative 1 would not result in a loss of forage (as measured by animal unit months) or reduce the amount of grazing in the allotments. As the mine transitions to reclamation and closure, which would occur approximately 7 years later than under the no-action alternative, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System	The proposed action would result in an estimated 117 acres of new disturbance on National Forest System lands in the Pinto Creek allotment and 112 acres of surface disturbance on National Forest System lands in the Sleeping Beauty Complex allotment. The longer duration of mine operations under the proposed action would expand the area unavailable for forage and extend the length of time during which forage on National Forest System lands occupied by mining activities would be unavailable to livestock grazing by approximately 229 acres and 19 years compared to the no-action alternative and 229 acres and 12 years compared to alternative 1. However,

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	Corp.'s reclamation plan for National Forest System lands.	lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands.	the estimated loss of animal unit months under the proposed action is not expected to result in a reduction in authorized livestock grazing numbers because the allotments are capable of supporting more animal unit months than currently permitted.
Noise	Existing human-made noise from mining operations would continue, gradually lessening during the 6-month transition period to start mine closure. Reclamation would generally occur during a 12-year period in three phases, with the highest noise levels resulting from reclamation of the tailing facilities during phase 3. Users of adjacent dispersed recreation areas near Pinto Valley Mine or travel routes to those areas may experience mine-related noise, depending on their proximity to mine-associated noise sources. The closest residences are 2.8 miles away and noise modeling found no discernable effects on those residences or on more distant wilderness areas. Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize and ready the mine for closure and reclamation, Pinto Valley Mining Corp. anticipates that the blasting events would be limited and would employ the same standards and practices as the current blasting program.	Users of adjacent dispersed recreation areas or travel routes to those areas would experience similar mine-related noise as under the no-action alternative but continuing for approximately 7 more years of mine operations and with the addition of infrequent blasting noise during daylight hours. Noise during mine reclamation and closure would be the same as under the no-action alternative but would begin approximately 7 years later. Like the no-action alternative, no noise effects on residences or wilderness areas are anticipated under alternative 1.	The proposed action would have the same operational noise impacts as alternative 1 but continuing for approximately 12 more years. Noise during mine reclamation and closure would be the same as under the no-action alternative and alternative 1 but would begin approximately 19 years and 12 years later, respectively. Like the no-action alternative and alternative 1, no noise effects on residences or wilderness areas are anticipated under the proposed action.
Public Health and Safety	Existing mine identification and security features would remain in place at Pinto Valley Mine under the no-action alternative. Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize and ready the mine for closure and reclamation, Pinto Valley Mining Corp. anticipates that the blasting events	Hazards to public health and safety would be essentially the same as under the no-action alternative, except that any hazards associated with active mining operations would continue for approximately 7 more years under alternative 1, resulting in increased volume of materials stored on site and a longer duration of material use during active mining operations. Although blasting would occur during mine	Hazards to public health and safety would be essentially the same as under the no-action alternative and alternative 1, except that an additional 229 acres of National Forest System lands would be subject to hazards associated with active mining operations. Additionally, public health and safety hazards associated with active mining operation would continue for approximately 19 more years than under the

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	would be limited and would employ the same standards and practices as the current blasting program There would be no change to the existing risk to Pinto Valley Mine employees or public health from potential exposure to hazardous or nonhazardous materials. During final reclamation, Pinto Valley Mining Corp. would install security fencing on private property around the Open Pit to deter public access, and would regularly monitor the fence during the post-closure period. Proposed modifications to the existing tailings storage facilities are not anticipated to affect the public safety risks associated with tailings storage facilities.	operations, public safety concerns would be minimized by the preventative safety measures employed by the mine and Forest Service. The security fence around the Open Pit would be installed approximately 7 years later than under the no-action alternative. Proposed modifications to the existing tailings storage facilities are not anticipated to affect the public safety risks associated with tailings storage facilities. Facility stabilization, including stabilizing the Open Pit high wall, would occur approximately 7 years later than under the no-action alternative.	no-action alternative (and would include blasting) and 12 more years than under alternative 1, resulting in increased volume of materials stored on site and a longer duration of material use during active mining operations. Final reclamation and facility stabilization activities and installation of the security fence around the Open Pit would begin approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.
Recreation and Wilderness	Mine-related vehicle trips on National Forest System Road 287 would decrease substantially after cessation of active mine operations (approximately 2 months after issuing the record of decision), decreasing the potential for conflicts with or impediments to public recreational access. Visual effects on dispersed recreation areas along the northern portion of Pinto Valley Mine from 367 acres of new surface disturbance on private lands would not change the overall scenic quality of the recreation areas, from which evidence of a large-scale mining operation has been visible for decades. The no-action alternative is not anticipated to affect recreationists using the Arizona National Scenic Trail or the Superstition Wilderness.	Average annual mine-related vehicle trips on National Forest System Road 287 would continue for approximately 7 more years than under the no-action alternative, resulting in a longer period during which mine-related traffic has the potential to conflict with or impede public recreational access. Continuation of mining activities under alternative 1 may increase the scale of mine features, especially the embankments, relative to other landscape elements and would result in 542 more acres of new surface disturbance on private lands compared to the no-action alternative, but is unlikely to change overall perceptions of scenic quality when viewed from National Forest System lands adjacent to Pinto Valley Mine, the Superstition Wilderness, and the Arizona National Scenic Trail, from which evidence of a large-scale mining operation (Pinto Valley Mine) has been visible for decades.	Same as described under the no-action alternative and alternative 1, except the operational life of the mine would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, resulting in a longer period during which mine-related traffic has the potential to conflict with or impede recreational access. Potential scenic quality impacts, as viewed by recreationists from National Forest System lands adjacent to Pinto Valley Mine, the Superstition Wilderness, and the Arizona National Scenic Trail, would be similar to those described under alternative 1, except the proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. However, the overall scenic quality of the landscape as seen and perceived by

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
			recreationists is not anticipated to change due to screening by topography and vegetation or due to the relatively distant viewing locations.
Socioeconomic Conditions	Mine employment would be maintained at existing levels during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure after issuance of the record of decision. Approximately 400 nonessential personnel are expected to be laid off within 3 months after issuance of the record of decision. Out-migration, increased vacancy rates, and decreased housing values due to staffing level reductions could occur during and after mine closure activities. Following the 2-month period of active mining operations after issuance of the record of decision, impacts from noise, human presence, and visual disturbance would decrease. As disturbed areas are reclaimed, nonmarket values would increase commensurate with the success of vegetation and reclamation efforts. Following the 2 months of active mining operations under the no-action alternative, State and local revenues generated from mine-related expenditures would be substantially reduced in perpetuity compared to existing conditions.	Operation of Pinto Valley Mine, which would continue for approximately 7 years longer than under the no-action alternative, would support approximately 1,030 total annual jobs in the Gila County region, would generate approximately $66.3 million in labor income, and would contribute approximately $326.4 million in industry activity across the region. Mine closure would result in the same types of socioeconomic effects as under the no-action alternative, but they would occur approximately 7 years later under alternative 1 due to the longer life of the mine. Alternative 1 would result in 909 acres of additional surface disturbance on private land compared to the no-action alternative. However, this additional disturbance would have minimal effects on nonmarket values, as the area is and would remain unavailable for recreation or other uses by the public during reclamation and closure. State and local government revenues generated through taxes and fees on Pinto Valley Mine would be greater than and accrue for approximately 7 more years than under the no-action alternative.	Annual jobs, labor income, and economic activity generated by operation of Pinto Valley Mine would be the same as under alternative 1 but would continue for approximately 12 more years under the proposed action. Mine closure under the proposed action would result in the same types of socioeconomic effects as under the no-action alternative and alternative 1 but they would occur approximately 19 years later than under the no-action alternative or 12 years later than under alternative 1 due to the longer life of the mine. Effects on nonmarket values would be greater than under the no-action alternative and alternative 1 due to the increased amount of surface disturbance on private land, the addition of 229 acres of surface disturbance on National Forest System lands, and the longer operational life of the mine. However, nonmarket values of the existing landscape are already low due to the highly altered condition of the landscape from decades of large-scale mining. State and local government revenues generated through taxes and fees on Pinto Valley Mine would accrue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.
Soils	Expansion of mining facilities under the no-action alternative would result in 367 acres of new surface disturbance on private land. Removal of vegetation and the temporary exposure of the bare soil could increase soil erosion rates until the disturbed areas are successfully reclaimed. Given the slow recovery of natural vegetative communities on disturbed land in arid climates in the desert	Expansion of mining facilities onto private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in approximately 909 acres of new surface disturbance on private land. Potential impacts on soils from surface disturbance would be similar to those described for the no-action alternative but to a greater extent due to 542 more acres of new surface	Surface disturbance under the proposed action would result in similar types of effects on soils as described for the no-action alternative and alternative 1. However, a larger area would be affected because the proposed action would result in 720 more acres of new surface disturbance on private land compared to the no-action alternative, 178 more acres of new surface disturbance on private land compared

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	southwest, soil conditions in disturbed areas may require a substantial amount of time to return to natural conditions.	disturbance on private land compared to the no-action alternative.	to alternative 1, and 229 more acres of new surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
Traffic and Transportation	The volume of vehicle traffic entering and exiting Pinto Valley Mine along U.S. Highway 60 and National Forest System Road 287 would continue at approximately current levels during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure. During this time, ongoing mining operations could result in minor and temporary impacts on public access along the segment of National Forest System Road 287 that passes through Pinto Valley Mining Corp. property. After mine closure, annual contractor vehicle trips would substantially decrease to approximately 1,806 vehicle roundtrips per year (5 average annual daily roundtrips) for 12 years, then decrease to approximately 161 vehicle roundtrips per year during the 30-year post-closure period. Potential for temporary public road user conflicts with mining operation traffic would exist and minor delays or reroutes could be encountered along the segment of National Forest System Road 287 that passes through Pinto Valley Mining Corp. property, resulting in minor and temporary potential impacts on public access.	Under alternative 1, the volume of employee and contractor vehicles entering and exiting Pinto Valley Mine and potential for minor and temporary impacts on public access would continue at approximately current levels for the operational life of the mine, which would be approximately 7 years longer than under the no-action alternative. Annual contractor vehicle trips after mine closure would decrease approximately 7 years later than under the no-action alternative.	Under the proposed action, the volume of employee and contractor vehicles entering and exiting Pinto Valley Mine and potential for minor and temporary impacts on public access would continue at approximately current levels for the operational life of the mine, which would be approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1. Annual contractor vehicle trips after mine closure would decrease approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.
Visual Resources	Visual modifications resulting from the no-action alternative are expected to be minimal relative to existing conditions and associated characterization of the landscape according to Forest Service visual quality objectives, Forest Service variety classes, and Bureau of Land Management scenery classes. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument during	Visual modifications resulting from alternative 1 would be slightly greater than those from the no-action alternative due to 542 more acres of new surface disturbance on private lands and the increased top elevations of tailings dams and waste rock dumps. However, these changes to the landscape would be minimal relative to the highly altered existing condition of the landscape at the Pinto Valley Mine.	Visual modifications from the proposed action are expected to be greater than those from either the no-action alternative or alternative 1 due to 720 more acres of new surface disturbance on private land compared to the no-action alternative, 178 more acres of new surface disturbance on private land compared to alternative 1, and 229 more acres of new surface disturbance on National Forest System

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	the remaining 2 months of active mining operations would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Reclamation of existing Pinto Valley Mine facilities on National Forest System lands could result in the gradual transition of the existing disturbed areas to meet current visual objectives as mine facilities are removed and the disturbed area is revegetated in accordance with the reclamation plan for National Forest System lands.	Continuation of active mining operations for approximately 7 more years than under the no-action alternative would extend the duration of visual effects from alternative 1. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for the no-action alternative except that nighttime lighting for mine operations would continue for approximately 7 more years under alternative 1. Reclamation of existing Pinto Valley Mine facilities would have the same effects as described under the no-action alternative but would occur approximately 7 years later.	lands compared to the no-action alternative and alternative 1. Continuation of active mining operations for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 would extend the duration of visual effects from the proposed action. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for alternative 1 except that nighttime lighting for mine operations would continue for approximately 12 more years under the proposed action. Reclamation of mine features on National Forest System lands in accordance with the reclamation plan for National Forest System lands as well as natural weathering processes during operations and post mining would, over time, reduce contrasts between mining-related disturbances and adjacent natural-appearing landscapes, resulting in a gradual transition of disturbed areas to meet current visual objectives.
Water Resources and Hydrogeochemistry – Groundwater Quantity and Quality	Groundwater drawdown is predicted to continue to expand during the post-mining period from 15.6 square miles at the end of mining in 2021 to 35.7 square miles at 100 years post-closure. There is potential for long-term impacts on groundwater and surface water quality from draindown of entrained process water during the post-closure period. Furthermore, long-term impacts from formation and discharge of acid rock drainage are possible, but not considered likely to be significant. Production of acid rock drainage from waste rock dumps in response to rain events would tend to react with other rock materials, which may act to dilute and neutralize to an unknown extent. Currently, groundwater wells proximal	Groundwater drawdown is predicted to continue to expand during the post-mining period from 18.9 square miles at the end of mining in 2027 to 36.2 square miles at 100 years post-closure. Impacts on groundwater quality are expected to be the same as described under the no-action alternative.	The predicted changes in groundwater levels under the proposed action indicate the drawdown area is predicted to continue to expand during the post-mining period from 23.8 square miles at the end of mining to 37.9 square miles at 100 years post-closure. At the 100-year post-mining timeframe, the proposed action drawdown area is 6 percent larger than under the no-action alternative scenario, and 1 percent larger than under the alternative 1 scenario. Groundwater quality impacts from the tailings storage facilities under the proposed action would be similar to but could be greater than those described for the no-action alternative and alternative 1. Owing to the expanded volume of tailings storage under the proposed

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
	to waste rock dumps do not show impacts from acid rock drainage. This and the absence of reported routine or sporadic acid rock drainage seeps or runoff suggest that infiltration of meteoric precipitation into the waste rock dumps is insufficient to produce a discharge of acid rock drainage in the long term.		action, a greater volume of neutral pH, high total dissolved solids, high sulfate leachate would be generated and stored in the larger facility.
Water Resources and Hydrogeochemistry – Surface water Quantity and Quality	Groundwater drawdown is projected to encompass a total of 5.49 miles of perennial stream length that includes portions of Pinto Creek (4.43 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration (approximately 3 years). Of the 15 inventoried spring sites (six wet, nine dry) within the drawdown area, groundwater drawdown could reduce baseflows to the six wet springs that are considered perennial and conservatively assumed to have baseflow controlled by discharge from the groundwater system. Without long-term capture and treatment, seepage from Tailings Storage Facility No. 4 would migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek. Under the no-action alternative, there is a potential for long-term impacts on groundwater and surface water quality from draindown of entrained process water during the post-closure period.	Groundwater drawdown is projected to encompass a total of 5.68 miles of perennial stream length that includes portions of Pinto Creek (4.62 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Long-term reduction in baseflow resulting from groundwater pumping would result in impacts of a similar magnitude on segments of Pinto Creek as described for the no-action alternative but would persist for an additional 7 years. Of the 17 inventoried spring sites (six wet, 11 dry) within the drawdown area, groundwater drawdown could reduce baseflows to the six wet springs as described under the no-action alternative. Impacts on water quality from tailings storage facilities would be approximately the same or similar to those described under the no-action alternative.	Groundwater drawdown is projected to encompass a total of 5.86 miles of perennial stream length that includes portions of Pinto Creek (4.80 miles), Miller Springs Gulch (0.82 mile), and an unnamed tributary to Pinto Creek (0.25 mile). These results are similar to but slightly larger than those defined under the no-action alternative and alternative 1. Segments of Pinto Creek that were previously characterized as perennial prior to 2013 would be expected to continue to be affected at a similar magnitude but for a longer duration (19 years longer than under the no-action alternative and 12 years longer than under alternative 1). Of the 19 inventoried spring sites (seven wet, 12 dry) within the drawdown area, groundwater drawdown could reduce baseflows to the seven wet springs that are considered perennial and conservatively assumed to have baseflow controlled by discharge from the groundwater system. The potential impact on water quality would be similar to but could be greater than that under the no-action alternative and alternative 1 owing to the expanded volume of tailings storage under the proposed action; a greater volume of neutral pH, high total dissolved solids, high sulfate leachate water would be generated and stored in the larger facilities.

Resource/Resource Element	No-action Alternative	Alternative 1	Proposed Action
Water Resources and Hydrogeochemistry – Water Rights	There are 25 surface water rights in the drawdown area that include 16 used for livestock, eight used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife. Nine of these 25 surface water rights also occurred within the projected drawdown area resulting from groundwater pumping between 2013 and 2018. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right.	There are 26 surface water rights in the drawdown area that include 17 used for livestock, seven used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife. Nine of these 26 surface water rights also occurred within the projected drawdown area resulting from groundwater pumping between 2013 and 2018. Alternative 1 would result in similar impacts as under the no-action alternative for surface water rights that are dependent on groundwater discharge; however the impacts would occur for an additional 7 years.	The same 26 water rights identified within the drawdown area under alternative 1 were identified within the projected drawdown area under the proposed action. The proposed action would result in similar impacts as under the no-action alternative and alternative 1 for surface water rights that are dependent on groundwater discharge; however, the impacts would occur for an additional 19 years or 12 years, respectively. Potential impacts on the Forest Service in-stream flow right could persist for a longer period compared to the no-action alternative and alternative 1 (19 more years or 12 more years, respectively).

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
EIS	environmental impact statement
Forest Service	U.S. Department of Agriculture, Forest Service
IMPLAN	Impact Analysis for Planning

1.0 Purpose of and Need for Action

1.1 Introduction

The Tonto National Forest, an administrative unit of the U.S. Department of Agriculture, Forest Service (Forest Service), prepared this final environmental impact statement (EIS) to evaluate and disclose the potential environmental effects from approval of the proposed mining plan of operations (the “project”) for use of National Forest System lands in connection with operations authorized by the United States mining laws submitted by Pinto Valley Mining Corp. for the Pinto Valley Mine (Capstone Mining Corp. 2016a). The Pinto Valley Mine is an existing open pit copper and molybdenum mine located in Gila County, Arizona, approximately 8 miles west of the Town of Miami on both private lands and National Forest System lands in the Globe Ranger District. Pinto Valley Mining Corp. (a wholly owned subsidiary of Capstone Mining Corp.) operates the mine. Pinto Valley Mining Corp. proposes to expand existing mining operations onto National Forest System lands to access mineralization that extends onto claims on National Forest System lands, to extend the mine life for approximately 19 years, to address existing Open Pit slope instability in the southeastern portion of the pit, and to consolidate prior authorizations that are reasonably incident to extraction, transportation, and processing of mineral deposits.

Approval of the proposed mining plan of operations under applicable regulations (Title 36 part 228, subpart A of the Code of Federal Regulations [CFR]) is considered a major Federal action subject to the National Environmental Policy Act. Accordingly, the Forest Supervisor determined that preparation of an EIS was necessary to identify the scope of issues associated with the proposed mining plan of operations, identify and assess reasonable alternatives to the proposed mining plan of operations in order to minimize adverse effects on National Forest System surface resources to the extent feasible, and evaluate and disclose the potential significant environmental effects. The Forest Supervisor of the Tonto National Forest has considered the beneficial and adverse impacts of each alternative analyzed in the final EIS. The Forest Service has released a draft record of decision that identifies mitigation measures that would be included to minimize potential impacts.

The Forest Service is the lead agency conducting the National Environmental Policy Act review of Pinto Valley Mining Corp.’s proposed mining plan of operations. The Bureau of Land Management, U.S. Environmental Protection Agency, and Arizona Game and Fish Department are serving as cooperating agencies due to their regulatory or enforcement jurisdiction or special expertise on certain aspects of the project. These cooperating agencies do not have any decision-making responsibility in the record of decision.

On July 16, 2020, the Council on Environmental Quality published a final rule to amend its regulations implementing the National Environmental Policy Act of 1969 (Council on Environmental Quality 2020). The final rule went into effect on September 14, 2020. In accordance with the amended regulations at 40 CFR 1506.13, the amended regulations apply to any National Environmental Policy Act review process begun after September 14, 2020; however, an agency may apply the amended regulations to ongoing activities and environmental documents begun before September 14, 2020. The Notice of Intent for the Pinto Valley Mine EIS was published in March 2017, initiating the public scoping period, and the notice of availability for the Pinto Valley Mine draft EIS was published in December 2019, initiating the public comment period on the draft EIS. As a result, the Pinto Valley Mine National Environmental Policy Act review and associated EIS are proceeding under the previous Council on Environmental Quality 1978 regulations, as amended, and its existing agency National Environmental Policy Act procedures (Council on Environmental Quality 1978).

1.1.1 Changes Since the Draft Environmental Impact Statement

This final EIS reflects changes made to the Pinto Valley Mine draft EIS that was released to the public in December 2019. The changes were based on public comments on the draft EIS, updates to the alternatives analyzed in detail, revisions based on new information, input from cooperating agencies, the results of other Federal agency consultation processes, and improvements to the overall organization and readability of the document.

One of the changes since the draft EIS is modification of the no-action alternative based on the Forest Service's consideration of public and agency comments on the draft EIS and further review of the previous permits and authorizations for the Pinto Valley Mine. The previous no-action alternative contemplated that the Forest Service would authorize use and occupancy of National Forest System lands necessary for continued operations at the Pinto Valley Mine consistent with the current use and occupancy of National Forest System lands previously authorized under now-expired permits and authorizations. Under the no-action alternative included in this final EIS, the Forest Service would not reauthorize use of National Forest System lands for the Pinto Valley Mine except those activities necessary for mine closure and reclamation. Therefore, the no-action alternative included in this final EIS depicts an alternative where the Pinto Valley Mine would transition from active mining operations to reclamation and closure within 6 months of the record of decision. The no-action alternative presented in the draft EIS is now included as alternative 1 in the final EIS. The proposed action remains the same as presented in the draft EIS, with some minor refinements. As a result, this final EIS describes and analyzes three alternatives in detail including the no-action alternative, alternative 1, and the proposed action. Refer to chapter 2, "Proposed Action and Alternatives," for a description of the alternatives described and analyzed in detail in this final EIS. Based on the new no-action alternative and transitioning of the previous no-action alternative to alternative 1, the Forest Service has revised the structure and description of the environmental consequences of the alternatives presented in chapter 3, "Affected Environment and Environmental Consequences."

Other improvements that were made between the draft EIS and the final EIS include:

- Clarification that private land activities are described and analyzed in the final EIS because the activities on private land and National Forest System lands constitute an integrated mine. Correspondingly, the final EIS clarifies that activities on private land are not under the Forest Service's regulatory authority. This change was made to reduce potential confusion on why private land activities are included and analyzed in the document.
- Clarification of the Forest Service's regulatory authority under 36 CFR 228, subpart A in reviewing and approving a proposed mining plan of operations to minimize confusion.
- Moved the description of existing mining operations at the Pinto Valley Mine out of the description of the no-action alternative and into its own section in section 2.2, "Existing Operations at the Pinto Valley Mine." This change makes it easier to differentiate among existing operations at the Pinto Valley Mine and the proposed operations under the alternatives.
- A variety of other changes were made to the organization and structure of the resource sections in chapter 3, "Affected Environment and Environmental Consequences," to improve overall readability. For example, section 3.3, "Biological Resources," was divided into subsections for Vegetation, Fish and Wildlife, and Special Status Species to present a more logical and organized approach to this section. These changes were made to improve the consistency and readability of the document.

- The description of potential impacts associated with a tailings storage facility failure or breach were moved out of individual resource sections and consolidated into section 3.9, "Geology, Minerals, and Geotechnical Stability," and into appendix F, "Geotechnical Stability Appendix." This change was made to remove a worst-case scenario analysis of potential impacts from a tailings storage facility failure or breach[1] and to consolidate information and analysis of a potential failure or breach to improve readability and to properly disclose expected impacts.
- The description of resources of tribal concern and analysis of potential impacts on resources of tribal concern were removed from the cultural resources section and moved into their own section in chapter 3, "Affected Environment and Environmental Consequences." This change was made in recognition of the difference between cultural resources and resources of tribal concern.
- Updates to the air quality modeling based on newly available information (such as site-specific silt sampling), additional commitments from Pinto Valley Mining Corp. (such as fugitive dust control plan), and overall refinements to the air quality modeling. These changes were made to improve the accuracy and completeness of the air quality modeling. In contrast to the draft EIS, the air quality modeling conducted for the final EIS shows no exceedances of National Ambient Air Quality Standards that are attributable to the alternatives.
- Refinements to various resource analysis areas, analysis approaches, and baseline information. For example, viewshed assessments for alternative 1 and the proposed action were refined based on updated project information and refined topographical data. These changes were made to incorporate information that was identified after the draft EIS and to refine and improve the quality and accuracy of information that was presented in the draft EIS. These refinements to resource conditions and analyses that were made in the final EIS did not substantially change the extent or severity of adverse impacts that were presented in the draft EIS.
- Inclusion of appendix C, "Biological Evaluation," that provides additional detail on Forest Service sensitive species, management indicator species, and migratory birds. This appendix was added in accordance with Forest Service Manual 2670, which requires the preparation of a biological evaluation.
- Inclusion of appendix D, "Biological Opinion," issued by the U.S. Fish and Wildlife Service on August 4, 2020, that reflects the outcome of consultation under section 7 of the Endangered Species Act. This appendix was added to provide documentation of the Endangered Species Act section 7 consultation process and the results of consultation.
- Inclusion of appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," that describes the monitoring and mitigation measures that the Forest Service is considering and that could be included as part of the approval of the selected action in the record of decision and approved mining plan of operations. The mitigation measures described in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," are generally not part of the alternatives analyzed in detail in chapter 3, "Affected Environment and Environmental Consequences." These mitigation measures were identified based on the potential adverse impacts associated with the alternatives carried forward for detailed analysis. Appendix H,

[1] The 1978 Council on Environmental Quality National Environmental Policy Act Regulations (Council on Environmental Quality 1978) required agencies to address uncertainties with worst-case scenario analyses. However, that regulation was amended in 1986 to rescind the worst-case analysis approach and replace it with a more flexible mandate that agencies must discuss the uncertainties in their analyses (see 40 CFR 1502.22(b)).

"Environmental Protection Measures, Monitoring, and Mitigation," includes five attachments with detailed monitoring and mitigation plans associated with key resources including biological resources, geotechnical stability, and water resources. The Forest Service also included additional detail on monitoring and mitigation measures including the Forest Service's authority to require the measures, the timeframe of the measures, and a description of potential impacts that could result from implementation of the measures. This appendix was added to consolidate the detailed information on monitoring and mitigation measures into one location and to provide additional detail on the identified monitoring and mitigation measures.

- Inclusion of appendix I, "General Conformity Determination," which determined that the proposed action is in conformance with the Clean Air Act General Conformity Rule in the National Ambient Air Quality Standards nonattainment zones that overlap the Pinto Valley Mine. A general conformity determination is required in accordance with the General Conformity Rule (40 CFR 93, subpart B) because the Pinto Valley Mine overlaps nonattainment areas for sulfur dioxide and particulate matter of 10 microns diameter and smaller (PM_{10}).
- Inclusion of appendix J, "Draft EIS Comment Report," that describes the public comment process on the draft EIS, identifies comments received, and describes how the Forest Service considered and addressed comments received on the draft EIS. A description of and response to comments received on a draft EIS are required under the procedural provisions of the National Environmental Policy Act (Council on Environmental Quality 1978).
- Overall effort to consolidate information, reduce redundancy, and streamline content in the document. These changes were made to improve the overall readability of the document.

Based on the changes and improvements presented above, and in accordance with 40 CFR 1502.9(c) and the Council on Environmental Quality's Forty Most Asked Questions Concerning National Environmental Policy Act Regulations (Council on Environmental Quality 1981), the Forest Service considered the need to release a supplemental draft EIS instead of proceeding to a final EIS. The Forest Service determined that a supplemental draft EIS was not necessary for the following reasons:

- The Forest Service followed the implementing regulations and procedural provisions of the National Environmental Policy Act, as well as agency-specific regulations associated with National Environmental Policy Act review of the proposed mining plan of operations.
- The proposed action has not changed in any substantial respect between the draft EIS and the final EIS and there were no significant new circumstances or information associated with the proposed action relevant to environmental concerns that would necessitate preparation of a supplemental draft EIS.
- The new alternative structure and refined analysis of environmental consequences did not identify any new significant environmental concerns that were not already presented in the draft EIS.
- In general, inclusion of the new no-action alternative in the final EIS represents a variation of the no-action alternative that was presented in the draft EIS because the duration of effects and types of activities (such as closure and reclamation) that would occur under the new no-action alternative were components of the no-action alternative that was included in the draft EIS. As such, the operations and impacts associated with the new no-action alternative are within the spectrum of activities and impacts presented in the draft EIS.
- The analysis contained in the final EIS was informed by substantive public and agency comments resulting in an additional alternative that responds to the received comments and includes additional information for consideration by the decisionmaker.

- The final EIS represents a thorough review of the effects of the proposed action and its alternatives by the Forest Service under the National Environmental Policy Act and provides sufficient information to support the record of decision. The final EIS and draft record of decision will inform the next phase of public involvement on the project, which includes a predecisional objection period and a subsequent objection resolution period in accordance with 36 CFR 218 and described in section 1.4, “Decision Framework.”

1.2 Background

The Pinto Valley Mine is located in the Globe-Miami mining district, which is among the oldest and most productive mining districts in the United States. Since the district’s first recorded production in 1878, more than 15 billion pounds of copper have been produced in the mining district (Capstone Mining Corp. 2016a). The general site of the Pinto Valley Mine has been mined by various entities over the past century. The Open Pit at the Pinto Valley Mine was developed in 1972 and became operational in 1974. The Open Pit eventually consumed the adjacent Castle Dome Mine, which was actively mined from 1943 to 1953. The Pinto Valley Mine has operated continuously since 1974 with the exception of a short period of curtailed operations in 1983, and curtailments from 1998 to 2007 and from 2008 to 2012. Pinto Valley Mining Corp.’s annual copper production over the past 6 years has ranged from approximately 116 to 151 million pounds (Capstone Mining Corp. 2020a).

The Pinto Valley Mine is located within portions of the following townships, ranges, and sections as depicted on map 1-1 in appendix A:

- Township 1 north, range 13 east, sections 1, 2, 3, 4, 11, 14, 23, 24, and 25
- Township 1 north, range 14 east, sections 6, 7, 8, 17, 18, 20, 21, 28, 29, 30, 31, and 32
- Township 1 south, range 14 east, sections 5 and 6
- Township 2 north, range 13 east, sections 23, 25, 26, 27, 28, 33, 34, 35, and 36

Although the majority of the Pinto Valley Mine is located on private property, certain facilities and operations are located on National Forest System lands. These uses were authorized by the Forest Service or the Bureau of Land Management (later transferred to the Forest Service in 1989) through rights-of-way, plans of operations, special use permits, or letter agreements (see table 1-1). Authorizations related to Pinto Valley Mine date from as early as the 1940s and have been amended, updated, and re-authorized over the years. However, some of the former authorizations have since expired or were nontransferable, which led to ongoing discussions between the Forest Service and prior operators regarding land exchanges and consolidated plans.

At the request of the Forest Service, BHP Copper, Inc. (former Pinto Valley Mine owner) submitted a proposed mining plan of operations in 2009 for the administrative consolidation of these prior Federal land use authorizations to continue ongoing activities on National Forest System lands. The Forest Service subsequently initiated a review of the proposed plan under the National Environmental Policy Act. In 2010, the Forest Service conducted public scoping, which included notification in local newspapers and a public meeting in Miami, Arizona.

The BHP Copper, Inc. 2009 plan of operations addressed the need for consolidation and authorization of previous uses or ongoing activities on National Forest System lands related to the operation and maintenance of infrastructure and associated access, operation of environmental controls, and long-term maintenance and possible reclamation of existing Federal land uses. These uses included previously authorized activities as well as inadvertent encroachments onto National Forest System lands. The Forest Service's evaluation of the environmental effects of the 2009 plan of operations, in addition to requests for clarification regarding the proposed reclamation activities on National Forest System lands, continued until BHP Copper, Inc. began marketing and ultimately sold its holdings.

In October 2013, Pinto Valley Mining Corp. (a Delaware corporation that is a wholly owned indirect subsidiary of Capstone Mining Corp., a Canadian copper mining company with operations in North and South America), acquired the Pinto Valley Mine from BHP Copper, Inc. and now operates the mine. Pinto Valley Mining Corp. has continued to make payments to the Forest Service as required by previous special use authorizations. Additionally, Pinto Valley Mining Corp. continued to consult with the Forest Service on the status of the mine site's authorizations and permits and confirmed its intent to ensure all operations at the Pinto Valley Mine site would be consolidated, renewed, and kept current. Concurrently, Pinto Valley Mining Corp. initiated discussions with the Forest Service of its planned facility development, including expansion of certain facilities onto National Forest System lands. The planned expansions are reasonably incident to and integrated with the existing mining operations on private lands.

In 2014, Pinto Valley Mining Corp. submitted a draft consolidated mining plan of operations that described existing and proposed activities on National Forest System lands. The 2014 draft plan of operations was refined and a final draft was submitted in May 2016 and accepted by the Forest Service in August 2016 as ready to initiate the National Environmental Policy Act evaluation. The 2016 plan's proposed action is presented in the Pinto Valley Mine EIS, which remains consistent with the long-standing request of the Forest Service to consolidate all prior authorizations and to address existing encroachments from previous operators (see map 1-1 in appendix A). Pinto Valley Mining Corp.'s 2016 plan also included a proposal for an expansion onto National Forest System lands for activities such as mineral development and extraction, in addition to reasonably incident uses such as tailings deposition, power lines, and water lines related to processing the copper and molybdenum deposit that extends from its private land onto its mining claims on National Forest System lands.

Existing facilities at Pinto Valley Mine include, but are not limited to, the Open Pit and adjacent milling and processing operations, tailings storage facilities, waste rock disposal areas, roads, pipelines, transmission lines, wells, and other infrastructure (map 1-1 in appendix A). Existing surface disturbance associated with the Pinto Valley Mine currently encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands and 566 acres are on National Forest System lands. The mining plan of operations proposes an additional 1,317 acres of surface disturbance (1,087 new acres on private land and 229 new acres on unpatented claims on National Forest System lands) for a total estimated surface disturbance of 5,232 acres (4,436 acres on private land and 795 acres on National Forest System lands). Expansion of the Open Pit and tailings storage facilities would address existing Open Pit slope instability in the southeastern portion of the pit, extend the operating life of the mine, and allow Pinto Valley Mining Corp. to access mineralization that extends onto its claims on National Forest System lands (Capstone Mining Corp. 2016a, 2020b). The mining plan of operations proposes continuation of active mining operations at the Pinto Valley Mine for approximately 19 years with closure and reclamation activities lasting for 12 years following active mining operations, and post-closure maintenance and monitoring lasting for 30 years. For additional information on Pinto Valley Mining Corp.'s assessment of mineral reserves, refer to: https://capstonemining.com/operations/pinto-valley/default.aspx.

1.3 Purpose of and Need for Action

The Forest Service's purpose is to decide whether to approve Pinto Valley Mining Corp.'s proposed mining plan of operations and, if approved, what requirements are appropriate to minimize impacts on surface resources in accordance with 36 CFR 228, subpart A. After evaluating the proposed mining plan of operations, the Forest Service determined that approving the proposed mining plan of operations would be a major Federal action subject to the National Environmental Policy Act as defined in 40 CFR 1508.1. Accordingly, the Forest Service prepared an EIS to (1) identify the scope of issues associated with the mining plan of operations, (2) identify and assess reasonable alternatives to the proposed mining plan of operations in order to minimize adverse effects, (3) evaluate and disclose the potential significant environmental effects, and (4) ensure compliance with applicable laws, regulations, and policy.

The need for the Forest Service's action is to comply with regulations governing the use of surface resources for operations authorized by the United States mining laws on National Forest System lands under 36 CFR 228, subpart A. These regulations require that the Forest Service respond to parties who submit a proposed plan of operations for approval to conduct operations authorized by the United States mining laws on National Forest System lands for part or all of their planned actions including mining, mineral processing, and uses reasonably incident thereto. In accordance with 36 CFR 228.5, the submittal of Pinto Valley Mining Corp.'s proposed mining plan of operations requires the Forest Service to consider whether to approve the proposed mining plan of operations or to require changes or additions necessary to meet the purpose of the regulations for locatable mineral operations.

1.4 Decision Framework

The Forest Service is the lead agency in the preparation of this document, in accordance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act at 40 CFR 1501.5. The Bureau of Land Management, U.S. Environmental Protection Agency, and Arizona Game and Fish Department are cooperating agencies throughout the analysis process. These cooperating agencies do not have any decision-making responsibility in the record of decision.

The Forest Supervisor of the Tonto National Forest is the lead agency responsible official for this National Environmental Policy Act review of the Pinto Valley Mine proposed mining plan of operations. The Forest Supervisor's decision space is in accordance with Forest Service regulations that govern locatable mineral activities on National Forest System lands (36 CFR 228, subpart A) and other applicable laws and regulations. These regulations require that the Forest Service respond to parties who submit a proposed plan of operations for approval to conduct operations authorized by the United States mining laws for part or all of their planned actions including mining, mineral processing, and uses reasonably incident thereto.

The Forest Service's consideration of operations authorized by the United States mining laws on National Forest System lands is governed by the General Mining Law of 1872 as amended, the Organic Administration Act of 1897, and the Surface Resources Act of 1955, among other statutory authorities. The Forest Service's regulations at 36 CFR 228, subpart A set forth the rules through which use of the surface of National Forest System lands in connection with mining and mineral process operations shall be conducted so as to minimize adverse environmental impacts on surface resources where feasible. However, the Forest Service cannot impose unreasonable mitigation on mining activities and cannot impermissibly encroach on legitimate uses incident to operations authorized under the General Mining Law of 1872.

As described in chapter 2, "Proposed Action and Alternatives," private land activities are not part of the proposed action and are not within the decision space of the Forest Service. However, a description of private land activities is included and analyzed in the direct and indirect impacts analysis sections in chapter 3, "Affected Environment and Environmental Consequences," of the final EIS because the activities on private land and Federal land constitute interdependent parts of a larger action, that is, an integrated mine. This approach is consistent with Council on Environmental Quality regulations, which define actions as connected when: (1) they automatically trigger other actions that may require an EIS; (2) they cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) they are interdependent parts of a larger action and depend upon the larger action for their justification (40 CFR 1508.25(a)(1)).

Given the purpose and need for the project, the deciding official reviews the proposed action, other alternatives (including the no-action alternative), and their environmental consequences in order to make the following decisions for activities on National Forest System lands:

- To determine which alternative or combination of alternatives to select, as considered in detail in the Pinto Valley Mine EIS. The final decision may be to approve a hybrid of various components of the alternatives considered. Whichever alternative is selected, its operations must be conducted to minimize adverse impacts on National Forest System surface resources where feasible in accordance with 36 CFR 228, subpart A.
- To determine whether selection of an alternative would require any changes or additions to mitigate impacts or satisfy applicable regulatory authorities.
- To determine whether approval of an action alternative would be consistent with the Tonto National Forest Plan (Forest Service 1985), or whether one or more amendments to the forest plan would be required.

In accordance with Forest Service regulations at 36 CFR 228.13, the Forest Service has the authority to require financial assurances for reclaiming disturbances on National Forest System lands before approving a mining plan of operations. The agency may conduct additional comprehensive bond reviews and adjust the amount after modification of a reclamation or operating plan, an annual overview, or an inspection of the permit area. Bond release would be conducted in accordance with established criteria to meet the requirements of 36 CFR 228.8(g). At the time of the final EIS release, the Forest Service has not determined the amount of financial assurance required in accordance with 36 CFR 228.13(a), but Pinto Valley Mining Corp. will be required to provide such assurance prior to approving the mining plan of operations.

Following issuance of the Pinto Valley Mine draft EIS, the Forest Service solicited comments on the draft EIS that were considered in preparing a final EIS (see appendix J, "Draft EIS Comment Report"). Concurrent with the public release of this final EIS, the Forest Supervisor of the Tonto National Forest released a draft record of decision. The draft record of decision identifies changes and additions to the proposed mining plan of operations necessary to minimize adverse environmental impacts from the proposed mineral development on National Forest System lands. The final EIS and draft record of decision are subject to 36 CFR 218, subparts A and B, "Project-Level Pre-decisional Administrative Review Process." Issues raised in objections must be based on previously submitted specific written comments regarding this project proposal and attributed to the objector, unless the issue is based on new information that arose after the opportunities for comment (36 CFR 218.8(c)). All persons or entities who meet eligibility requirements under 36 CFR 218.5 may object to the document and draft decision in accordance with the instructions found in 36 CFR 218.

Following conclusion of the objection process, the Forest Service will issue a final record of decision. Once the final record of decision is signed, Pinto Valley Mining Corp. will have the option to (1) appeal the decision under 36 CFR 214, or (2) modify the proposed mining plan of operations in accordance with the requirements in the record of decision and resubmit the mining plan of operations to the Forest Service for approval, along with the required amount of financial assurance.

After the Forest Service has determined that the revised mining plan of operations complies with the final record of decision, and that the bond or financial assurance is acceptable, it will notify Pinto Valley Mining Corp. that the mining plan of operations has been approved. Implementation of actions that affect National Forest System lands and resources may not commence until the financial assurance is received and a final mining plan of operations is approved.

1.5 Proposed Action Summary

For the Pinto Valley Mine EIS, the proposed action is defined by the proposed mining plan of operations originally submitted by Pinto Valley Mining Corp. in May 2016. In September 2016 the Forest Service determined that the proposed mining plan of operations met the regulatory requirements for processing. This section briefly describes the proposed action, highlighting the proposed activities on National Forest System land. Refer to section 2.3.3, "Proposed Action," for a detailed description of the proposed action.

The proposed mining plan of operations submitted by Pinto Valley Mining Corp. to the Tonto National Forest (Capstone Mining Corp. 2016a) describes existing mining operations conducted by Pinto Valley Mining Corp. and the proposed activities on National Forest System lands surrounding Pinto Valley Mining Corp. property. The proposed action includes the expansion of existing mining operations from private lands onto National Forest System land and extension of the mine life by approximately 19 years compared to the no-action alternative.

The proposed action encompasses the following broad categories of actions:

- Consolidation and authorization of previously authorized activities and permitted disturbances on National Forest System lands at the Pinto Valley Mine. Power lines, pipelines, roads, and other facilities and infrastructure on National Forest System lands at the Pinto Valley Mine are integral to the mining operations at the mine. As such, their authorization is most appropriate under a consolidated mining plan of operations.
- Authorization of new operations on National Forest System lands including expansion of the Open Pit and Tailings Storage Facilities Nos. 3 and 4, and construction or relocation of linear features (access roads, electrical power distribution lines, pipelines).
- Authorization of existing legacy encroachments on approximately 29 acres of National Forest System lands from prior mine operators associated with activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand (see map 1-1 in appendix A).

In addition to the activities described above that require Forest Service approval, the integrated mining plan at the Pinto Valley Mine also includes Pinto Valley Mining Corp.'s actions on private lands that support ongoing and expanded mining operations. While the Forest Service does not have authority to regulate activities on private land, the actions on private lands are described and analyzed in accordance with 40 CFR 1508.25. These other activities on private lands are interdependent parts of the integrated mining operations at the Pinto Valley Mine, they are closely related to the proposed operations on National Forest System lands, and they generally would not occur unless the Forest Service takes action to approve previous authorizations.

1.6 Previous and Existing Authorizations at the Pinto Valley Mine

Pinto Valley Mining Corp. and its predecessors have been issued authorizations for use of National Forest System and Bureau of Land Management lands, as listed in table 1-1. As indicated in table 1-1, the previous authorizations for use of National Forest System lands have expired and would be authorized under alternative 1 and the proposed action.

Table 1-1. Previously authorized rights-of-way, plans of operations, special use permits, and letter agreement on Federal lands

Number	Facility	Original Authorized Activities	Expired	Status
Rights-of-Way				
AZA-007282	Burch pipeline	Authorizes the segment of the Burch pipeline on Bureau of Land Management-administered lands	Expires 12/31/2042.	Issued 5/23/1973.
PHX-080742	Cottonwood Tailings Impoundment, Cottonwood Reservoir, and a portion of 19 Dump	Originally construction, operation, and maintenance of a tailings dam and reservoir; tailings pipeline and return water pipeline in 20-foot-wide right-of-way; amended to include a portion of a mining waste dump (19 Dump, the balance of which is authorized by plan of operations POO-0003)	Expired 5/22/2013.	Issued 5/31/1944.
PHX-080933	Water Pipeline and Mine Reservoir	A historic water line feeding a mine reservoir, and a second water line transporting water out of the mine reservoir to private lands now within Pinto Valley Mine	Expired 5/22/2013.	Issued 12/11/1944.
Plans of Operation				
POO-0001	Tailing Storage Facility No. 3	Tailings impoundment expansion on to two unpatented claims (one of which is also covered by POO-0002)	Not applicable	Issued 2/14/1994.
POO-0002	Tailings Storage Facility No. 3	Construction of new access roads and improvement of an existing National Forest System road to 25 feet wide, water pipeline, and electric cables along edge of roads on four unpatented claims (one of which is also used by POO-0001)	Not applicable	Issued 3/24/1995.
POO-0003	19 Dump	Waste rock dump, a portion of which is authorized by the amended right-of-way PHX-080742	Not applicable	Issued 9/5/1984.
Special Use Permits				
445301	Pinto Valley Mine sign	Use and maintenance of a non-illuminated company identification sign	Expired 12/31/2017.	First issued 4/23/1991.
445302	Electric power lines and access roads for operation of wells on Peak mill site claims, and the Burch pipeline booster station	Operation and maintenance of 13.8-kilovolt electrical transmission lines along 20-foot-wide corridors; use and maintenance of National Forest System roads for access	Expired 12/31/2007.	First issued 7/10/1973.

Number	Facility	Original Authorized Activities	Expired	Status
445303	Water pipelines and access roads from the Pinto Valley Mine to BHP Copper Cities and for wells on Peak mill site claims to the Pinto Valley Mine	Operation and maintenance of the Burch pipeline; 4-, 12-, and 16-inch diameter pipelines along 8.19 miles of 20-foot-wide corridors, originally totaling 20 acres; use of a booster station in a 50-foot-wide portion of the corridor; use and maintenance of access roads within same corridor	Expired 12/31/2007.	First issued 10/1/1987.
Tonto 468	Peak Well 37	100-by-100-foot water well site, and 650 feet of access road for pipeline and power line, and vehicular access	Expired 12/31/2009.	First issued 3/31/1981.

Source: Capstone Mining Corp. 2016a

Pinto Valley Mining Corp. also holds a variety of environmental permits and approvals, principally from the Arizona Department of Environmental Quality and the Arizona Department of Water Resources, which cover Pinto Valley Mining Corp. activities on both private land and National Forest System lands. Table 1-2 lists these other permits and approvals relevant to the Pinto Valley Mine.

Table 1-2. Pinto Valley Mine primary existing environmental permits and authorizations

ID Number	Permit or Authorization	Expiration	Status
65025	Arizona Department of Environmental Quality Air Quality Class II Synthetic Minor Permit, as amended by Minor Permit Revision Number 79180	4/4/2022	Renewed 4/5/2017, amended 12/4/2019
AZ0020401, LTF 74513	Arizona Department of Environmental Quality Arizona Pollution Discharge Elimination System Authorization to Discharge Under the Arizona Pollutant Discharge and Elimination System for direct discharge from Outfall Nos. 002, 003, 004, and 005	10/6/2024	Effective 10/7/19
AZMSG 2019-002/ AZMSG-80593	Arizona Department of Environmental Quality Arizona Pollution Discharge Elimination System Stormwater Multi-Sector General Permit	Not applicable	First issued 10/11/2013, renewed 2/11/2020
P-100329, LTF 79098	Arizona Department of Environmental Quality Aquifer Protection Permit	Life of facility	Amended 3/20/2020, 7/27/2020
AZ0404321	Arizona Department of Environmental Quality Public Water System Permit for non-transient, non-community water system	Life of facility	Effective
Place ID Number 838; License Timeframes Number 65006	Arizona Department of Environmental Quality Authorization to Operate a Non-Municipal Solid Waste Landfill at Mining Operation under General Permit; Pinto Valley Mine Landfill	Life of facility	Effective
AZT000624353	U.S. Environmental Protection Agency Hazardous Waste Generator Identification (Hazardous Waste Site ID)	Not applicable	Effective
320276	Arizona Department of Environmental Quality Special Waste Generator Identification (special condition petroleum-contaminated soil only)	Not applicable	Effective
Not applicable	Arizona Department of Environmental Quality Off-Road Tire Burial Permit for Burial Cell A (per Arizona Administrative Code R-18-8-704)	Life of facility	Effective
Not applicable	Arizona State Mine Inspector Mined Land Reclamation Plan	Life of facility	June 9, 1998 approval; updated in 2014 and 2016;

ID Number	Permit or Authorization	Expiration	Status
			approved by Arizona State Mine Inspector's Office 9/16/2016
4.13	Arizona Department of Water Resources License of Approval for Gold Gulch No. 2 Dam and Reservoir	Life of facility	Effective
4.16	Arizona Department of Water Resources License of Approval for Gold Gulch 1A Dam and Reservoir	Life of facility	Effective
4.17	Arizona Department of Water Resources License of Approval for Slack/Conklin Dam	Life of facility	Effective
04-008	Arizona Radiation Regulatory Agency Radioactive Permit	7/31/2025	Effective
04-I-2050	Arizona Radiation Regulatory Agency Radioactive Permit (X-ray registration)	9/30/2023	Effective
File No.: SPL-2015-00139-MWL	U.S. Army Corps of Engineers Approved Jurisdictional Determination	Life of facility	Updated September 2017

Source: Capstone Mining Corp. 2016a with periodic updates.
Note: The table above identifies the primary existing environmental permits and authorizations. There may be other permits and authorizations not identified above.

1.7 Public Scoping

Public involvement for preparing an EIS begins with the initiation and notification of the public scoping period. The Forest Service posted the project on the Tonto National Forest schedule of proposed actions at https://www.fs.fed.us/sopa/forest-level.php?110312 and on March 28, 2017, the Forest Service began soliciting comments on the proposed mining plan of operations with publication in the Federal Register of a "Notice of Intent to Prepare an Environmental Impact Statement" (82 Federal Register 15322). The scoping period ran until April 27, 2017. During the scoping period, the Forest Service notified interested parties of the scoping period, solicited input on the scope of the Pinto Valley Mine EIS, conducted public scoping meetings, and received scoping comments from the public, cooperating agencies, tribes, and other interested parties. The Forest Service hosted two public scoping meetings in communities local to the Pinto Valley Mine site on April 18, 2017, in Superior, Arizona and April 20, 2017, in Miami, Arizona. In total, 26 people attended the scoping meetings. During the public scoping meetings, the Forest Service provided stations for attendees to provide both written comments (using hard copy comment forms) and oral comments (using a court reporter). The Forest Service hosted two scoping meetings with cooperating agencies, separate from the public scoping meetings, at the Tonto National Forest Supervisor's Office in Phoenix. The Bureau of Land Management was the sole cooperating agency that attended the scoping meeting held April 18, 2017. The April 19, 2017 cooperating agency scoping meeting was attended by the Arizona Game and Fish Department and the U.S. Environmental Protection Agency (by phone). The Tonto National Forest has been conducting tribal consultation related to Pinto Valley Mine since 2017. That consultation has focused on identifying issues of tribal concern and possible measures to mitigate the potential adverse effects on those issues. Consultation is ongoing and will continue through the end of the project. Refer to section 3.6, "Resources of Tribal Interest," and section 4.4, "Tribal Consultation and Involvement," for additional information on tribal input received during the EIS process. The Forest Service also solicited input from Forest Service staff during the scoping period.

The Forest Service's effort to solicit comments on the proposal and the corresponding public participation are described further in the "Scoping and Issues Report for the Pinto Valley Mine Environmental Impact Statement" (Forest Service 2017a). The Forest Service received 22 comment documents during the scoping period, including comments received at scoping meetings and via email.

Processing these comment documents yielded 340 individual scoping comments covering a broad range of categories. The Forest Service used a multi-step process to catalogue, organize, sort, and summarize comments submitted during scoping, as described in the final "Scoping and Issues Report for the Pinto Valley Mine Environmental Impact Statement" (Forest Service 2017a).

Content analysis resulted in the identification of nine key issues that drove development of action alternatives and are the focus of the Pinto Valley Mine EIS. Section 1.8 describes the nine key issues identified for detailed analysis. Some public concerns were determined to be outside the scope of the Pinto Valley Mine EIS because of one or more of the following reasons: they did not reflect a legitimate cause and effect relationship supported by scientific evidence; they were not relevant to the decision to be made; they were outside of Forest Service authority or cooperating agencies' jurisdiction by law or special expertise; or they were already decided by law, regulation, or policy.

1.8 Key Issues for Detailed Analysis

Based on scoping input and the comments received, the Forest Service identified concerns with nine key potential issues and sub-issues for detailed analysis in the Pinto Valley Mine EIS. The detailed analysis contained in the Pinto Valley Mine EIS for each resource will focus on the concerns associated with the nine key potential issues and sub-issues and will allow for a concise comparison of impacts. The development of alternatives for the Pinto Valley Mine EIS also focused on alternative options and other measures to address these key issues identified during scoping.

The description of each issue includes a cause-and-effect statement that describes the expected effects or unintended consequences that may occur from the proposed action and alternatives, thereby providing opportunities during the analysis to identify means to reduce adverse effects. For additional information on these issue statements, please refer to the "Scoping and Issues Report for the Pinto Valley Mine Environmental Impact Statement" (Forest Service 2017a).

1.8.1 Issue 1: Air Quality Impacts Resulting from Project-Related Emissions and Dust Generated from Project Activity

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations and the associated construction, operation, reclamation, and closure of the Pinto Valley Mine will require equipment, vehicles, and other activities that generate dust, airborne chemicals, and transportation-related (mobile source) emissions. These emissions could result in potential impacts on air quality, deposition, and visibility in the region. Potential air quality impacts are relevant for the Pinto Valley Mine Project due to its proximity to the Superstition Wilderness (Class I area) and location of the Pinto Valley Mine site within the existing non-attainment areas for particulate matter less than or equal to 10 microns in diameter and sulfur dioxide.

1.8.2 Issue 2: Biological Resource Impacts Resulting from Surface Disturbance, Human Activity, and Other Project-Related Effects on Ecosystems and Ecosystem Components

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in impacts on biological resources from expansion of the Open Pit and tailings storage facilities and other construction activities and associated disturbance; project-related vehicle traffic and noise; and other project-related activity that affects wildlife, wildlife habitat, forage, and prey base as well as project-related impacts on vegetation, soils, water resources, and other ecosystem components. Potential impacts on biological resources could include direct mortality of wildlife from vehicle collisions, degradation of habitat from toxins and pollutants (upland and aquatic), and degradation in water and forage quantity and quality, habitat fragmentation, degradation of water quality and quantity, reduction in soil and vegetative productivity, and other impacts.

1.8.3 Issue 2A: Impacts on Special Status Species, including Federally Listed Species, Arizona Game and Fish Department Species of Greatest Conservation Need, and Forest Service Sensitive Species

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in impacts on special status species including wildlife and plant species that are federally listed under the Endangered Species Act, Arizona Species of Greatest Conservation Need (Arizona Game and Fish Department 2012), and Forest Service sensitive species. Project-related impacts could affect overall management goals and objectives for these special status species.

1.8.4 Issue 2B: Impacts on Fish and Wildlife Species Resulting from Project-Related Activity and Project Components

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations would result in additional vehicle traffic, noise and vibration, and other project-related activity that could cause direct, indirect, and cumulative impacts on general wildlife and fish species. In addition, certain project components (such as reservoirs and the Open Pit) could pose hazards to fish and wildlife including entrapment, ingestion of hazardous materials, exposure to process water and storm water, and other effects.

1.8.5 Issue 2C: Impacts on Habitat, Soils, Vegetation Communities, and Ecosystem Components that Result in Adverse Impacts on Wildlife, Fish, and Plants

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations would result in direct disturbance and removal of soils and vegetation that could result in reduction in the quality or quantity of habitat and forage, habitat fragmentation, disruption of wildlife movement and connectivity corridors, changes to the availability and quality of water resources, and other potential effects on ecosystems and their services that could result in adverse impacts on wildlife, fish, and plants in the area. These effects would occur in the short term during construction and could persist for the long term during project operation, reclamation, and closure.

1.8.6 Issue 3: Long-Term Impacts on Landscape Productivity and Function Resulting from Surface Disturbance and Other Project Activity

Surface disturbance from clearing vegetation, grading, and stockpiling soils, tailings storage, tailings expansion, pit expansion, and other project activity has the potential to compact soils, accelerate erosion, and reduce soil productivity, thereby potentially affecting the long-term productivity of soils and vegetation and the overall function of the landscape. The Open Pit, tailings facilities, and waste rock facilities could be unstable over time, and reclamation may not adequately stabilize and revegetate landscape to a productive condition. This could affect soil productivity, vegetation communities, downstream water quality, and future uses of the area. In addition, the geochemical composition of tailings facilities and other facilities may not support the re-establishment of native vegetation during reclamation and post-closure. Damage, disturbance, contamination, or removal of the nonrenewable soil resources could result in a loss of soil productivity, changes in soil dynamics, impacts on soil and vegetation physical structure, and changes to the overall ecological function of the landscape in the long term. This issue will recognize the interconnected nature of landscape function and impacts on wildlife, vegetation, soil function, surface water, and groundwater as well as the potential for successful reclamation based on soil, vegetation, and climatic conditions.

1.8.7 Issue 4: Cultural Resource Impacts Resulting from Project-Related Activity, Facilities, and Surface Disturbance

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations and associated surface disturbance, project-related activity (such as vehicle trips), and presence of long-term facilities associated with the mine expansion have the potential to affect cultural resource sites, cultural settings, traditional cultural properties, and other cultural resources. Sites identified as eligible for inclusion on the National Register of Historic Places have been identified by surveys in and around the project area. National Register of Historic Places sites could be adversely affected by expansion of the tailings storage facilities, expansion of the Open Pit, and other project-related activity. Project-related surface disturbance also has the potential to uncover and disturb previously unidentified cultural resource sites. Disturbance of known or unknown cultural resources is an impact that is important to many tribes, regardless of whether data recovery or additional mitigation measures are undertaken.

1.8.8 Issue 5: Impacts on Public Health and Safety from Construction, Operation, and Reclamation of the Pinto Valley Mine Project

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations and associated construction, operation, and reclamation could present a variety of potential risks to public health and safety. Potential impacts on public health and safety include the potential for accidental spills or releases of hazardous materials, public or mine worker exposure to hazardous materials or project components (such as ponds and the Open Pit), potential dam or stability failures, public or mine worker exposure to blasting, hazards to recreationists and the public from project-related vehicle traffic, and potential public health and safety effects associated with impacts on natural resources such as air quality and water quality. Pinto Valley Mining Corp. employs a variety of standards and practices to reduce these potential impacts on public health and safety.

1.8.9 Issue 6: Impacts on Recreation and Recreational Access from Project-Related Traffic, Surface Disturbance, and Other Project Activities

National Forest System Road 287 traverses the Pinto Valley Mine site and is used by the public to access a variety of recreation areas in the region including Haunted Canyon and Pinto Creek. Extension of the mine life and associated project-related traffic and other project activities under the proposed mining plan of operations have the potential to affect recreational access along National Forest System Road 287 and other routes used by the public to access these recreational areas. Expansion of the Pinto Valley Mine under the proposed mining plan of operations also has the potential to alter recreation settings, experiences, and opportunities in the area, including hiking (such as at Haunted Canyon Trailhead), hunting, off-highway vehicle use, and opportunities for solitude.

1.8.10 Issue 7: Impacts on Social and Economic Conditions, including Environmental Justice Resulting from Expansion and Operation of the Pinto Valley Mine Project

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations would continue to influence local and regional social and economic conditions through jobs, tax revenues, local and regional spending on project components and services, demands on local and regional resources and services (such as housing, roads, and schools), and quality of life and non-market value impacts. Based on the proximity of the Pinto Valley Mine Project to tribal lands and local communities, it will also be important to determine if the Pinto Valley Mine Project would result in disproportionate adverse effects on minority or low-income populations. It is important to note that because the Pinto Valley Mine is an existing and operating mine, many of the social and economic impacts associated with the project would represent continuation of current conditions.

1.8.11 Issue 7A: Impacts on Social Conditions

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in a variety of potential impacts on social conditions in the region including potential impacts on job opportunities, population, housing, property values, community services and infrastructure, and quality of life resources such as air quality, water quality and quantity, and recreation.

1.8.12 Issue 7B: Impacts on Economic and Fiscal Conditions

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations and associated project-related development, operation, spending, and employment would result in a variety of potential impacts on economic conditions in the region including potential impacts on labor, labor income, tax revenues, recreation and tourism spending, and overall economic output.

1.8.13 Issue 7C: Environmental Justice Impacts

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in social and economic impacts that affect various socioeconomic groups in different ways. In accordance with Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations), the Pinto Valley Mine EIS will address the potential for disproportionate adverse impacts on minority or low-income communities in the analysis area.

1.8.14 Issue 8: Potential Risk to Resources from Geotechnical or Stability Issues Associated with Expansion of the Tailings Storage Facilities and Open Pit

Expanding and raising the top elevations of the tailings storage facilities and further excavating the Open Pit under the mining plan of operations could increase risk of dam failure and pit wall instability, and affect the geotechnical integrity of these project facilities. In addition, there have been previous tailings dam breaches and failures at the Pinto Valley Mine site. Dam failures and slope stability issues could present a range of potential impacts including risks to health and safety, impacts on water resources, and impacts on other resources.

1.8.15 Issue 9: Impacts on Groundwater and Surface Water in the Pinto Creek Watershed during Construction, Operation, Reclamation, Closure, and Post-Closure of the Pinto Valley Mine Project

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations and associated construction, operation, reclamation, and closure could result in a range of potential impacts on groundwater and surface water in the Pinto Creek watershed. The primary issues related to water resources include impacts on surface and groundwater quantity in the Pinto Creek watershed resulting from additional and extended water use for the Pinto Valley Mine Project, impacts on surface and groundwater quality from geochemically affected seepage and surface water runoff, impacts on existing water rights, and impacts on surface water and groundwater from the formation of a pit lake after the Pinto Valley Mine closes. These impacts could result in a range of potential effects including reduction in the quantity and quality of water available for consumption and other human uses; degradation of surface water features such as seeps, springs, and creeks (such as Pinto Creek); and degradation of aquatic and riparian habitats and associated impacts on fish and wildlife.

1.8.16 Issue 9A: Impacts on Groundwater Quantity

The Pinto Valley Mine currently requires, on average, an estimated 9,722 gallons of water per minute for onsite milling, dust control, potable water, and other uses. These water requirements are met by two pipeline supply systems originating from different basins and through the reuse of water within the Pinto Valley Mine site. Under the proposed mining plan of operations, a portion of the water required for the project would continue to be withdrawn from groundwater wells in the Pinto Valley watershed, which, combined with continued dewatering operations in the pit for mine water supply, could result in groundwater drawdown. Groundwater pumping reduces the water level and changes the flow direction in the aquifer, potentially affecting groundwater availability and water use. As a result, groundwater pumping could potentially reduce groundwater available to recharge springs and streams such as Pinto Creek, thereby reducing surface water flow and potentially affecting the survival and long-term persistence of riparian vegetation.

Effects on groundwater availability from extension of the mine life could include potential long-term impacts for the life of the project and beyond depending on length of time for recovery of groundwater levels after groundwater pumping ceases.

1.8.17 Issue 9B: Impacts on Groundwater Quality

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in potential impacts on groundwater quality from mine facilities during construction, operations, reclamation, closure, and post-closure phases.

Seepage would continue to occur from the tailings storage facilities and could increase due to the expansion of the tailings storage facilities and the extended mine life. Seepage would also continue to occur from waste rock and Leach Piles. Seepage could affect groundwater quality and the quality of downstream surface waters that are fed by groundwater. Geochemical reactions within tailings, waste rock, and Leach Piles could result in acid rock drainage and leachate with elevated metals, sulfate, and total dissolved solids that could degrade groundwater resources, depending on site conditions.

Extension of the mine life and storage and use of hazardous materials, the storage and handling of hazardous waste and process water, and the transportation of hazardous materials over a longer period of time carry a risk for inadvertent spills or release, which could affect groundwater quality. The presence of ore stockpiles on the surface could also affect groundwater quality.

1.8.18 Issue 9C: Impacts on Surface Water Quantity in the Pinto Creek Watershed

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations could result in reductions in groundwater quantity associated with Pinto Valley Mine water use and could result in the potential for decreased flow and supply to the surface waters that are fed by groundwater, including Pinto Creek and other streams, seeps, and springs in the area (see issue 9A above). In addition, storm water management at Pinto Valley Mine facilities could change the amount of surface water moving downstream in the Pinto Creek drainage. Lost surface water would not be available for downstream groundwater recharge, consumption, and other beneficial uses; downstream users (such as reduced supply to Roosevelt Lake); aquatic and riparian habitats; and wildlife use (see issues 2A, 2B, and 2C).

Effects on surface water quantity would include short-term impacts during construction and operation, as well as long-term impacts during the reclamation and post-closure phases.

1.8.19 Issue 9D: Impacts on Surface Water Quality in the Pinto Creek Watershed

Expansion of the Pinto Valley Mine would result in additional surface disturbance and extension of the operational life of the mine that could increase the potential for impacts in the Pinto Creek watershed. Storm water runoff could interact with hazardous materials, tailings, waste rock, spent Leach Pile materials, and ore stockpiles, which could result in contaminants moving downstream. This includes metals or other contaminants resulting from exposure to tailings, waste rock, spent Leach Pile materials, stockpiled ore, and process chemicals, as well as the potential for sulfate, geochemical reactions (acid rock drainage), or surface salt accumulation to occur in the tailings facility and affect surface water runoff. The presence of ore stockpiles on the surface also could affect surface water quality.

Additional surface disturbance under the proposed mining plan of operations could result in increased sediment transport to downstream waters and could cause aggradation or erosion in downstream channels, leading to potential degradation of riparian habitat or impacts on surface water uses. A tailings spill or failure of a tailings dam could result in impacts on downstream surface water quality. Expansion of the tailings storage facilities under the mining plan of operations could increase deposition of windblown dust that could also affect surface water quality.

Extension of the mine life and storage and use of hazardous materials, the storage and handling of hazardous waste and process water, and the transportation of hazardous materials over a longer period of time carry a risk for inadvertent spills or release, which could affect surface water quality.

Effects on surface water quality would include short-term impacts during construction and operation, as well as long-term impacts during the reclamation and post-closure phases.

1.8.20 Issue 9E: Impacts on Water Rights

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations would continue to withdraw water from mine water supply wells in the Pinto Creek watershed and would continue dewatering operations in the Open Pit. These activities could reduce surface water flows in Pinto Creek and other streams, seeps, and springs and could reduce groundwater quantity available for water rights held by both private and government entities. The Forest Service has a surface water right with a total annual volume of 1,794.2 acre-feet per year on Pinto Creek downstream of the mine that could be affected by the Pinto Valley Mine Project.

1.8.21 Issue 9F: Impacts on Surface Water and Groundwater Quality and Quantity as a Result of Post-Mine Pit Lake

Expansion of the Pinto Valley Mine and extension of the mine life under the proposed mining plan of operations would result in a larger pit lake on private land at the end of mining when dewatering operations cease. Results from hydrologic modeling of the pit lake indicate that the pit lake would act as a hydraulic sink (hydrologic capture zone where there is groundwater inflow that is permanently lost to evaporation but no outflow to the groundwater system), intercepting surface water and groundwater toward the pit that otherwise would flow toward Pinto Creek, potentially reducing the quantity of available surface water and groundwater. There also are potential impacts on groundwater and surface water resources if the hydraulic sink does not fully capture and retain water. A pit lake creates water quality concerns due to geochemical reactions from the exposure of previously undisturbed rock and the potential long-term concentration of contaminants from evaporation. The pit lake could have elevated concentrations of metals, total dissolved solids, sulfate, and other constituents, which could migrate away from the pit and downgradient toward Pinto Creek if pit lake modeling results indicate there is no hydraulic sink or only a weak hydraulic sink. This scenario would result in degradation of groundwater quality in the vicinity of the pit that potentially could reach and affect surface water quality in Pinto Creek. Additionally, there are potential pit lake water quality impacts on wildlife (such as birds) that may come into contact with and ingest the pit lake water.

1.9 Forest Plan Consistency

The Forest Service reviewed each element of Pinto Valley Mining Corp.'s mining plan of operations for consistency and conformance with the goals, objectives, standards, and guidelines of the Tonto National Forest Plan, as amended (Forest Service 1985). The relevant laws, regulations, and policy sections for each resource section in chapter 3, "Affected Environment and Environmental Consequences," identifies goals, objectives, and standards related to the proposed action and alternatives. Tonto National Forest Plan management direction for minerals is to support environmentally sound energy and minerals development.

The Pinto Valley Mine is located within management area 2F, as defined by the forest plan, which covers the majority of the Globe Ranger District. The overall management emphasis for management area 2F is to manage for a variety of renewable natural resources with a primary emphasis on wildlife habitat improvement as well as improvements to resources indirectly related to biological resources, including water quality, livestock forage, dispersed recreation, watershed values, and riparian areas.

The Forest Service did not identify any conflicts between the Pinto Valley Mine Project and the Tonto National Forest Plan, as amended, that would require a project-specific forest plan amendment.

The Tonto National Forest Plan is undergoing a revision with a draft plan and EIS released in December 2019 and the final plan expected in 2021. The revised forest plan would be used as guidance for future projects, plans, and assessments. It is not expected that new direction from the revised forest plan would be used to reevaluate or change decisions that have been made under the previous forest plan. Project-specific authorizations for occupancy and use of National Forest System lands made before approval of the revised forest plan may proceed unchanged until the time of reauthorization, if needed.

At time of reauthorization, all permits, contracts, and other authorizing instruments must be made consistent with the revised forest plan, subject to existing valid rights, as provided at 36 CFR 219.15.

2.0 Proposed Action and Alternatives

2.1 Introduction

This chapter describes the no-action alternative, the proposed action, and one additional action alternative in detail and identifies other alternatives considered but eliminated from detailed consideration. The proposed action, with the application of the monitoring and mitigation measures identified in section 4.4 in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," is the U.S. Department of Agriculture, Forest Service (Forest Service) preferred alternative.

The alternatives that are described in detail in this chapter generally do not include the monitoring and mitigation measures that are identified in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation." These monitoring and mitigation measures were identified based on the potential adverse impacts associated with the alternatives carried forward for detailed analysis as described in chapter 3, "Affected Environment and Environmental Consequences," and would be part of the selected action in the record of decision.

The chapter concludes with a comparison of key features of the no-action alternative, the proposed action, and action alternative 1.

2.2 Existing Operations at the Pinto Valley Mine

The Pinto Valley Mine property was originally owned by Miami Copper Company in 1909 and was transferred to several other companies over the next century (Capstone Mining Corp. 2016a). In October 2013, Capstone Mining Corp., a Canadian copper mining company with operations in North and South America, acquired the Pinto Valley Mine from BHP. Pinto Valley Mining Corp. (a wholly owned subsidiary of Capstone Mining Corp.) operates the mine. The majority of the Pinto Valley Mine is located on private property owned by Pinto Valley Mining Corp. However, certain facilities and operations are located on National Forest System lands and were authorized by the Forest Service or the Bureau of Land Management through rights-of-way, plans of operations, and special use permits.

Existing surface disturbance associated with the Pinto Valley Mine currently encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands and 566 acres are on National Forest System lands. There are a variety of existing encroachments onto National Forest System lands from prior mine operators that encompass approximate 29 acres and associated with activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser (see table 2-1 below and map 1-1 in appendix A). A detailed description of these existing facilities and operations at the Pinto Valley Mine is included below.

Table 2-1. Estimated acreage of existing legacy encroachments on National Forest System land

Facility	Acres on National Forest System Lands
Tailings Storage Facility No. 3 (western portion) (western portion of Tailings Storage Facility No. 3)	1
Open Pit, access road, G Pond (east of Open Pit)	17
Access road	less than 1
Access road	less than 1
Open Pit, access road, power line, water pipeline (south of Open Pit by Pennell Pond)	6
Access road, power line, water pipeline (south of Pennell Pond)	4

Facility	Acres on National Forest System Lands
Access road, water pipeline (off National Forest System Road 287 between mine site and U.S. Highway 60)	1
Total	29

A description of private land activities is included and analyzed in the direct and indirect impacts analysis section in chapter 3 because the activities on private land and Federal land constitute an integrated mine. This approach is consistent with Council on Environmental Quality regulations, which define actions as connected when: (1) they automatically trigger other actions that may require an environmental impact statement (EIS); (2) they cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) they are interdependent parts of a larger action and depend upon the larger action for their justification (40 CFR 1508.25 (a)(1)).

2.2.1 Mining Facilities

2.2.1.1 **Open Pit**

The Open Pit is an existing, active facility encompassing approximately 746 acres of private land. Several facilities associated with the Open Pit (such as perimeter road, storm water ponds, water pipelines, and dispensers for dust control) were inadvertently expanded onto approximately 9 acres of unpatented National Forest System lands (map 1-1 in appendix A).

The Open Pit was developed in 1972 and became operational in 1974. The Pinto Valley Mine has operated continuously since 1974 with the exception of periods of curtailed Open Pit mining operations in 1983, from 1998 to 2007, and from 2008 to 2012. Since 1974, the footprint of the Open Pit has expanded to its current size of approximately 754 acres and has an existing (2020) pit bottom elevation of approximately 2,600 feet above mean sea level (Pinto Valley Mining Corp. 2020a). The approximate east-west and north-south dimensions of the pit are 8,300 feet and 5,300 feet, respectively. Pit slope angles between in-pit roads are controlled by rock strength and geologic structure and range between 27 and 52 degrees. Ongoing safety and geotechnical evaluations may change depending on updated evaluations and changing conditions during operations.

Pinto Valley Mining Corp. utilizes conventional open-pit hard rock mining methods employing drilling, blasting, loading, crushing, flotation, thickening, and filter pressing to extract copper from a copper-bearing sulfide ore. Ores bearing copper and molybdenum are extracted from the Open Pit; there is no underground mining at the Pinto Valley Mine site.

Pinto Valley Mining Corp. maintains a pit slope monitoring program, monitoring dozens of slope prisms on a 24-hour scan sequence and a pit wall monitoring radar unit that scans the highwalls on a 24-hour basis. A recent occurrence within the Open Pit on private Pinto Valley Mining Corp. property affected adjacent National Forest System lands. In September 2015, tension cracks were observed in pit benches above the 4,040-foot level of the Open Pit (referenced with respect to feet above mean sea level) on private Pinto Valley Mining Corp. property; the slope instability at this location affected the existing haul road below this level. The unstable ground condition affected approximately 2 acres of National Forest System lands and was communicated to the Forest Service and a remediation plan was prepared. The remediation plan consisted of removal of up to approximately 415,000 tons of material from the unpatented Pinto Valley Mining Corp. claims on National Forest System lands.

The pit is dewatered by vertical wells with pumps, horizontal drains, and pit sump pumps. Various catchments and associated diversion ditches divert storm water runoff from the surrounding hillsides from the southern and northeastern wall slopes of the Open Pit. The Aquifer Protection Permit from the Arizona Department of Environmental Quality allows Pinto Valley Mining Corp. to use the Open Pit after closure as containment to store storm water and process water up to an elevation of 3,450 feet and store additional volumes under emergency conditions. A pit lake is predicted to form in the Open Pit at the end of mining due to excavation below the potentiometric surface of groundwater, inflow from Leach Piles draindown, and cessation of pit dewatering.

2.2.1.2 Inert Limestone Stockpile

The Inert Limestone Stockpile is an existing, active facility approximately 7 acres in size located entirely on private lands. The Inert Limestone Stockpile grew from approximately 8,000,000 tons of rock on 7 acres in 2018 to approximately 16,000,000 tons of rock on 50 acres in 2020. The Inert Limestone Stockpile has a current (2020) top elevation of approximately 4,875 feet above mean sea level.

The Inert Limestone Stockpile consists of a run-of-mine stockpile of broken limestone that has not been processed through a crusher or screened to favor or reject a particular particle size. The limestone would be available for use as riprap, armor plating to minimize erosion, and reclamation purposes at the end of mine life. Part of the reclamation of several existing facilities at Pinto Valley Mine has included placement of rock armor above the reclaimed material. The limestone formations placed in the limestone stockpile are inert, acid-neutralizing formations suitable for rocky reclamation cover, rock armor, and riprap (SRK Consulting, Inc. 2021a).

2.2.1.3 Waste Rock Dumps

Overburden removed from the Open Pit during mining has been stored in various dumps at the Pinto Valley Mine. Two dumps are currently active at the Pinto Valley Mine: the Main Dump and the Castle Dome Marginal Dump. All other dumps are inactive and some of the inactive dumps have been reclaimed.

2.2.1.3.1 Main Dump

The Main Dump is an existing, active dump on private land that would remain active throughout the life of the mine; there is no use of National Forest System lands for this facility. The existing (2020) top elevation of the main dump is approximately 4,875 feet above mean sea level.

2.2.1.3.2 Castle Dome Marginal Dump

The Castle Dome Marginal Dump is currently under construction on private land; there is no use of National Forest System lands planned for this facility. Castle Dome Marginal Dump has a current (2020) top elevation of approximately 3,785 feet above mean sea level.

2.2.1.3.3 North Barn Marginal Dump

The North Barn Marginal Dump is a permitted, planned facility located entirely on private lands along the west-southwest side of the Open Pit.

2.2.1.3.4 Northside Dumps 9.1, 9.11, 9.12, and 9.3

Northside Dumps 9.1, 9.11, 9.12, and 9.3 are existing, inactive waste rock dumps encompassing approximately 102 acres of private land; there is no use of National Forest System lands for these facilities. Some revegetation has naturally occurred on these dump faces.

The Northside Dumps contain the following approximate tonnages of waste rock: 700,000 tons at 9.1, 13,500,000 tons at 9.11, 500,000 tons at 9.12, and 9,000,000 tons at 9.3. The waste rock is composed of mixtures of granodiorite, diabase, quartz monzonite, altered limestone, conglomerate, granite porphyry, schist, quartzite, basalt, and a small amount of Castle Dome–era tailings. The dumps reach top elevations of up to 4,190 feet above mean sea level and have outer slopes less than or equal to a ratio of 1.5 horizontal to 1 vertical.

2.2.1.3.5 Southside Dumps 13 and 14

The inactive Southside Dump 13 and Southside Dump 14 are located on private land; there is no use of National Forest System lands for these facilities. Southside Dump 13 encompasses approximately 6 acres of private land. Southside Dump 14 lies within the footprint of and was completely consumed by the reclamation of Tailings Storage Facility No. 1 and Tailings Storage Facility No. 2. Southside Dump 14 is considered by the Arizona Department of Environmental Quality to be in a post-closure condition.

Southside Dump 13 contains an estimated 1,000,000 tons of waste rock composed primarily of diabase and quartz monzonite, with smaller amounts of granodiorite, conglomerate, and basalt. This dump has a maximum height of 100 feet above ground surface, a top elevation of 4,025 feet above mean sea level, and an outer slope less than or equal to a ratio of 1.5 horizontal to 1 vertical.

2.2.1.3.6 19.1 Dump

The 19.1 Dump is an existing, inactive dump encompassing approximately 3 acres of private land; there is no use of National Forest System lands for this facility. The 19.1 Dump currently contains approximately 1,000,000 tons of waste rock, primarily Pinal Schist, a non-acid-forming material. The dump has a height of approximately 80 feet above ground surface and an outer slope less than or equal to a ratio of 1.5 horizontal to 1 vertical.

2.2.1.3.7 19 Dump and 19 Extension Dump

The 19 Dump is an existing, inactive dump encompassing approximately 76 acres of National Forest System lands. The 19 Dump is the only Pinto Valley Mining Corp. waste rock dump on unpatented claims. The 19 Dump was previously authorized by Forest Service plan of operations POO-0003 in 1984, with authorization to extend the toe of the dump onto the right-of-way for the Cottonwood Tailings Impoundment and Reservoir through amendment to Bureau of Land Management right-of-way PHX-080742 (see table 1-1). The facility was constructed by end-dumping overburden from access roads above the planned dump footprint. Site records indicate that the facility holds approximately 27,000,000 tons of rock consisting almost entirely of Pinal Schist, a non-acid-forming material. The 19 Dump has been inactive since 1993.

The 19 Dump facility reaches an elevation of approximately 4,425 feet above mean sea level. The outer slope of the waste rock dump ranges from ratios of 1.3 horizontal to 1 vertical to 1.5 horizontal to 1 vertical and is considered seismically stable (Wood 2018). The overburden rests on bedrock exposures of granite, schist, and granodiorite. The 19 Dump has partially revegetated through natural processes.

The 19 Extension Dump is permitted with the State of Arizona; however, it has not yet been constructed and Pinto Valley Mining Corp. currently has no plans to construct the dump.

2.2.1.4 **Borrow and Riprap Sources**

Pinto Valley Mining Corp. has identified borrow and riprap sources on private land for use as cover material during reclamation. Areas used for borrow and riprap sources on private lands are outside the footprint of other mining facilities. There are approximately 22 acres of private land currently used as borrow and riprap sources.

2.2.2 Milling and Processing

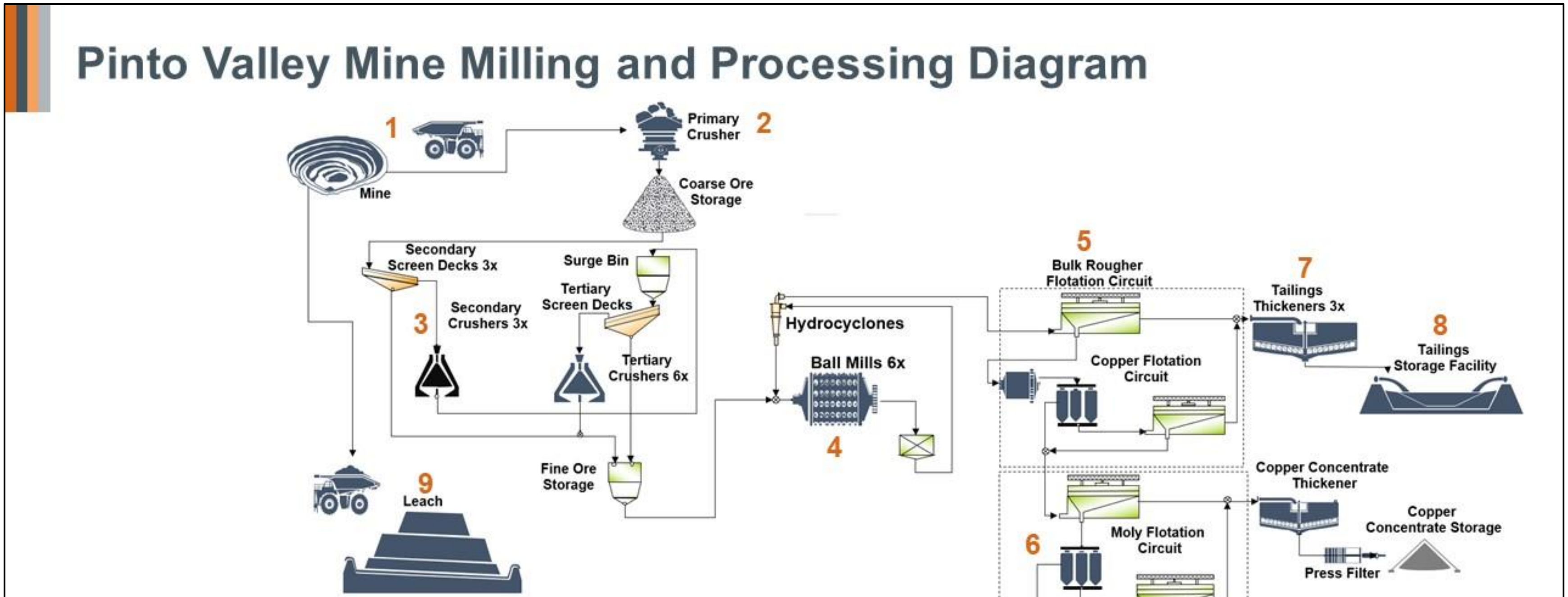
2.2.2.1 **Mill and Concentrator**

Existing mill, concentrator, and ancillary facilities are located on approximately 152 acres of private and 13 acres of National Forest System lands (map 1-1 in appendix A). As currently configured, copper-bearing ore is first run through a 60- by 89-inch gyratory primary crusher, a set of three 7-foot secondary crushers, and a set of six 7-foot tertiary crushers. The finely crushed ore is then fed into a set of six 18- by 21-foot ball mills charged with 3-inch grinding balls where process water and flotation reagents are added. Ore from each ball mill then passes through 3- by 33-inch cyclones and the finer fraction enters the flotation circuit.

The flotation circuit operates as a staged process designed for the recovery of copper and molybdenum to individual concentrates. The primary focus of the rougher flotation circuit is to optimize recovery of the primary sulfide minerals from the gangue[1] by upgrading for economic downstream processing. Cleaner flotation delivers economic concentrate grades for marketing while maintaining high recoveries. The rougher flotation section is operated in open circuit, with the rougher tailings reporting to the tailings thickeners. The tails from the cleaner scavenger bank are also sent to tailings storage facilities. Tailings from the three rougher line bank sections and the cleaner scavenger bank are combined and feed three 350-foot-diameter tailings thickeners where water is reclaimed, and sent on to the tailings thickeners. Tailings gradation test results indicate that approximately 10 percent of the particles are finer than 4.8 microns, approximately 50 percent of the particles are finer than 112 microns, and approximately 80 percent of the particles are finer than 360 microns. The design tailings pipeline flow rate is calculated to be 12,930 gallons per minute with 55 percent solids. Tailings Storage Facility No. 4 is the primary location for the disposal of tailings from the mill. Tailings Storage Facility No. 3 is generally used as a backup. Copper-bearing rougher froth is combined and concentrated in four 8- by 40-foot column cells, then to two 90-foot thickeners where water is reclaimed and the solids are separated. Residual water is removed by filter press from the copper concentrate. The copper concentrate is stored in a weather-resistant tent before transport to offsite smelters.

Figure 2-1 depicts the milling and processing activities at the Pinto Valley Mine.

[1] The commercially valueless material in which ore is found.



1. Conventional drill/blast/load/haul operations in the Mine.
2. Mined ore is first crushed in a Primary Crusher to <6"
3. Fine Crushing Plant applies 2 more stages of crushing & screening to achieve a <½" crushed ore product.
4. 6 Ball Mills grind the ore from Fine Crushing Plant creating a slurried feed to the Flotation Plant.
5. Valuable minerals are recovered Bulk Rougher Flotation which produces a bulk Cu/Mo concentrate.
6. Moly Plant separates the bulk conc, resulting in 2 conc streams for sale: molybdenum conc and copper conc.
7. After removing the concentrates, the residual slurry of ground ore is processed in 3 Tails Thickeners to recycle water back to the Ball Mills.
8. Thickened underflow from Tails Thickeners is pumped for storage in 2 Tailings Storage Facilities.
9. Using catalytic leaching technology from Jetti Resources, some waste rock is leached for recovery of cathode copper in our SXEW plant.

Figure 2-1. Pinto Valley Mine milling and processing diagram

2.2.2.2 **Cottonwood Tailings Impoundment**

The Cottonwood Tailings Impoundment consists of an unlined tailings impoundment, embankment, and ancillary facilities. Approximately 44 acres of the Cottonwood Tailings Impoundment are located on private lands and 278 acres are located on National Forest System lands. The impoundment has not received tailings since 1984 and is considered closed.

The Cottonwood Tailings Impoundment was previously authorized by the Bureau of Land Management in 1944 under right-of-way PHX-080742. As previously discussed, the right-of-way was amended in 1984 to allow a portion of the area to be used for the 19 Dump and was administratively transferred to the Forest Service in 1989. The Cottonwood Tailings Impoundment embankment was constructed across Cottonwood Canyon near Manitou Hill to support the original Castle Dome Mine, which began operation in 1943. The embankment was constructed by hydraulic deposition of tailings from the top gradually increasing the embankment height as the facility was operated. The Cottonwood Tailings Impoundment received tailings from ore processed at the Castle Dome mill from 1944 until 1954. The impoundment was deactivated in 1954, reactivated in 1974, and received tailings from ore processed at a new mill constructed for the Pinto Valley Mine until 1984. In 1988, the surface was capped with an approximately 6-inch-thick layer of inert material and subsequently seeded with grasses (GeoSystems Analysis, Inc. 1998).

The embankment wall has a total height of 286 feet (top to downstream toe), with an existing (2020) top elevation of approximately 4,023 feet above mean sea level (Pinto Valley Mining Corp. 2020a). The embankment outer slope has a ratio of 2 horizontal to 1 vertical and is considered seismically stable based on a stability analysis conducted by Wood in 2018 (Wood 2018). Tailings embankments are not subject to Arizona Department of Water Resources dam safety regulations, but Pinto Valley Mining Corp. does inspect the embankment regularly. The Forest Service does not require or routinely receive inspection reports from Pinto Valley Mining Corp., the State of Arizona, or other jurisdictional entity for the Cottonwood Tailings Impoundment on National Forest System lands.

Some of the original infrastructure related to the impoundment is still active. The current infrastructure related to the impoundment includes:

- The seepage collection system at the embankment (including Arizona Pollutant Discharge Elimination System Outfall No. 004), which provides collected water to the service water circuit. Approximately 42 gallons per minute of seepage from Cottonwood Tailings Impoundment reports to Cottonwood Seepage Caisson, where it is collected and pumped back to Pinto Valley Mine. Pinto Valley Mining Corp. does not anticipate seepage ceasing for many years, if ever. As long as seepage reports to the caisson it will be collected and returned to Pinto Valley Mine unless direct discharge to the ground is authorized under an updated Arizona Pollution Discharge Elimination System permit, or another use or disposition of the water is identified;
- Arizona Pollutant Discharge Elimination System Outfall No. 005 near the southeastern corner of the facility, which discharges to an unnamed wash that eventually reports to Pinto Creek;
- Evaporation and settling ponds, which manage storm water that falls on the impoundment surface; and
- The base for National Forest System Road 287 along the west side of the impoundment.

National Forest System lands on and near the Cottonwood Tailings Impoundment are used by Pinto Valley Mining Corp. for several purposes:

- The impoundment surface is currently crossed by access roads used by Pinto Valley Mining Corp. for monitoring the facility. A road onto the impoundment enters from the Pinto Valley Mine plant area (on private Pinto Valley Mining Corp. land) and allows general access to the Cottonwood Tailings Impoundment surface for monitoring purposes, where other roads extend along the Cottonwood Reservoir embankment, along the top of the inset embankment, or continue east toward the 19 Dump.
- Numerous groundwater wells and piezometers are situated within and around the impoundment.
- A contractor parking lot near the northwestern corner of the facility is situated partially within the impoundment footprint.
- An equipment laydown yard east of the parking lot is partially within the impoundment footprint.
- An area adjacent to the southern edge of the impoundment footprint has been developed as a commercial vehicle staging area. The 80,000-square-foot area is on the north side of National Forest System Road 287, where a road cut through a low ridge isolated a small section of the ridge that was flattened for this purpose. Under a letter agreement with the Forest Service in 2009, excess granitic material from an Arizona Department of Transportation U.S. Highway 60 construction project was placed on the flattened area. The agreement transferred ownership of the material from Arizona Department of Transportation to the mine, and the Forest Service stated that the permitted use of the Cottonwood Tailings Impoundment would not be affected by the material placement. Pinto Valley Mining Corp. currently uses this area for commercial vehicle staging. It is accessible from National Forest System Road 287 but not from the impoundment surface.

2.2.2.3 Tailings Storage Facility No. 1/2

Tailings Storage Facility No. 1 and Tailings Storage Facility No. 2 (hereafter referred to as Tailings Storage Facility No. 1/2) are inactive and unlined tailings storage facilities that merged over time into a single impoundment area occupying approximately 404 acres of private land. These facilities would remain inactive for the life of the mine. Southside Dump 14, decommissioned with the majority of material used as a cover layer for Tailings Storage Facility No. 1, is within the footprint of Tailings Storage Facility No. 1/2. Tailings Storage Facility No. 1 is considered to be in a reclaimed, post-closure status by the Arizona Department of Environmental Quality.

Tailings Storage Facility No. 1/2 was constructed concurrently and operated from 1973 to late 1987. Starter dams were constructed using borrowed local materials and incorporated granular blanket drains at the base of the embankment to facilitate drainage. The tailings storage facilities were raised in an upstream manner and eventually coalesced to form a single impoundment. Deposition of the tailings included periods of using both cycloned sand and peripheral spigotting.

Tailings Storage Facility No. 1/2 currently contains an estimated 70,000,000 tons of mine tailings to an elevation of 3,850 feet. Rockfill was placed above the tailings to elevations of between 3,900 and 3,920 feet. The maximum toe to top height of the tailings storage facilities is 440 feet.

2.2.2.4 Tailings Storage Facility No. 3

Tailings Storage Facility No. 3 consists of a tailing impoundment and a series of pumps, caissons, collection drains, ditches, ponds, and tanks designed to collect and recycle seepage and storm water runoff from the face of the Tailings Storage Facility No. 3 dam. The existing footprint of the facility encompasses approximately 264 acres of private land and 6 acres of National Forest System lands. Tailings Storage Facility No. 3 has a current (2020) top elevation of approximately 3,785 feet above mean sea level.

Tailings Storage Facility No. 3 was started on private Pinto Valley Mining Corp. property in 1974 and operated intermittently until 2009. A portion of Tailings Storage Facility No. 3 on National Forest System lands was previously authorized in 1994 under plan of operations POO-0001. Additionally, roads, water pipelines, and electrical power lines associated with Tailings Storage Facility No. 3 were previously authorized under plan of operations POO-0002. All tailings in Tailings Storage Facility No. 3 are from ore processed at the Pinto Valley Mine mill. The Tailings Storage Facility No. 3 embankment on private Pinto Valley Mining Corp. property was constructed in an upstream manner, with a cycloned sand shell.

Southwest of the previously authorized tailings placement area, an encroachment of tailings occurred on unpatented claims in 2013. Later that year, a boundary dam was constructed on the private Pinto Valley Mining Corp. property to isolate the encroachment area and the tailings were removed from National Forest System lands in 2014. The area has since naturally revegetated. A separate encroachment onto unpatented claims in National Forest System lands associated with Tailings Storage Facility No. 3 encompasses a less-than-1-acre sediment trap and adjoining cleared area, for a total disturbance area of 2 acres. The sediment trap is adjacent to the Tailings Storage Facility No. 3 embankment, which is on private Pinto Valley Mining Corp. property. It is not known when the sediment trap was constructed.

The sediment trap collects runoff from a portion of the embankment and acts as a small detention basin. Solids settle to the bottom of the trap, and water flows back onto the private Pinto Valley Mining Corp. property into the Slack/Conklin Pond. The sediment trap is maintained as needed, using roads on the embankment face to access the trap and remove accumulated sediments to maintain the trap’s capacity. The sediments are disposed of on private Pinto Valley Mining Corp. property within the Tailings Storage Facility No. 3 impoundment.

The existing reclaimed water system at Tailings Storage Facility No. 3 is entirely on private Pinto Valley Mining Corp. property and currently consists of a single trailer-mounted, self-priming, centrifugal pump with an engine drive. The pump conveys water from the southern end of the Tailings Storage Facility No. 3 supernatant pool to the mill water supply tank, which is also on private Pinto Valley Mining Corp. property. Alternative pump locations are occasionally used at Tailings Storage Facility No. 3. One of these alternative locations is on National Forest System lands, pursuant to the 1994 authorization (POO-0001).

Tailings Storage Facility No. 3 is regulated by the State of Arizona under the Aquifer Protection Program and other State regulations and programs. Under the jurisdiction of the State of Arizona, the guidance followed for design of tailings storage facilities is provided by the Arizona Department of Environmental Quality Best Available Demonstrated Control Technology (2004).

2.2.2.5 Tailings Storage Facility No. 4

Tailings Storage Facility No. 4 is an existing, active facility that encompasses approximately 704 acres of private land. Tailings Storage Facility No. 4 itself does not extend onto National Forest System lands. Tailings Storage Facility No. 4 has a current (2020) top elevation of approximately 3,945 feet above mean sea level. Boundary dams constructed since 2016 along the private property line prevent tailings from extending onto National Forest System lands. However, Pinto Valley Mining Corp.’s predecessors constructed an access road and installed electrical power lines and poles on National Forest System lands that service floating (barge-mounted) pumps in the supernatant pond of the impoundment, which currently lies on private Pinto Valley Mining Corp. property. The access road and power lines were approved by the Forest Service in 1973 under special use permit GLO-445302.

The Tailings Storage Facility No. 4 embankment, currently on private Pinto Valley Mining Corp. property, is raised by cyclone deposition of the tailings. A 30-inch-diameter, high-density, polyurethane pipeline is situated on the west side of the Tailings Storage Facility No. 4 embankment to the top of the dam to deliver tailings slurry. The pipeline continues across the top of the dam to the east abutment, still on private Pinto Valley Mining Corp. property. The pipeline has multiple taps where tailings are routed to crane hoisted cyclone clusters and cyclone racks where the coarse cyclone underflow material is used to construct the dam embankment. The fine-grained fraction from the cyclone overflow is piped to the Tailings Storage Facility No. 4 beach, as described in the Pinto Valley Mining Corp.'s overall tailings operation, maintenance, and surveillance manual (Capstone Mining Corp. 2020c).

The existing reclaim water system, all currently on private Pinto Valley Mining Corp. property, consists of barge-mounted pumps and two booster pump stations conveying water from the southern end of the Tailings Storage Facility No. 4 supernatant pool to the mill water supply tank. The nominal design flow rate of the reclaimed water system is 6,500 gallons per minute.

Tailings Storage Facility No. 4 is regulated by the State of Arizona under the Aquifer Protection Program and other State regulations and programs. Under the jurisdiction of the State of Arizona, the guidance followed for design of tailings storage facilities is provided by the Arizona Department of Environmental Quality Best Available Demonstrated Control Technology (2004).

2.2.2.6 Leach Piles

Leach piles currently encompass approximately 654 acres on private land. Throughout the history of mining at Pinto Valley Mining Corp., the hydrometallurgical operations including the Leach Piles have operated based on the economic viability of the process. Unit costs for cathode (hydrometallurgical) copper at Pinto Valley Mining Corp. have been low enough to justify continuous operation since June 1981 in spite of occasional production curtailments in the Open Pit mine and concentrator.

2.2.2.7 Pregnant Leach Solution Ponds and Ancillary Facilities

Pregnant Leach Solution Ponds and associated ancillary facilities encompass approximately 19 acres on private land. As part of the hydrometallurgical operations, the use of Pregnant Leach Solution and Raffinate Ponds as well as the ancillary facilities are directly connected with the use of the Leach Piles.

Pinto Valley Mining Corp. has evaluated various options for managing leach solutions in the case that hydrometallurgical operations are curtailed. These evaluations are independent of the proposed mining plan of operations.

While the Leach Piles are operational, pregnant leach solution from leaching operations is to be pumped to the Solvent Extraction and Electrowinning Plant for copper removal, then returned to the Leach Piles. Only under emergency conditions are pregnant leach solutions pumped to the Open Pit. All pipeline corridors between the Pregnant Leach Solution Ponds, the Solvent Extraction and Electrowinning Plant, the Leach Piles, the Open Pit, and the mill are on property owned by Pinto Valley Mining Corp. in areas of existing disturbance.

2.2.2.8 Solvent Extraction and Electrowinning Plant

As part of the hydrometallurgical operations, the use of the Solvent Extraction and Electrowinning Plant is entirely on private land and directly connected with the use of the Leach Piles. When leaching operations are curtailed, the Solvent Extraction and Electrowinning Plant would be the first to cease operation.

2.2.3 Roads

2.2.3.1 National Forest System Roads

Pinto Valley Mining Corp. currently uses approximately 29.8 miles of National Forest System roads to access the Pinto Valley Mine site and various Pinto Valley Mining Corp. facilities on both patented and unpatented claims on National Forest System lands (Capstone Mining Corp. 2020b) (see map 3-16 in appendix A). For a complete list of roads used by Pinto Valley Mining Corp., refer to the "Road Use and Maintenance Plan" (appendix I to the proposed mining plan of operations evaluated in this final EIS, as updated [Capstone Mining Corp. 2020b]). Pinto Valley Mining Corp. and predecessors have used the National Forest System roads as thoroughfares to access proximate mine or pertinent facilities and structures throughout the history of the Pinto Valley Mine. In some cases, certain linear utility infrastructure such as electrical power lines or water pipelines follow National Forest System road alignments and are immediately adjacent to the travel way.

National Forest System Roads 287 and 305 are currently designated by the Forest Service as maintenance level 3 (suitable for passenger cars) and open to public use, including approximately 14.7 miles of these roads used by Pinto Valley Mining Corp. for ongoing operations. An additional 15.0 miles of National Forest System roads currently used by Pinto Valley Mining Corp. are designated by the Forest Service as maintenance level 2 (high clearance roads) and are open for administrative (non-public) use only. Some of the National Forest System roads pass through Pinto Valley Mining Corp.'s patented claims for Peak Wells. Pinto Valley Mining Corp. maintains three gates on National Forest System lands to control public access to the Open Pit for safety reasons and to control access onto private lands: (1) on National Forest System Road 287B just west of its intersection with National Forest System Road 608, (2) where National Forest System Road 287B becomes Access Road 25 as it approaches the Open Pit, and (3) where National Forest System Road 2608 meets Access Road 24 near the eastern rim of the Open Pit. Public use of other National Forest System roads that pass through Pinto Valley Mining Corp.'s patented claims for Peak Wells is not authorized but has not been physically restricted. Additional detail on access roads is provided below in section 2.2.3.2, "Access Roads."

National Forest System Road 287 extends north 3.2 miles from U.S. Highway 60 to the Pinto Valley Mine property line as a paved two-lane road, then passes through the Pinto Valley Mine on private Pinto Valley Mining Corp. property as an unpaved, all-weather road, and continues within the Tonto National Forest west and north of the mine. The paved segment was constructed in the mid-1970s around the Cottonwood Tailings Impoundment (and atop a portion of the embankment) and is also known as Pinto Valley Mine Road. All Pinto Valley Mining Corp. employees and contractors use National Forest System Road 287 from U.S. Highway 60 to access the mine.

Within the mine property, National Forest System Road 287 is used by Pinto Valley Mining Corp. to access various mine facilities, whereas the public uses National Forest System Road 287 to pass through Pinto Valley Mining Corp. property and access Pinto Creek and Haunted Canyon. The total length of National Forest System Road 287 within the private Pinto Valley Mining Corp. property is currently 3.7 miles. The route through the private Pinto Valley Mining Corp. property is periodically altered to accommodate mine development, thus changing the length of this segment. Upon issuance of a land patent on April 12, 1972 (United States of America 1972), the Federal government reserved an easement, 66 feet in width, for a portion of National Forest System Road 287 within Tract 40 of township 1 north, range 14 east on private lands currently owned by Pinto Valley Mining Corp.

2.2.3.2 **Access Roads**

Pinto Valley Mining Corp.'s predecessors constructed access roads[2] on surrounding National Forest System lands, which were intended to be temporary for use at the mine and typically extend from existing National Forest System roads to access specific facilities on either private land or National Forest System lands. Pinto Valley Mining Corp. uses approximately 15.2 miles of access roads on National Forest System lands. Access roads are used to directly access mine facilities (earthwork structures, infrastructure, and environmental controls) located both on private Pinto Valley Mining Corp. property and surrounding unpatented claims, principally for maintaining and monitoring the facilities.

Access road alignments often include pipelines and power lines within the disturbance area. Access roads were previously authorized on National Forest System lands under plan of operations POO-0002 and special use permits GLO-445302, GLO-445303, and Tonto 468. The access roads currently used by Pinto Valley Mining Corp. are described in detail in the Road Use and Maintenance Plan (appendix I to the proposed mining plan of operations evaluated in this final EIS, as updated [Capstone Mining Corp. 2020b]).

Access roads associated with electrical power lines were typically constructed as short extensions from National Forest System roads to power poles, whereas access roads associated with water pipelines typically extend from National Forest System roads to follow the pipeline alignment and in some cases lead to well sites. Other access roads were constructed to lead to or around earthwork structures on either National Forest System lands or private property (such as the Open Pit, waste rock dumps, tailings storage facilities, and reservoirs) and to environmental monitoring sites (such as monitoring wells, surface water discharge points, and storm water management and sampling sites). As appropriate (on steep slopes), erosion controls such as water bars, diversion channels, and culverts have been integrated in the access roads.

2.2.3.3 **Dust Control**

Pinto Valley Mining Corp. applies a variety of fugitive dust control operating practices to help site personnel comply with the "reasonable precaution" requirements outlined in section VIII (B)(1)(b) of the mine's current Class II Synthetic Minor Air Quality Permit issued by the Arizona Department of Environmental Quality on December 4, 2019 (Permit #65025 As Amended By Minor Permit Revision No. 79180) (Pinto Valley Mining Corp. 2019a). These fugitive dust requirements are described in Pinto Valley Mining Corp.'s fugitive dust control plan for existing operations (Pinto Valley Mining Corp. 2019b). This plan is maintained and implemented to prevent excessive amounts of particulate matter from becoming airborne. The plan is reviewed and updated as necessary.

[2] The mining plan of operations refers to segments of unnumbered access roads located on National Forest System lands as "temporary access roads." For simplicity, this EIS refers to all roads other than National Forest System roads that were intended to be temporary and provide access to the mine or mine-related facilities, regardless of land jurisdiction, as "access roads." Access roads located exclusively on private lands were not mapped for this EIS.

2.2.4 Utilities

2.2.4.1 **Electrical Power Lines**

Electrical power to the Pinto Valley Mine is currently provided by Salt River Project transmission lines and delivered to usage sites by Pinto Valley Mining Corp.–owned distribution lines that cross both private Pinto Valley Mining Corp. property (approximately 20.3 miles, 37 acres) and National Forest System lands (approximately 11.1 miles, 20 acres) (map 1-1 in appendix A). Salt River Project holds a special use permit with the Forest Service for the main line that connects to the Pinto Valley Mine substation at the plant site, within private property. The Pinto Valley Mine substation and all power lines branching from the substation are owned by Pinto Valley Mining Corp. The total power requirement for the mine is approximately 47 megawatts and requires a minimum transmission voltage of 115 kilovolts.

Electrical power lines were previously authorized on National Forest System lands under plan of operations POO-0002 and special use permits GLO-445302, GLO-445303, and Tonto 468. Most of the electrical power lines follow various National Forest System road or access road alignments, and overland lines are accessed by access roads; therefore, electrical power lines are not included in the disturbance calculations. Similarly, one ground-mounted transformer on National Forest System lands, to support the pump at Cottonwood Reservoir, is adjacent to an access road and included in the access road footprint (map 1-1 in appendix A). The minimal footprints of the power poles, or electrical cables and the transformer on the ground surface, are incorporated in the land disturbance associated with the National Forest System roads or access roads and also not repeated here.

Most of Pinto Valley Mining Corp.'s power lines on National Forest System lands supply electricity to power pumps in various Peak Wells located northwest and west of the Pinto Valley Mine (see map 1-1 in appendix A) or to support the conveyance of water in the Burch pipeline between BHP's Copper Cities Diamond H Pit facility located approximately 6 miles east of the mine and the Cottonwood Reservoir. Other lines (those southeast of the Open Pit and east of Tailings Storage Facility No. 4) supply electricity to other pumps and equipment on private Pinto Valley Mining Corp. property. Most of the electrical power lines on National Forest System lands are 13.8 kilovolts and typically run from well site to well site, usually parallel to the roads. Two exceptions to the power line voltage are a 120/240-volt line to Peak Well 9 and a 440-volt line from the JH6 Ranch (formerly known as the Layton Ranch at the northwestern extent of the Pinto Valley Mine) to a pump at Peak Well 15A. That well supplies water to the ranch, independent from the mine. No matter the voltage, electrical power is delivered via overhead lines supported by wooden poles and occasionally through cable lines that run on the ground surface along roadways. However, the electrical cables that were placed along the edge of the road west of Tailings Storage Facility No. 3 have been abandoned. Only one ground-surface cable, 650 feet long, remains in active use. This cable supplies electricity to Peak Well 37, a potable water supply well southwest of the Pinto Valley Mine.

The electrical distribution system also includes transformers to reduce the transmitted voltage. All of the Pinto Valley Mining Corp. transformers on National Forest System lands are pole mounted, except one located near the Cottonwood Reservoir. The pole-mounted transformers do not have any footprint on National Forest System lands; as noted above, the poles' minimal footprint is incorporated into the access road disturbance area. The single transformer near Cottonwood Reservoir supplies electricity to the pump on the floating barge that extracts water from the reservoir for delivery to the ore processing system and a barge-mounted aerator. In 2017, Pinto Valley Mining Corp. also installed an electrical circuit recloser along the power line that runs parallel to the Burch pipeline. The disturbance area for the power line and transformer is included in the area of the associated access road.

2.2.4.2 Lighting

Onsite lighting is used at Pinto Valley Mine to illuminate active operational areas and for safety and security. Many indoor lights are outfitted with motion sensor switches but are generally on 24 hours a day, 7 days a week. Most outdoor lights are on dusk to dawn photocells or timers. Stationary, outdoor lighting is concentrated around the existing mill and concentrator area (such as crushers, ore storage piles, mill, thickeners, maintenance shops, concentrate tent, and warehouses), the Solvent Extraction and Electrowinning Plant, the tailings pump station, the north barn, the guard gate house, the potable water tank, and office buildings. Mobile light plants are typically stationed at active areas of the Open Pit and waste rock dumps. Vehicles have headlights and safety beacons. Vehicle use is concentrated along the paved portion of National Forest System Road 287 from U.S. Highway 60 to the mine entrance, in the immediate vicinity of the mill and concentrator, and along haul roads. Vehicle use is considerably less intense along other National Forest System roads and access roads on National Forest System lands, or within the private Pinto Valley Mining Corp. property. Nighttime road use, requiring vehicle headlights and beacons, is almost exclusively along haul roads between the Open Pit, mill and concentrator, and waste rock dumps. Commuter traffic along National Forest System Road 287 is concentrated during shift changes, typically from 5:00 a.m. to 7:00 a.m. and from 5:00 p.m. to 7:00 p.m.

The original lighting at the Pinto Valley Mine was either high-intensity discharge mercury vapor lights or fluorescent lights. Because mercury vapor is no longer available and very inefficient, many lights have been upgraded to light-emitting diode lighting.

2.2.5 Water Supply, Distribution, Use, and Treatment

Water supply, distribution, use, and treatment facilities used to operate Pinto Valley Mine include wells, buried and surface pipelines, ponds, reservoirs, and storage tanks. Together, existing water-related facilities encompass an estimated 86 acres of private land and 72 acres of National Forest System lands (as estimated based on assumptions in table 2-4).

The Pinto Valley Mine has an average consumptive water use of 9,722 gallons per minute (plus or minus 20 percent), a substantial portion of which is recycled for onsite milling (93.6 percent of water), dust control (4.6 percent of water), potable water (0.2 percent of water), and other uses (1.5 percent of water). Table 2-2 presents the estimated water use for existing operations.

Table 2-2. Pinto Valley Mine consumptive water use for existing operations

Water Supply Source	Average Water Use (gallons per minute)	Estimated Water Use Rate (gallons per minute)			
		Mill Use	Dust Control	Potable Water	Other Uses
East Water System[3]	1,700	1,350	350	-	-
West Water System	-	-	-	-	-
Peak Well Field	3,500	3,250	100	-	150
Peak Well 37[4]	22	-	-	22	-
Tailings Storage Facility No. 4 Decant Water (recycled water)	4,200	4,200	-	-	-
Open Pit Pumping (recycled water)	300	300	-	-	-
Total	9,722	9,100	450	22	150

[3] East water system comes from multiple sources transmitted to the Pinto Valley Mine site by the Burch pipeline including the Old Dominion mine site, BHP's Diamond H Pit, Myberg Basin, and three groundwater wells. These systems are further described in this section.
[4] Peak Well 37 provides potable water to Pinto Valley Mine.

Note: The table above presents total water consumption associated with active mining operations including water recycled on site (Tailings Storage Facility No. 4 Decant Water) and fresh water.

2.2.5.1 **Peak Well Field (West Water System)**

The Peak Well field includes 22[5] industrial water supply wells and one potable water supply well, Peak Well 37. Peak Well 37 was previously authorized on National Forest System lands under special use permit Tonto 468. Inactive wells on private land may remain inactive or may be abandoned per Arizona Department of Water Resources requirements and the Mined Land Reclamation Plan.

The average annual water production rate for the Peak Well field is 3,500 gallons per minute. Annual production can range from 3,000 gallons per minute to 3,700 gallons per minute. The Peak Well field was developed in the mid-1970s to provide water used at the site, which is transported to the mine site via surface and buried pipelines. National Forest System lands were used for pipelines to deliver some of the water from the Peak Well field to the Pinto Valley Mine site. The pipelines on National Forest System lands supporting the Peak Well field were constructed following existing National Forest System roads; in some locations, new access roads were built to access well sites and provide a corridor for associated water pipelines.

Peak Well 37 is situated on an unpatented mill site claim, “Peak 94,” near the western boundary of the private Pinto Valley Mining Corp. property. Peak Well 37 is the only active water supply well for Pinto Valley Mine that is located on National Forest System lands. The well was drilled in 1999 on a 100- by 100-foot pad to supply potable water for personnel at the mine. A high-density, polyethylene water pipeline and an electrical power line were installed from the well approximately 650 feet to the Pinto Valley Mine boundary and enter via the onsite infrastructure network.

Construction of water pipelines and wells on peak mill sites and associated service roads was authorized by the Forest Service in 1987 under special use permit GLO-445303. Construction of access roads to service electrical power lines for operation of wells on peak mill sites was authorized by the Forest Service in 1973 (special use permit GLO-445302). This latter permit was amended in 1984 to allow operation and maintenance of 13.8-kilovolt electrical transmission lines to power the Peak Well field.

2.2.5.2 **Burch Pipeline System (East Water System)**

The Burch pipeline alignment has been altered over the years, and currently runs from the BHP Copper Cities Diamond H Pit across private property, entering National Forest System lands near Webster Gulch where Little Pinto Creek joins Webster Gulch. The alignment extends up Little Pinto Creek Canyon to Pinto Valley Mining Corp.’s Mine Reservoir. From the Mine Reservoir, the Burch pipeline follows an access road to Pinto Valley Mine.

Construction of the Burch pipeline for supplying water from BHP’s Diamond H pit at the Copper Cities Unit was authorized by the Forest Service in 1987 under special use permit GLO-445303. Other portions of the Burch pipeline system on Bureau of Land Management-administered surface were authorized by the Department of the Interior in 1944 under right-of-way PHX-080933 and under right-of-way AZA-007282 issued in 1973. Special use permit GLO-445302, first authorized by the Forest Service in 1973, was amended in 1984 to allow operation and maintenance of 13.8-kilovolt electrical transmission lines to power the Burch pipeline booster station. Construction and use of a 2-acre water storage reservoir east of what is now known as Pinto Valley Mine was originally authorized by the U.S. Department of the

[5] This number is subject to change based on project needs.

Interior in 1944 under right-of-way PHX-080933, and the reservoir is now fed by water from a segment of pipeline that tees off the Burch pipeline. All of these previously authorized rights-of-way and special use permits have now expired (see table 1-1). Prior to commissioning a filter plant at Pinto Valley Mine in 2007, copper concentrate slurry pumped through a high-pressure pipeline from Pinto Valley Mine to the Copper Cities Unit. For a period of time, Freeport-McMoRan also delivered water to Pinto Valley Mine through a tap along the Burch pipeline.

The Burch pipeline and power lines continue to be integral components of the water supply system for Pinto Valley Mine. Virtually all water sourced outside the Pinto Creek watershed comes to Pinto Valley Mine through this pipeline. The Burch pipeline transports water to the Pinto Valley Mine from the east water system, providing water for dust control, storage in the Cottonwood Reservoir, or transport directly to the Pinto Valley Mine mill for immediate use. Electrical power to operate the pipeline and several other functions at BHP’s Copper Cities Unit is supplied through the power lines that parallel the pipeline. In addition to established National Forest System roads (National Forest System Road 608), several access roads along the pipeline and power line corridor provide for regular inspection and maintenance of these utilities. The Burch pipeline connects Pinto Valley Mine to BHP’s Copper Cities Unit, and more specifically with the Diamond H Pit, which is its starting point. That pit receives treated groundwater from the Pinal Creek Project, a State-mandated remediation project in the Globe-Miami area, as well as water from BHP’s Old Dominion Mine and a small number of water wells north of Globe.

Various segments of the 16- to 18-inch-diameter pipeline were constructed of carbon steel and high-density polyethylene pipe. Steel segments were typically elevated above ground surface with wooden cribbing, whereas polyethylene segments were placed directly on the ground surface. A booster station for the Burch pipeline was constructed along the alignment but was removed in the 1980s. Various segments of the original pipe have since been replaced when needed (as a result of wear or weathering) with steel or high-density polyethylene pipe. The segment of the Burch pipeline that leads to Cottonwood Reservoir does not extend the full distance, but rather terminates a short distance downstream of a pipe Tee and discharges to a channel above the reservoir, then flows overland from there approximately 800 feet to the reservoir. The pipeline segment from the Tee to the mill continues uninterrupted to the mill.

Flow in the Burch pipeline currently ranges from 1,500 to 1,800 gallons per minute, but the pipeline can accommodate flows in excess of 3,300 gallons per minute, and flow is continuously monitored by a series of flow meters along its length. Flow meters include one on BHP’s Copper Cities Mine property, one between a Tee and the Mine Reservoir, and one on private Pinto Valley Mining Corp. property before the pipe Tee and valves that allow the flow to be directed to Cottonwood Reservoir or the mill. A discrepancy of greater than approximately 3 percent in the measured flow rate between water sent and water received triggers an alarm on a continuously monitored control panel. Operators are trained to then dispatch personnel to investigate or shut down the pipeline. The entire length of the Burch pipeline on National Forest System lands is also visually inspected daily.

A second, inactive pipeline follows the Burch alignment, on private property and National Forest System lands. This buried, 4-inch-diameter, steel pipeline was used to transport copper concentrate slurry from the Pinto Valley Mine concentrator to the Miami Unit for filter pressing between 1974 and 1997. The pipeline was unused during a curtailment period until 2007, and then abandoned altogether after a filter plant and concentrate storage facility were constructed at Pinto Valley Mine. The majority of the pipeline remains buried alongside and beneath the Burch water pipeline, although small segments have been removed. Decommissioning and reclamation of inactive facilities on National Forest System lands would be conducted in accordance with the National Forest System land reclamation plan; see mitigation measure MM-4 in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation."

2.2.5.3 Other Water Pipelines

Various pipelines on National Forest System lands were previously authorized under right-of-way PHX-080742, plan of operations POO-0002, and special use permits GLO-445303 and Tonto 468. The pipelines generally follow various road alignments on National Forest System lands as depicted on map 1-1 in appendix A.

2.2.5.4 Ponds and Reservoirs

Storm water and seepage collection ponds include the following: No. 1 Upper Basin, No. 1 Lower Basin, Upper Catchment Upper Pond, Upper Catchment Lower Pond, Upper Catchment Toe Drain, Upper Tule Pond, Lower Tule Pond, Lower Tule Caisson, North Pond, Peeples Pond, Southside Ditch, Road Crossing Pond, East Catchment and East Catchment Caisson, Slack/Conklin Pond, No. 3 Seepage Caisson, West Catchment, Canyon Dam, Able Pond, Gold Gulch Final Catchment, Baker Pond, Rosa's Pond System, G Pond, H Pond, K Pond, Pennell Pond, Cottonwood Reservoir, and Cottonwood Seepage Caisson System. Refer to the proposed mining plan of operations (Capstone Mining Corp. 2016a) and the Pinto Valley Mine Aquifer Protection Permit (Arizona Department of Environmental Quality 2019a) for more information on these ponds and reservoirs. Some of the storm water seepage and collection ponds, including all or portions of Upper Tule Pond, G Pond, H Pond, K Pond, Pennell Pond, Cottonwood Reservoir, and Cottonwood Seepage Caisson System, are located on National Forest System lands.

The Cottonwood Reservoir is the primary water storage facility for the Pinto Valley Mine and is situated on unpatented claims on National Forest System lands. The reservoir was originally merely the supernatant pond of the Cottonwood Tailings Impoundment and a decant tower was used to recover water for use in the mill. The reservoir was isolated from the impoundment in the mid-1970s. A berm was constructed atop tailings at the upstream extent of the Cottonwood Tailings Impoundment. The top of the berm when constructed was approximately 35 feet above the tailings level at that time. In anticipation of tailings backfilling against the embankment, a drainage blanket constructed of sand and gravel was placed on the downstream portion of the dam to control seepage and reduce piping. The upstream face of the berm was covered with a riprap layer of cobbles and boulders. Pinto Valley Mining Corp. maintains the reservoir berm on an as-needed basis.

Cottonwood Reservoir functions as originally designed in the 1970s, providing the primary water storage for the Pinto Valley Mine. Excess water during winter months is typically sent over to Cottonwood Reservoir from various sources for storage and is then used in mining processes during the summer months when the water supply falls short of demand. Currently, Cottonwood Reservoir has a capacity of approximately 1,000 acre-feet. The top elevation of the embankment is 4,023 feet above mean sea level and the reservoir has a maximum depth of 60 feet. The actual footprint of Cottonwood Reservoir is currently 30 acres (approximately 40 acres at top level). The reservoir continues to serve as a collection and retention point for water from both on- and offsite sources, including surface drainage, Peak Wells, the Old Dominion Shaft, Diamond H Pit, mine pit dewatering operations, and various collection ponds, basins, and ditches associated with mining operations. Most water to the Cottonwood Reservoir is delivered via the Burch pipeline (some of which is below grade), with additional water delivered by a second pipeline from the Open Pit. Both of these pipelines terminate approximately 800 feet away from the reservoir, discharging to a channel adjacent to the 19 Dump. Water flows overland down the channel to enter the reservoir near the toe of the 19 Dump. Water is also supplied from Tailings Storage

Facility No. 4 reclaim, Peak Wells, Upper Tule Pond (partially on National Forest System lands), and Upper Catchment Pond (on private Pinto Valley Mining Corp. property). The portion of Upper Tule Pond on National Forest System lands measures 2 acres. High-density, polyethylene pipelines from these ponds deliver water directly to the reservoir, following the northern edge of the Cottonwood Tailings Impoundment and discharging into the northwestern corner of the reservoir. A pump barge is anchored near the northwestern corner of the reservoir and supplies water to the mill for ore processing via high-density polyethylene pipelines on the ground surface.

The Mine Reservoir is a water storage facility that, along with its associated pipeline, is situated on National Forest System lands. The Mine Reservoir provided water storage for the now-abandoned Castle Dome Mine. It was constructed in 1944 as a concrete-lined, 2-acre pond that was supplied by a 16- to 18-inch-diameter steel pipeline lying on the ground surface. The pipeline originated on private property at an unspecified mine site east of the Pinto Valley Mine, followed Live Oak Gulch, crossed overland through Barney Canyon, entered National Forest System lands, and then followed the Little Pinto Creek Canyon to the reservoir (U.S. Geological Survey 1945). This pipeline was abandoned and removed sometime after the Burch pipeline (described above) was constructed in the mid-1970s. A second 16- to 18-inch pipeline was constructed to convey water from the reservoir to the Castle Dome Mine, following the alignment of National Forest System Road 287B. This second pipeline is still in place and is buried for its entire length; it is on National Forest System lands until it enters private Pinto Valley Mining Corp. property near the Open Pit.

Water to the Mine Reservoir is now supplied by the Burch pipeline. A Tee-junction in the Burch pipeline allows a portion of the flow to be diverted to the Mine Reservoir. A 6-inch-diameter, high-density, polyethylene pipe taps the Burch pipeline and an inline valve is manually opened to fill the Mine Reservoir as needed. This water is stored temporarily in the reservoir and eventually used for dust control on haul roads in the Open Pit or waste rock dumps whose runoff drains to the Open Pit. The water flows out of the reservoir by gravity in a steel and high-density polyethylene pipeline leading north, along an abandoned section of National Forest System Road 287B to one of two water stand dispensers on the southeastern side of the Open Pit. The Mine Reservoir occupies 1 acre of National Forest System lands.

2.2.5.5 **Water Storage Tanks**

Water storage tanks on private land are included in the footprint of the plant site and other facilities at the Pinto Valley Mine. Use of existing potable and emergency (fire) water storage tanks on National Forest System lands would continue under the no-action alternative.

The two water storage tanks on National Forest System lands were constructed within the footprint of the area previously authorized by the mining plan of operations for 19 Dump (POO-003). They are situated on unpatented claims near the 19 Dump: an 110,000-gallon, steel-walled, potable water tank and a 650,000-gallon, steel-walled fire and service water tank. Both tanks are above-ground installations resting on concrete foundations. Maintenance activities include periodic cleaning, painting, and replacing valves, piping, and lights.

2.2.5.6 **Storm Water Management**

Pinto Valley Mining Corp. has developed a storm water pollution prevention plan for all Pinto Valley Mine facility operations, on private and public lands, in accordance with the requirements of the Arizona Pollutant Discharge Elimination System storm water multi-sector general permit (Arizona Department of Environmental Quality 2019b). In general, Pinto Valley Mining Corp. designs and manages the majority of the storm water management system to contain the 100-year, 24-hour storm event, but some areas are designed and permitted to discharge during the 10-year, 24-hour storm event. In addition to coverage under the storm water multi-sector general permit, Pinto Valley Mining Corp. maintains coverage under an individual Arizona Pollutant Discharge Elimination System permit (#AZ0020401) for process water and storm water discharges that do not qualify for coverage under the storm water multi-sector general permit. Discharges from Arizona Pollutant Discharge Elimination System Outfall Nos. 004 and 005 and Seep MG2-8b are authorized under the individual Arizona Pollutant Discharge Elimination System permit and occur on National Forest System lands. The Arizona Pollutant Discharge Elimination System permit also requires ambient seep monitoring.

Pinto Valley Mining Corp. also applies an operations and maintenance manual for catchment ponds, reservoirs, and tailings storage facilities that identifies best management practices, maintenance, and inspection to manage and prevent the unauthorized discharge of storm water at the Pinto Valley Mine (Oracle Environmental 2016).

2.2.5.7 Wastewater Treatment

The wastewater treatment plant is located on private land and receives gravity-fed sewage via a pipeline system from most buildings in the main plant area. The wastewater treatment plant is a factory-built, Smith & Loveless Model 20-B-25Oxigest extended aeration-type sewage treatment plant that consists of primary and secondary treatment with a design capacity of 25,000 gallons of wastewater per day. The effluent is treated by injecting air into the receiving tank to increase the oxygen content of the incoming effluent and to provide agitation of the tank. Effluent is chlorinated and the treated water is stored in an onsite tank, and then returned to the process water circuit for reuse.

2.2.6 Monitoring and Inspection

Pinto Valley Mining Corp. conducts water sampling and monitoring in accordance with Pinto Valley Mining Corp.’s Aquifer Protection Permit (Arizona Department of Environmental Quality 2019c), Arizona Pollutant Discharge Elimination System Permit for discharges to surface water (Arizona Department of Environmental Quality 2019b), Pinto Valley Mining Corp.’s storm water multi-sector general permit for storm water (Arizona Department of Environmental Quality 2019b), and Safe Drinking Water Act requirements for potable water. In general, monitoring and inspection under State permits would persist during operations, closure, and post-closure.

Compliance monitoring and sampling at Pinto Valley Mine is performed by qualified personnel trained in water quality sampling methods. The field technicians perform well, spring, and seep sampling on the schedule required by applicable permits. Water levels are measured and water quality samples are collected from wells on a quarterly basis for analysis of the constituents as specified in the Aquifer Protection Permit. Site conditions and measurements of field parameters are noted on field forms for record keeping. Analysis of the samples is conducted according to quarterly and biennial requirements. The water quality samples are shipped for analysis to laboratories certified by the Arizona Department of Health Services.

In accordance with Pinto Valley Mining Corp.’s air quality permit with the Arizona Department of Environmental Quality, Pinto Valley Mining Corp. applies a visual observation plan that requires Pinto Valley Mining Corp. to conduct readings, testing, and visual observations of emissions from point sources, fugitive sources, and other equipment to determine opacity levels (HSEC 2013).

Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” for additional information on monitoring and mitigation responsibilities at the Pinto Valley Mine.

2.2.6.1 Groundwater Monitoring and Sampling

Pinto Valley Mining Corp. monitors 14 groundwater sample points per the requirements of the Aquifer Protection Permit. The sampling points include both point-of-compliance and alert-level monitoring points. The points of compliance consist of nine groundwater wells and two springs. At three locations, the point-of-compliance monitoring wells are in pairs, generally consisting of one shallow well and one deep well.

2.2.6.2 Water Level Measurements

Pinto Valley Mining Corp. also periodically measures water levels and prepares associated water level contour maps and hydrogeologic cross sections. The most recent measurements and maps were analyzed in June 2017 using water levels measured at 61 wells.

2.2.6.3 Discharge Monitoring

In accordance with the Aquifer Protection Permit, Pinto Valley Mining Corp. also conducts sampling of the Pinto Valley Mine wastewater treatment plant and associated effluent with sampling 4 out of every 7 days for fecal coliform. The discharge monitoring water quality samples are shipped for analysis to a laboratory licensed by the Arizona Department of Health Services.

2.2.6.4 Best Available Demonstrated Control Technology Monitoring

Pinto Valley Mining Corp. uses engineered controls and operational practices to comply with best available demonstrated control technology criteria as stipulated by the Arizona Department of Environmental Quality Aquifer Protection Permit program. A monitoring program specifically designed to monitor facility operation and best available demonstrated control technology performance is included in table 4.1-3 of the Aquifer Protection Permit (Arizona Department of Environmental Quality 2018). The monitoring program includes, but is not limited to, the Gold Gulch drainage and Pregnant Leach Solution Pond facilities; the monitoring ponds and catchment basins; the Raffinate Pond; storm water diversion and catchment systems; tailings impoundments; waste rock dumps; storm water run-on and runoff control features and berms; point-of-compliance and alert-level wells; and storage facility operational features such as freeboard, liner integrity, berm integrity, bank storage, Solid Waste Landfill, and wastewater treatment plant. The monitoring program consists of inspecting all permitted operational facilities at intervals (daily, weekly, monthly, quarterly, and annually), plus after significant storm events. Logbooks and recordkeeping forms documenting the results of the routine inspections are maintained by Pinto Valley Mining Corp.

Four tailings impoundments at Pinto Valley Mine are listed in the Aquifer Protection Permit: Tailings Storage Facility No. 1, Tailings Storage Facility No. 2, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4. The historic Cottonwood Tailings Impoundment, which was closed prior to the initiation of the Aquifer Protection Permit program, is not included in the Aquifer Protection Permit. Pinto Valley Mining Corp. personnel routinely inspect all tailings impoundments on site, and the inactive and active tailings impoundments are included in the monitoring and observation program conducted by the engineer of record. All electric, open-well, vibrating wire and pneumatic piezometers are read by Pinto Valley Mine personnel or the engineer of record on a monthly or bi-monthly basis.

2.2.6.5 Open Pit Stability Monitoring

Pinto Valley Mining Corp. currently uses multiple methods to monitor stability of the Open Pit, including:

- Daily visual inspections by operators and engineering staff
- Extensometers
- Piezometers
- Lidar scanning
- Robotic total station prism monitoring
- Highwall mapping
- Slope stability radar monitoring

2.2.6.6 **Tailings Storage Facility Monitoring and Inspection**

Pinto Valley Mining Corp. conducts periodic tailings deposition modeling at Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. No tailings deposition is occurring at Tailings Storage Facility No. 1, Tailings Storage Facility No. 2, or the Cottonwood Tailings Impoundment; these areas are not periodically modeled for tailings deposition.

Pinto Valley Mining Corp. maintains a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). The tailings operation, maintenance, and surveillance manual would be maintained and applied during operations, closure, and post-closure. Pinto Valley Mining Corp. conducts daily inspections at these facilities including inspection of embankments, impoundments, storm water controls, pumps and piping, cyclone operation, and discharge. Abnormal conditions identified during daily inspections are reported and addressed as quickly as possible. In addition to daily inspections, Pinto Valley Mining Corp. regularly monitors tailings storage facilities for loss of freeboard and insufficient beach distance. Pinto Valley Mining Corp. also increases inspections and surveillance of Tailings Storage Facilities No. 3 and No. 4 in the event of floods, earthquakes, and other unusual conditions (such as observed cracks, abnormally high piezometric levels in the embankments, and damage to any component of the tailings storage facility).

Annual inspections of Cottonwood Tailings Impoundment and Tailing Storage Facility No. 1/2 are conducted by the engineer of record, as well as by Pinto Valley Mining Corp. Inspections also occur following rainfall events.

2.2.6.7 **Waste Rock Monitoring and Characterization**

The Aquifer Protection Permit (Arizona Department of Environmental Quality 2019a) requires regular quarterly monitoring and characterization inspections of the waste rock dumps. The following waste rock dumps are included in Pinto Valley Mining Corp.'s current quarterly inspection checklists; however, only active waste rock dumps are formally inspected.

- 19 Dump (active and inspected)
- 19 Extension Dump (potential future, would be inspected once active)
- 19.1 Dump (inactive, typically not inspected)
- Castle Dome Marginal Dump (active and inspected)
- Main Dump (active and inspected)
- North Barn Marginal Dump (potential future, would be inspected once active)
- Northside 9.11 (inactive, typically not inspected)

- Northside Dump 9.1 (inactive, typically not inspected)
- Northside Dump 9.12 (inactive, typically not inspected)
- Northside Dump 9.3 (inactive, typically not inspected)
- Southside Dump 13 (inactive, typically not inspected)
- Southside Dump 14 (inactive, typically not inspected)
- West Dump (potential future, would be inspected once active)

2.2.6.8 Storm Water Control Features and Berm Inspections

Periodic inspections are conducted of storm water run-on and runoff control features and berms. Facility inspectors typically look for signs that no visible erosion or other damage had occurred that may affect berm integrity or stability. These inspections are generally conducted monthly and after significant storm or natural disaster events. In general, inspection of storm water runoff and control features would occur during operations, closure, and post-closure.

2.2.7 Support Facilities

2.2.7.1 Plant Site

The plant site includes heavy equipment and light vehicle maintenance shops, warehouses, laydown yards, storage and fueling facilities, a drilling core storage building, administrative offices, locker rooms, and parking lots. Upon closure, removal, and reclamation of the plant facilities, inert bedrock materials consisting of the Gila Conglomerate formation would be excavated from this area for use as borrow materials for reclamation of other mine facilities.

2.2.7.2 Pinto Valley Mine Sign, Fencing, and Security

The existing Pinto Valley Mine sign was previously authorized on National Forest System lands under special use permit GLO-445301. The sign is a non-illuminated company identification sign that is 16 feet long, 8 feet high, and 2 feet wide. Pinto Valley Mining Corp. uses earthen berms, natural terrain, and lockable gates at access points along National Forest System Road 287.

Security staff are on site 24 hours per day, 365 days per year. The main entrance is staffed at all times. Security personnel receive extensive training, conduct roving inspections, and are in constant communication with operations personnel. They are responsible for dispatching first responders and contacting local ambulance, fire, and law enforcement officials as needed.

2.2.8 Sanitary and Solid Waste Disposal

Sanitary and solid waste are managed on private Pinto Valley Mining Corp. property; no sanitary or solid waste is disposed of on National Forest System lands by Pinto Valley Mining Corp. Sewage from most buildings in the main plant area is delivered by gravity feed to the onsite wastewater treatment plant via a subgrade pipeline system.

In the past, nonhazardous solid wastes have been disposed of in the existing Solid Waste Landfill located within the footprint of the Northside Dump 9.3 in an unlined facility under Disposal General Permit: Non-Municipal Solid Waste Landfills at Mining Operations (Arizona Administrative Code R18-13-802). However, nonhazardous solid wastes are currently disposed of off site and not at the existing Solid Waste Landfill on site. A variety of spent products are produced at Pinto Valley Mine through the standard course of mining. Many materials such as flotation reagents are reclaimed. Crusher liners, mill liners, used oil, scrap metal, batteries, light bulbs, and many other items are recycled. Wastes such as filter press media are managed as non-hazardous special wastes. Office trash and general plant trash is disposed of in permitted municipal solid waste landfills. Most recyclable and waste products are transported off site by medium-duty vehicles (service trucks) and large transports (semi-trucks or larger).

2.2.9 Hazardous Materials and Waste Management

2.2.9.1 Reagent Transportation and Storage

All industrial products used at Pinto Valley Mine are delivered using National Forest System Road 287 from U.S. Highway 60 to the mine entrance, and then to the point of use such as the plant site or the Solvent Extraction and Electrowinning Plant. Pinto Valley Mining Corp. maintains and annually updates an inventory of all hazardous materials used at Pinto Valley Mine. Contractors deliver sulfuric acid to the site for use in the leach process in 6,000-gallon tanker trucks. Contractors also deliver diesel fuel, gasoline, and numerous other products used in the mining and the milling processes.

2.2.9.2 Spill Prevention and Emergency Response

Pinto Valley Mining Corp. maintains a spill prevention, control, and countermeasures plan to address spills of petroleum-based products. The spill prevention, control, and countermeasures plan is a “living document” that is updated continually to reflect current Pinto Valley Mining Corp. management of petroleum and non-petroleum products.

Equipment using fuels and lubricants is inspected and maintained on a regular basis to ensure that leaks and spills are avoided. Spill containment kits are readily available to use in the event of an emergency. Pinto Valley Mining Corp. personnel are trained to recognize, contain, clean up, and report spills of hazardous materials, hazardous wastes, and petroleum products. Spills on National Forest System lands that exceed Forest Service–imposed reporting thresholds would be reported as directed.

2.2.9.3 Hazardous Materials and Waste Management

Hazardous materials and hazardous wastes are managed on Pinto Valley Mining Corp. private property; no hazardous materials or hazardous wastes are stored or disposed of on National Forest System lands by Pinto Valley Mining Corp. Certain regulated materials, such as petroleum-based fuels and lubricants, are used in Pinto Valley Mining Corp. mobile and stationary equipment.

Waste rock and tailings are exempted from solid waste management regulations. With the exception of petroleum products for powering, lubricating, or cooling motor vehicles or transformers, no regulated, hazardous, or toxic substances are used on National Forest System lands.

Pinto Valley Mining Corp. uses a number of sealed sources of radioactive materials in various industrial applications such as gauges and x-ray analyzers in accordance with permitted uses (see table 1-2). No radioactive materials are used on National Forest System lands.

2.2.10 Safety and Fire Protection

Pinto Valley Mining Corp. employs standard operating procedures for safety under the current blasting program, which includes implementation of a Forest Service closure order that prohibits members of the public from entering areas abutting the eastern portion of the mine in the blast radius. This closure order was implemented from May 2017 through May 2019 and has been renewed starting in June 2020 (Forest Service 2020a). Pinto Valley Mining Corp. also implements personnel exclusion zones near blasting sites and posts signage to prevent impacts from blasting on mine workers and the public.

A 650,000-gallon emergency water storage tank for fire suppression is located within the authorization area for the 19 Dump. The fire and service water tank is engineered so that service water is only extracted from the upper half of the tank, always leaving the lower half in reserve for emergency fire suppression.

Pinto Valley Mining Corp. has developed and maintains an emergency action plan intended to help responsible officials protect lives and reduce property damage in the event of flooding caused by failure of a tailings storage facility (Wood 2019a). The emergency action plan is intended to interface with the emergency operations plans, warning and evacuation plans, and annexes of other local, county, and State jurisdictions to ensure that response actions will be effectively implemented.

2.2.11 Exploration Activities

Pinto Valley Mining Corp. occasionally conducts exploration on private lands. Non-intrusive geophysical techniques such as seismic reflection, seismic refraction, or magnetotelluric surveys are commonly conducted in the first phase of exploration. Confirmatory drilling campaigns that may follow involve significantly greater planning and cost.

2.2.12 Workforce, Vehicle Trips, and Schedule

2.2.12.1 Workforce

Pinto Valley Mining Corp. maintains a work force of up to 690[6] employees at the Pinto Valley Mine. The mine normally operates 24 hours per day, 365 days per year. Security staff is also on site 24 hours per day, 365 days per year.

2.2.12.2 Vehicle Trips

Table 2-3 identifies the estimated number of annual mine-related vehicle roundtrips associated with existing operations at the Pinto Valley Mine.

Table 2-3. Pinto Valley Mine estimated average annual mine-related vehicle roundtrips for existing operations

Phase	Type 1 Vehicles	Type 2 Vehicles	Type 3 Vehicles	Total per Phase	Areas Closed/Reclaimed During Period
Mine Operation[7]	165,260	11,315	14,965	191,540	None

Notes:
Type 1 Vehicle = light duty (such as pickup trucks, personal vehicles, small service trucks)
Type 2 Vehicle = medium duty (such as vacuum trucks, medium-duty service trucks)
Type 3 vehicle = large transports (semi-trucks or larger)

[6] The number of reported employees reflects estimated full-time-equivalent jobs including Pinto Valley Mine salaried employees, hourly workers, and contractor staff. Staffing levels can vary over time based on time of year, project phase, and other factors.
[7] Mine-related vehicle roundtrips during operations assumes roundtrip travel by 557 salaried employees 5 days a week combined with 42,720 annual vehicle roundtrips by 133 contractors and part-time employees (estimated by Pinto Valley Mining Corp.).

2.2.13 Reclamation and Closure

Reclamation activities on private land are conducted in accordance with the Pinto Valley Mine Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a) and the Pinto Valley Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a).

2.3 Alternatives Considered in Detail

2.3.1 No-Action Alternative

The no-action alternative provides a baseline for comparison of the environmental consequences of alternative 1 and the proposed action. The no-action alternative was adjusted after the release of the draft EIS based on the Forest Service's consideration of public and agency comments on the draft EIS and further review of the authorizations and permits for the Pinto Valley Mine. The former no-action alternative from the draft EIS is now identified as alternative 1 as described in section 2.3.2, "Alternative 1 – Authorization of Existing Uses of National Forest System Lands."

The Forest Service's review and approval of mining operations on National Forest System lands are governed by the General Mining Law of 1872 as amended, the Organic Administration Act of 1897, and the 1955 Surface Resources Act, among other statutory authorities. In addition, 36 CFR 228, subpart A sets forth the rules through which use of the surface of National Forest System lands in connection with operations authorized by the Federal mining laws shall be conducted so as to minimize adverse environmental impacts on National Forest System lands' surface resources. The Forest Service cannot impose unreasonable regulations on mining activities and cannot impermissibly encroach on legitimate uses incident to mining and millsite claims under the General Mining Law of 1872.

Under the no-action alternative, the Forest Service would not authorize use of National Forest System lands for the Pinto Valley Mine except those activities necessary for mine closure and reclamation in accordance with Federal and State requirements. The expired or nontransferable rights-of-way and special use permits on National Forest System lands would not be authorized (see table 1-1 in chapter 1 of the final EIS). The no-action alternative assumes that on the date the final record of decision for Pinto Valley Mine's proposed mining plan of operations is issued, the use of previous authorizations would be limited to those activities required to initiate shutdown of mine operations, transition to reclamation and closure, and conduct ongoing reclamation and post-closure care and maintenance. Under the no-action alternative, reclamation and closure of facilities on both National Forest System lands and private lands would need to commence as the primary water supply pipelines and electrical lines to the mine are on National Forest System lands and they could no longer be utilized for mining operations. There are no alternative delivery systems for water or electricity on private land, which are necessary to operate the mine due to the status of the property as an inholding (see map 2-1 in appendix A of the final EIS).

The no-action alternative includes the following:

- The Forest Service would allow the temporary continued use of existing facilities on National Forest System lands that are necessary to ensure proper closure and reclamation (such as water pipelines and transmission lines) until the Forest Service determines reclamation is complete and releases the reclamation bond.
- Following the record of decision, all activities and operations at the Pinto Valley Mine would begin transitioning to closure and reclamation. Based on information from Pinto Valley Mining Corp., the Forest Service assumes that it would take approximately 6 months to transition the

mine from active production to beginning closure and reclamation. The 6-month transition period would include two phases: phase 1 is estimated to last approximately 2 months and would include active mining and tailings deposition, and phase 2 is estimated to last approximately 4 months and would include preparing the mine for closure and reclamation. The following activities would take place during the 6-month transition period:

- Active mining of sulfide ore and overburden (waste rock) would cease as soon as active mining faces can be stabilized and readied for closure and reclamation.
- Waste rock dumps, leach piles, and stockpiles would be assessed for capacity, conformance with end-of-mine-life stability, topographic characteristics, and drainage profiles.
- Milling and tailings deposition would cease as soon as stockpiled sulfide ore is exhausted. Boundary dam construction at tailings storage facilities would cease concurrently with cessation of tailing deposition. Tailings storage facilities would be assessed for capacity, conformance with end-of-mine-life stability, topographic characteristics, and drainage profiles.
- Closure plans would be drafted and submitted to the Arizona Department of Environmental Quality for closure of all discharging facilities covered under the Aquifer Protection Permit. The 2016 Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) would be updated to conform with the site closure and infrastructure removal in accordance with Arizona State Mine Inspector requirements. Pinto Valley Mining Corp. would be required to update and complete a reclamation plan for disturbance on National Forest System lands.
- Pipelines, power lines, roads, and the Solvent Extraction and Electrowinning Plant would be inventoried, and salvage agreements would be drafted for infrastructure removal and reclamation.
- Ponds and reservoirs would be surveyed, sludge would be inventoried, and plans would be prepared for breach or in-place closure.
- Pregnant Leach Solution conveyance and pumping systems would be designed to pump to the Open Pit.
- Workforce reductions for Pinto Valley Mining Corp. would commence with an immediate hiring freeze and notification of impending layoffs in conformance with the Worker Adjustment and Retraining Notification Act. Nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities would be laid off first.

- Existing encroachments and formerly authorized uses on National Forest System lands that are not necessary for orderly closure and reclamation would be decommissioned and reclaimed after the 6-month transition period.
- The Peak Well field would supply water needed during the 2 months of active mining operations. After that, sufficient water (up to 300 gallons per minute) of water for dust control during reclamation and closure would be sourced from select wells at the toe of Tailings Storage Facility No. 4, or from the reclaim water pond on Tailings Storage Facility No. 4.
- Cessation of active mining operations at the Pinto Valley Mine within 6 months of the record of decision would require construction of (1) a robust Pregnant Leach Solution pumping and conveyance system from Gold Gulch 1A to the Open Pit, (2) power lines and pumping infrastructure to convey collected seepage from draindown of the Pregnant Leach Solution to

the Open Pit, and (3) perpetual maintenance of a decant pond pumping system and pipeline from the tailings storage facilities to the Open Pit.

- Tailings Storage Facility No. 4 would continue to be used for tailings deposition during the first 2 months of the transition period, resulting in an estimated 10 acres of additional disturbance on private land (map 2-1 in appendix A). There would be no other planned expansion of the Open Pit or tailings storage facilities onto National Forest System lands.
- Any new roads, pipelines, or other infrastructure needed for closure or reclamation would be placed in areas of existing disturbance or in existing corridors.
- Materials needed for reclamation would be sourced from private land and could include excavation of borrow and riprap material from up to 601 acres, including 244 acres in areas of existing disturbance and 357 acres of new disturbance.

The no-action alternative could result in up to 367 acres of new surface disturbance on private land associated with 10 acres of lateral expansion of Tailings Storage Facility No. 4 during the 2-month active mining period and 357 acres of new surface disturbance associated with excavation of borrow and riprap sources during reclamation. Table 2-4 presents the approximate acreage of existing disturbance, additional disturbance under the no-action alternative, and the total disturbance.

Table 2-4. Estimated surface disturbance for the no-action alternative

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Mining									
Open Pit	746	9	754	-	-	-	746	9	754
Inert Limestone Stockpile	7	-	7	-	-	-	7	-	7
Main Dump	96	-	96	-	-	-	96	-	96
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	-	-	-	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	-	-	-	25	-	25
West Dump	-	-	0	-	-	-	-	-	-
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	601[8]	-	601	623	-	623
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*601*	-	*601*	*1,635*	*84*	*1,719*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1 & 2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	-	-	-	264	-	270
Tailings Storage Facility No. 4	704	-	704	10	-	10	714	-	714
Leach Piles	654	-	654	-	-	-	654	-	654
Pregnant Leach Solution Pond/ancillary facilities	19	-	19	-	-	-	19	-	19
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	10	-	10	*2,243*	*293*	*2,536*

[8] The 601 acres of surface disturbance for borrow and riprap sources encompass 244 acres in areas that overlap existing disturbance areas and 357 acres of new surface disturbance.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
***Transportation*[9]**									
National Forest System Roads	18	81	99	-	-	-	18	81	99
Access Roads	3	44	47	-	-	-	3	44	47
Subtotal, Transportation Facilities	*21*	*124*	*145*	-	-	-	*21*	*124*	*145*
Utilities									
Electrical Power Lines[10]	37	20	57	-	-	-	37	20	57
***Water Supply, Distribution, Use, and Treatment*[11]**									
Peak Wells[12]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[13]	2	10	11	-	-	-	2	10	11
Water Pipelines (Surface)[14]	26	20	46	-	-	-	26	20	46
Ponds and Reservoirs[15]	55	41	96	-	-	-	55	41	96
Water Storage Tanks[16]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	-	-	-	*86*	*72*	*158*
TOTAL	**3,349**	**566**	**3,915**	**367**	**0**	**367**	**3,717**	**566**	**4,283**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this final EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of "existing disturbance" in this final EIS are close approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

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[9] Disturbance for National Forest System roads and access roads was calculated based on an assumed disturbance width of 25 feet. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[10] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[11] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[12] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[13] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[14] Ibid.

[15] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[16] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

2.3.1.1 Mining Facilities

2.3.1.1.1 Open Pit

Under the no-action alternative, active mining of sulfide ore and overburden would cease as soon as active mining faces can be stabilized and readied for closure and reclamation, which is estimated to be approximately 2 months after issuance of the record of decision. There would be no further lateral expansion of the Open Pit during the 2 months of active mining, but continued processing of available materials would yield an estimated 58,000 tons of ore and 82,000 tons of waste rock per day, yielding an estimated cumulative total of 3,480,000 tons of ore and 4,920,000 tons of waste rock during 2 months of active mining operations. The anticipated pit bottom elevation at the end of active mining operations is estimated to be approximately the same as existing conditions at approximately 2,600 feet above mean sea level.

Use of areas where placement of existing mining facilities associated with the Open Pit have encroached on National Forest System lands would continue during the 6-month transition period. After the 6-month transition period, facilities within encroachment areas would be reclaimed.

Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize and prepare the mine for closure and reclamation, Pinto Valley Mining Corp. anticipates that few blasting events would occur and would employ the same standards and practices as the current blasting program.

2.3.1.1.2 Inert Limestone Stockpile

There is no anticipated use of National Forest System lands for the Inert Limestone Stockpile under the no-action alternative. The stockpiles would be assessed for capacity, conformance with end-of-mine-life stability, topic characteristics, and drainage profiles. The Inert Limestone Stockpile would remain close to its current (2020) top elevation of approximately 4,875 feet above mean sea level.

2.3.1.1.3 Waste Rock Dumps

Under the no-action alternative, additional dumps would not be constructed. Waste rock yielded from 2 months of active mining operations would be placed in the Main Dump unless needed to shape or stabilize slopes of the Castle Dome Marginal Dump. The footprints and top elevations of the waste rock dumps would remain the same as under existing operations described in section 2.2, “Existing Operations at the Pinto Valley Mine.”

Main Dump

Under the no-action alternative, there would be no further expansion of the Main Dump and conditions would remain the same as described under existing operations in section 2.2, “Existing Operations at the Pinto Valley Mine.”

Castle Dome Marginal Dump

Under the no-action alternative, construction of the Castle Dome Marginal Dump would cease and there would be no further expansion of the dump.

North Barn Marginal Dump

Although the North Barn Marginal Dump is a permitted, planned facility as described in section 2.2, "Existing Operations at the Pinto Valley Mine," it would not be constructed under the no-action alternative.

Northside Dumps 9.1, 9.11, 9.12, and 9.3

Under the no-action alternative, there would be no change to the northside dumps compared to the existing operations described in section 2.2, "Existing Operations at the Pinto Valley Mine."

Southside Dumps 13 and 14

Under the no-action alternative, there would be no change to the southside dumps, and both would remain inactive as described in section 2.2, "Existing Operations at the Pinto Valley Mine."

19.1 Dump

The 19.1 Dump would remain inactive under the no-action alternative as described in section 2.2, "Existing Operations at the Pinto Valley Mine."

19 Dump

The 19 Dump would remain inactive under the no-action alternative as described in section 2.2, "Existing Operations at the Pinto Valley Mine." Pinto Valley Mining Corp. has no plans to add more material to the 19 Dump under the no-action alternative. However, a portion of the stored overburden would likely be used as borrow and riprap sources and removed for use as cover material to reclaim certain features at the end of the mine life as described in detail in the Mined Land Reclamation Plan. The area of the dump where the material would be removed would be regraded, with no net change to the facility's footprint or top elevation.

19 Extension Dump

The 19 Extension Dump would remain permitted with the State of Arizona but would not be built under the no-action alternative.

2.3.1.1.4 Borrow and Riprap Sources

Pinto Valley Mining Corp. has identified up to 601 additional acres of private lands that could be used as future borrow and riprap sources under the no-action alternative, including 244 acres in areas of existing disturbance and 357 acres of new disturbance areas. There would be no use of National Forest System lands for borrow and riprap for the no-action alternative. Excavators, loaders, and haul trucks would be used to transport borrow and riprap materials during reclamation activities. Existing haul and access roads would be used to the extent possible; short access roads from existing roads to the source locations may be necessary.

2.3.1.2 **Milling and Processing**

2.3.1.2.1 Mill and Concentrator

Use of the existing mill, concentrator, and ancillary facilities described in section 2.2, "Existing Operations at the Pinto Valley Mine," is anticipated to continue for approximately 2 months under the no-action alternative. Pinto Valley Mine could produce an estimated cumulative total of 21,024,658 pounds of copper concentrate and 205,480 pounds of molybdenum during the 2 months of operations.

2.3.1.2.2 Cottonwood Tailings Impoundment

Under the no-action alternative, the Cottonwood Tailings Impoundment would remain generally inactive with no anticipated changes in facility footprint or top elevation. Ongoing and routine maintenance for reclamation and closure of this facility would continue and could include regrading and covering the embankment face and recontouring portions of the surface to direct storm water off the facility. The outfall at the southeastern corner of the Cottonwood Tailings Impoundment is expected to continue indefinitely. Water discharging from this outfall currently meets water quality standards and is expected to do so in the future. Depending upon the ultimate configuration of the final storm water management system, flow from the outfall (currently about 7 to 8 gallons per minute) may be reduced or increased at closure. The reclamation plan for National Forest System lands will address long-term maintenance and monitoring for the Cottonwood Tailings Impoundment (such as reclamation objectives and revegetation).

2.3.1.2.3 Tailings Storage Facility No. 1/2

Under the no-action alternative, Tailings Storage Facility No. 1/2 would remain inactive as described in section 2.2, "Existing Operations at the Pinto Valley Mine."

2.3.1.2.4 Tailings Storage Facility No. 3

There would be no expansion of Tailings Storage Facility No. 3 under the no-action alternative. The construction of boundary dams at Tailings Storage Facility No. 3 would cease unless additional freeboard is necessary for closure. The elevation of Tailings Storage Facility No. 3 at the end of active mining operations would be the same as under existing conditions, approximately 3,785 feet above mean sea level.

2.3.1.2.5 Tailings Storage Facility No. 4

Pinto Valley Mining Corp. would continue to deposit tailings in Tailings Storage Facility No. 4 during the first 2 months of the 6-month transition period until milling activities cease, resulting in an estimated lateral expansion of 10 acres on private land. The construction of boundary dams at Tailings Storage Facility No. 4 would cease immediately under the no-action alternative. At the end of active mining operations, the top elevation of Tailings Storage Facility No. 4 would be approximately 3,958 feet above mean sea level, approximately 13 feet taller than under existing conditions. The toe to top height of the Tailings Storage Facility No. 4 tailings dam would be 885 feet.

2.3.1.2.6 Leach Piles

During the 6-month transition period under the no-action alternative, the active leaching operation on private land would be terminated.

2.3.1.2.7 Pregnant Leach Solution Ponds and Ancillary Facilities

During the 6-month transition period of the no-action alternative, the Pregnant Leach Solution Ponds would continue to be used for leaching operations. At the end of the 6-month transition period, decommissioning of the leach circuit and the Solvent Extraction and Electrowinning Plant would necessitate the construction of a Pregnant Leach Solution pumping and conveyance system from Gold Gulch 1A to the Open Pit. Any pipelines or other infrastructure associated with this conveyance system would be located in areas of existing disturbance.

2.3.1.2.8 Solvent Extraction and Electrowinning Plant

During the 6-month transition period, operation of the Solvent Extraction and Electrowinning Plant would gradually wind down. Leach solutions will be diverted away from the Solvent Extraction Plant to the Raffinate Pond. Copper in the electrolyte solution will be plated until no longer feasible. Final cathode copper will be pulled from the electrolyte cells and sold. Pinto Valley Mining Corp. will investigate potential customers for the sale of the electrolyte and organic solutions.

2.3.1.3 **Roads**

2.3.1.3.1 National Forest System Roads

Pinto Valley Mining Corp.'s existing use of approximately 29.8 miles of National Forest System roads (see map 3-16 in appendix A) would continue during the first 2 months of continued operations, then begin to decrease over the remainder of the 6-month transition period. With the exception of National Forest System Road 287 (12.0 miles), which Pinto Valley Mining Corp. would continue to use during the post-closure period, use of the remaining National Forest System roads is expected to cease within 24 months (12.4 miles) or 36 months (5.3 miles) of mine closure (Capstone Mining Corp. 2020b).

Pinto Valley Mining Corp.'s authorized commercial use and maintenance of the paved portion of National Forest System Road 287 will be in compliance with applicable portions of Forest Service Manual 7730, "Transportation System Operation and Maintenance," and Forest Service Handbook 7709.59, "Road System Operations and Maintenance Handbook," chapter 20, "Traffic Management." Final alignment of National Forest System Road 287 would be coordinated between the Forest Service and Pinto Valley Mining Corp. after mine closure to ensure continued thoroughfare.

2.3.1.3.2 Access Roads

Under the no-action alternative, Pinto Valley Mining Corp.'s existing use of approximately 15.2 miles of access roads on National Forest System lands (see map 3-16 in appendix A) would continue during the first 2 months of continued operations, then begin to decrease over the remainder of the 6-month transition period. Pinto Valley Mining Corp. anticipates that use of all access roads on National Forest System lands would cease within 24 months (10.6 miles) or 36 months (4.6 miles) of mine closure (Capstone Mining Corp. 2020b).

All roads on National Forest System lands not identified as part of the official transportation network as determined by the Tonto National Forest Motorized Travel Management Plan Record of Decision would be decommissioned within 36 months of mine closure unless otherwise approved by the Forest Service at the time of mine closure. Reclamation would be conducted in accordance with the reclamation plan for National Forest System lands and include ripping and revegetating with a native seed mix or plantings and recontouring to pre-disturbance conditions and elevations. Storm water best management practices such as water bars, culverts, and erosion-control features would be removed as necessary and as specified by the Forest Service.

2.3.1.3.3 Dust Control

Under the no-action alternative, dust control would be the same as described in section 2.2, "Existing Operations at the Pinto Valley Mine."

2.3.1.4 Utilities

2.3.1.4.1 Electrical Power Lines

In general, Pinto Valley Mining Corp. would continue to use electrical power lines during the 6-month transition period and use of power lines would also continue for necessary facilities during reclamation, closure, and post-closure. Following the 6-month transition period, nonessential power lines on National Forest System lands would be decommissioned and reclaimed. In general, Pinto Valley Mining Corp. would decommission and begin reclamation on electric distribution lines not required for closure and post-closure activities within 24 months of mine closure.

Premature decommissioning of the leach circuit (before the Leach Piles have fully drained) and Solvent Extraction and Electrowinning Plant would necessitate construction of a robust Pregnant Leach Solution pumping and conveyance system from Gold Gulch 1A to the Open Pit, requiring distribution lines and power. Tailings seepage ponds at the toes of Tailings Storage Facilities Nos. 1, 2, 3, and 4 would require power lines to power water pumps to convey collected seepage to the Open Pit. Any new power lines would be placed in areas of existing disturbance and there would be no new surface disturbance.

2.3.1.4.2 Lighting

Use of existing lighting would continue during the 2 months of active operations under the no-action alternative. Pinto Valley Mining Corp. has not yet determined whether closure activities would be conducted at night and therefore require nighttime lighting, but in either case, lighting would decrease substantially as the mine transitions to reclamation and closure activities because lighting would no longer be needed to support active mining operations and there would be fewer vehicles traveling to and within Pinto Valley Mine. Pinto Valley Mining Corp. does not anticipate the need for lighting during the post-closure period unless required for essential security purposes.

2.3.1.5 Water Supply, Distribution, Use, and Treatment

Consumptive water use during the 2 months of active mining operations would be the same as under existing operations as described in section 2.2, "Existing Operations at the Pinto Valley Mine." These use rates would consume an estimated 2,578 acre-feet of water (including 417 acre-feet of fresh water from the Peak Well field and 2,161 acre-feet of reclaimed water from various sources) during 2 months of active mine operations. This level of water use would gradually decrease toward the end of the 6-month transition period as the mine is transitioned from active operations to reclamation and closure. In general, pipelines would continue to be used during the 6-month transition period. Following the 6-month transition period, nonessential pipelines would be decommissioned and reclaimed.

Decommissioning of the leach circuit and Solvent Extraction and Electrowinning plant at the end of the 6-month transition period and before the Leach Piles have fully drained would necessitate construction of a robust Pregnant Leach Solution pumping and conveyance system from Gold Gulch 1A to the Open Pit. Tailings seepage ponds at the toes of Tailings Storage Facilities Nos. 1, 3, and 4 would require pipelines to convey collected seepage to the Open Pit. In addition, Tailings Storage Facility No. 4 would require installation of a pipeline to route reclaimed water to the Open Pit. Any new pipelines would be placed in areas of existing disturbance and there would be no new surface disturbance.

2.3.1.5.1 Peak Well Field (West Water System)

Use of existing active Peak Wells on private land and National Forest System lands would continue to supply water for the Pinto Valley Mine during the 2 months of active mining operations under the no-action alternative. In addition, Peak Well 37 would continue to be used for potable water during reclamation and closure. Following the 2 months of active mining operations, sufficient water for closure and reclamation would be available from dewatering of the Open Pit or reclaimed water from Tailings Storage Facility No. 4.

Table 2-2 presents estimated water use consumption under the no-action alternative during the 6-month transition period. Table 2-4 presents the estimated surface disturbance associated with the Peak Well field and map 2-1 in appendix A depicts the location of the Peak Well field.

Two water pipeline segments extending southeast from Peak Well 21 along National Forest System Road 2500 and National Forest System Road 2501 and south along National Forest System Road 312 near Peak Well 14 are no longer in use and would be removed regardless of which alternative is selected. The first segment of abandoned pipeline proposed for removal consists of a 4,850-foot-long, 12-inch-diameter, carbon steel pipe that extends from Peak Well 21 to the southeast. The segment of abandoned pipeline proposed for removal near Peak Well 14 consists of a 3,000-foot-long, 12-inch-diameter, carbon steel pipe. All removal activities would occur within a narrow path (fewer than 12 feet wide) along the pipeline. The pipe would be field cut to lengths that allow for safe extraction and minimal disturbance to surrounding ground and vegetation. Where possible, the pipe lengths would be hoisted by boom truck or other means and loaded onto a flatbed to be secured for transport. Where necessary, the pipe lengths would be winched or dragged to the nearest access point where they can be hoisted and placed on a flatbed truck or trailer for transport. The removed carbon steel pipelines would be recycled as scrap metal. Following removal, any disturbed areas on private land would be reclaimed as described in Pinto Valley Mining Corp.'s Mined Land Reclamation Plan and disturbance on National Forest System lands would be removed and reclaimed in accordance with the reclamation plan for National Forest System lands.

2.3.1.5.2 Burch Pipeline System (East Water System)

Under the no-action alternative, the Burch pipeline would continue to supply water to the Pinto Valley Mine from the east water system at the rates described in table 2-2. Pinto Valley Mine would decommission and begin reclamation on the Burch pipeline within 36 months of mine closure.

2.3.1.5.3 Other Water Pipelines

Use of existing active water pipelines on private land and National Forest System lands described in section 2.2, "Existing Operations at the Pinto Valley Mine," would continue under the no-action alternative. In general, Pinto Valley Mining Corp. would decommission and begin reclamation on pipelines not required for closure and post-closure within 36 months of mine closure.

2.3.1.5.4 Ponds and Reservoirs

Use of existing water supply reservoirs, storm water management ponds, and seepage collection ponds on private lands and National Forest System lands described in section 2.2, "Existing Operations at the Pinto Valley Mine," would continue during the 6-month transition period under the no-action alternative. Pinto Valley Mining Corp. would continue to use and be responsible for the maintenance of Cottonwood Reservoir and the associated equipment and infrastructure under the no-action alternative.

2.3.1.5.5 Water Storage Tanks

Use of existing potable and emergency (fire) water storage tanks on National Forest System lands described in section 2.2, "Existing Operations at the Pinto Valley Mine," would continue during active mining operations and reclamation and closure under the no-action alternative.

2.3.1.5.6 Storm Water Management

Storm water would continue to be managed in accordance with the storm water pollution prevention plan and storm water multi-sector general permit (and any future revisions) under the no-action alternative. Discharges from Arizona Pollutant Discharge Elimination System Outfall Nos. 004 and 005 and Seep MG2-8b would continue under the no-action alternative and would be authorized under the individual Arizona Pollutant Discharge Elimination System permit. Arizona Pollutant Discharge Elimination System Outfall No. 005 would need to continue to operate during reclamation, closure, and post-closure as discharge may continue during all project phases. The storm water pollution prevention plan would be revised during the closure period for consistency with the storm water management system described in the final reclamation plan.

2.3.1.5.7 Wastewater Treatment

Use of the existing wastewater treatment plant on private land would continue under the no-action alternative. The wastewater treatment plant would be decommissioned and reclaimed when no longer needed in accordance with the Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a).

2.3.1.6 **Monitoring and Inspection**

Monitoring and inspection procedures for project facilities would be the same as described in section 2.2.6, “Existing Operations – Monitoring and Inspection.” Monitoring and inspection would generally continue during operations, closure, and post-closure.

Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” for additional information on monitoring and mitigation responsibilities.

2.3.1.7 **Support Facilities**

2.3.1.7.1 Plant Site

Use of the existing administration and maintenance building on private land at the plant site, which is close to the mill and concentrator, would continue under the no-action alternative. There would be no use of National Forest System lands for the plant site.

The plant site includes heavy equipment and light vehicle maintenance shops, warehouses, laydown yards, storage and fueling facilities, a drilling core storage building, administrative offices, locker rooms, and parking lots. Upon closure, removal, and reclamation of the plant facilities, inert bedrock materials consisting of the Gila Conglomerate formation would be excavated from this area for use as borrow materials for reclamation of other mine facilities.

2.3.1.7.2 Pinto Valley Mine Sign, Fencing, and Security

Pinto Valley Mining Corp. intends to continue to use the non-illuminated Pinto Valley Mine identification sign throughout active mining operations. The Pinto Valley Mine sign would be removed and the location would be reclaimed following the 6-month transition period under the no-action alternative.

A security fence and access road would be installed on Pinto Valley Mining Corp. private property around the Open Pit during final reclamation. The perimeter security fence would be monitored regularly during the post-closure period. Six-foot-high chain link fencing with three strands of barbed wire is in place in areas such as frequently used pedestrian corridors and employee and contractor parking lots. Other barriers include extensive use of earthen berms and natural terrain, lockable gates at access points along National Forest System Road 287, and restricted access signage. At the end of mine life, a minimum 6-foot-high chain link fence with three strands of barbed wire would be installed around the Open Pit. Surface disturbance from installation of the security fence is included within the Open Pit footprint shown on map 2-1 in appendix A.

2.3.1.8 **Sanitary and Solid Waste Disposal**

Under the no-action alternative, no sanitary or solid waste would be disposed of on National Forest System lands and sewage would be disposed of as described in section 2.2, "Existing Operations at the Pinto Valley Mine." Nonhazardous solid wastes would continue to be disposed of off site or at the existing Solid Waste Landfill on site under the no-action alternative.

2.3.1.9 **Hazardous Materials and Waste Management**

2.3.1.9.1 Reagent Transportation and Storage

The use of National Forest System Road 287 for delivery of industrial products as described in section 2.2, "Existing Operations at the Pinto Valley Mine," would continue through active mining operations and the reclamation period under the no-action alternative.

2.3.1.9.2 Spill Prevention and Emergency Response

The spill prevention, control, and countermeasures plan is a "living document" that is updated continually to reflect current Pinto Valley Mining Corp. management of petroleum and non-petroleum products, and would be continued throughout active mining operations and closure and reclamation under the no-action alternative.

2.3.1.9.3 Waste Management

Current hazardous waste management protocols described in section 2.2, "Existing Operations at the Pinto Valley Mine," would continue under the no-action alternative.

Solid waste generated by any activities conducted by Pinto Valley Mining Corp. would continue to be disposed of in a manner consistent with applicable local, State, and Federal regulations. Pinto Valley Mining Corp. may manage materials on site in its permitted non-municipal Solid Waste Landfill, or elect to have wastes transported to offsite disposal sites. With the exception of petroleum products for powering, lubricating, or cooling motor vehicles or transformers, no regulated, radioactive, hazardous, or toxic substances would be used on National Forest System lands in any of the activities described under the no-action alternative. No regulated, radioactive, hazardous, or toxic substances would be generated, stored, or disposed of on National Forest System lands.

2.3.1.10 **Safety and Fire Protection**

Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize and ready the mine for closure and reclamation, Pinto Valley Mining Corp. would employ the same standard operating procedures for safety as under the current blasting program described in section 2.2, "Existing Operations at the Pinto Valley Mine."

Under the no-action alternative, the 650,000-gallon emergency water storage tank for fire suppression would remain within the authorization area for the 19 Dump.

Pinto Valley Mining Corp. would continue implementation of the emergency action plan under the no-action alternative to help responsible officials protect lives and reduce property damage in the event of flooding caused by failure of a tailings storage facility (Wood 2019a). The emergency action plan is intended to interface with the emergency operations plans, warning and evacuation plans, and annexes of other local, county, and State jurisdictions to ensure that response actions will be effectively implemented.

2.3.1.11 **Exploration Activities**

There would be no further exploration activities on National Forest System lands conducted under the no-action alternative.

2.3.1.12 **Workforce, Vehicle Trips, and Schedule**

2.3.1.12.1 Workforce

During the 6-month transition period, Pinto Valley Mining Corp. would retain the workforce necessary to continue active mining and milling for approximately 2 months and then workforce would be reduced as the mine is transitioned to reclamation and closure. Workforce reductions would commence with an immediate hiring freeze and notification of impending layoffs in conformance with the Worker Adjustment and Retraining Notification Act of 1988. Nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities would be laid off first (approximately 400 in the first 3 months).

2.3.1.12.2 Vehicle Trips

As the mine transitions from operation to closure and reclamation, vehicle trips would reduce in accordance with overall workforce and operational reductions during these phases.

Table 2-5 identifies the estimated number of annual mine-related vehicle roundtrips by project phase for the Pinto Valley Mine under the no-action alternative.

Table 2-5. Pinto Valley Mine estimated average annual mine-related vehicle roundtrips for the no-action alternative

Phase	Months/Years After Record of Decision	Type 1 Vehicles	Type 2 Vehicles	Type 3 Vehicles	Total per Phase	Areas Closed/Reclaimed During Period
Mine Operation[17]	months 1–2	27,454	1,915	2,554	31,923	None
Transition Period	months 3–6	25,095	1,751	2,334	29,180	None
Closure/Reclamation Phase 1	month 7–year 3	728	77	7	812	West Dump, Leach Piles, Inert Limestone Stockpile, Main Dump
Closure/Reclamation Phase 1	month 7–year 3	1,014	83	33	1,130	Mined Land Reclamation Plan Items
Closure/Reclamation Phase 2	year 4–year 10	149	10	0	159	Tailings Storage Facility No. 3, Tailings Storage Facility No. 4 draindown period

[17] Mine-related vehicle roundtrips during operations assumes roundtrip travel by 557 salaried employees 5 days a week combined with 42,720 annual vehicle roundtrips by 133 contractors and part-time employees (estimated by Pinto Valley Mining Corp.).

Phase	Months/Years After Record of Decision	Type 1 Vehicles	Type 2 Vehicles	Type 3 Vehicles	Total per Phase	Areas Closed/Reclaimed During Period
Closure/Reclamation Phase 3	year 11–year 13	1,709	82	15	1,806	Tailings Storage Facility No. 3, Tailings Storage Facility No. 4 reclamation
Post-closure	year 14–year 43	149	10	2	161	Site-wide Maintenance

Notes:
Type 1 Vehicle = light duty (such as pickup trucks, personal vehicles, small service trucks)
Type 2 Vehicle = medium duty (such as vacuum trucks, medium-duty service trucks)
Type 3 vehicle = large transports (semi-trucks or larger)

2.3.1.12.3 Schedule

Following the record of decision, all activities at the Pinto Valley Mine would begin transitioning from active mining operations to reclamation and closure activities. Pinto Valley Mining Corp. estimates that it would take approximately 6 months to transition from active mining to reclamation and closure. The 6-month transition period would include two phases: phase 1 is estimated to last approximately 2 months and phase 2 is estimated to last approximately 4 months. Table 2-6 presents the schedule and duration of activities during the transition period.

Table 2-6. Schedule of activities under the no-action alternative

Project Activity	Phase/ Duration of Activity	Description
Active Mining	Phase 1 2 months	Active mining of sulfide ore and overburden would continue until active mining faces can be stabilized and readied for closure and reclamation.
Waste Rock Dumps, Leach Piles, and Stockpiles	Phase 1 2 months	Pinto Valley Mining Corp. would assess these facilities for capacity, conformance with end-of-mine-life stability, and topographic characteristics and drainage profiles.
Milling and Tailings Deposition	Phase 1 2 months	Milling of stockpiled sulfide ore and deposition of tailings. Cessation of boundary dam construction. Pinto Valley Mining Corp. would assess these facilities for capacity, conformance with end-of-mine-life stability, and topographic characteristics and drainage profiles.
Closure Plans	Phase 2 4 months	Closure plans would be drafted and submitted to the Arizona Department of Environmental Quality for closure of all discharging facilities covered under the Aquifer Protection Permit. The Mined Land Reclamation Plan would be updated to conform with the site closure and infrastructure removal. Pinto Valley Mining Corp. would also submit a final, detailed reclamation plan to the Forest Service for disturbances on National Forest System lands.
Pipelines, Power Lines, Roads, and Solvent Extraction and Electrowinning Plant	Phase 2 4 months	This infrastructure would be inventoried, and salvage agreements would be drafted for infrastructure removal and reclamation.
Ponds and Reservoirs	Phase 2 4 months	Ponds and reservoirs would be surveyed, sludge would be inventoried, and plans would be prepared for breach or in-place closure.
Pregnant Leach Solution Conveyance	Phase 2 4 months	Design of the Pregnant Leach Solution conveyance and pumping systems would be adjusted to pump to the Open Pit.
Workforce Reductions	Phase 2 4 months	Workforce reductions would commence with an immediate hiring freeze and notification of impending layoffs in conformance with the Worker Adjustment and Retraining Notification Act. Nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities would be laid off first (approximately 400 in the first 4 months).

2.3.1.13 Reclamation and Closure

Reclamation activities on private land would be conducted in accordance with the Pinto Valley Mine Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a) and the Pinto Valley Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a). Reclamation activities on National Forest System lands would be conducted in accordance with the reclamation plan for National Forest System land.

Final reclamation for the Pinto Valley Mine is defined as closure of all remaining Pinto Valley Mining Corp. facilities at the conclusion of active mining operations and is currently anticipated to begin following the 6-month transition period after the record of decision. In general, Pinto Valley Mining Corp. would decommission electric power lines not needed for closure or post-closure within 24 months of mine closure and would decommission pipelines not needed for closure or post-closure within 36 months of mine closure. Decommissioning of other project facilities not required for closure and post-closure is anticipated to last for approximately 3 years. However, Tailings Storage Facility No. 4 and Tailings Storage Facility No. 3 may require as many as 10 years of consolidation (draindown) prior to performing regrading activities on the impoundment surfaces.

Pinto Valley Mining Corp.'s Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a) and Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) propose to accomplish most reclamation by covering large facilities with inert material such as Gila Conglomerate from the project site. Locally, soil may be used for reclaiming access roads: the Mined Land Reclamation Plan calls for regrading cut-and-fill road sections with soil from the adjacent ground surface. The Mine Reservoir would be similarly reclaimed by soil sourced from adjacent areas.

Some Pinto Valley Mining Corp. facilities on National Forest System lands may contain equipment or materials that would require removal and disposal at an appropriately permitted facility during the reclamation process. Proper disposal of these materials would be determined during decommissioning and demolition. Hazardous wastes, as defined by the Resource Conservation and Recovery Act or Comprehensive Environmental Response, Compensation, and Liability Act, and hazardous materials as defined by the U.S. Department of Transportation would not be stored or disposed of on National Forest System lands and are not anticipated to be present at the time of final reclamation. In the unanticipated event that such materials are discovered in facilities such as abandoned pipelines, they would be isolated, treated, contained, or neutralized. Hazardous materials that cannot be neutralized or contained would be disposed of in permitted hazardous waste disposal facilities in accordance with regulatory requirements.

2.3.1.14 Post Closure

Post-closure reclamation activities would include maintenance and monitoring to ensure that the closed facilities meet reclamation goals. The maintenance period will require 3 years and is planned for 3 weeks during the summer of each year. Pinto Valley Mining Corp. facilities and reclamation structures on National Forest System lands that will be maintained and monitored during the post-closure period include:

- Access roads and other infrastructure necessary for post-closure operations;
- Constructed water diversion channels and berms;
- Reclaimed areas;
- Security fences and gates; and
- Surface water monitoring locations.

During this period, Pinto Valley Mining Corp. will also meet Aquifer Protection Permit and Mined Land Reclamation Plan maintenance and monitoring requirements. For Aquifer Protection Permit permitted discharging facilities, the monitoring period will last for at least 30 years, also commencing at the start of the post-closure care period. The duration of monitoring could persist for longer than 30 years as indicated in the Forest Service monitoring and mitigation plans included in appendix H, “Environmental Protection Measures, Monitoring, and Mitigation.”

One of the main objectives of the Forest Service reclamation policy (Forest Service Manual 2840) is to ensure that disturbed lands are returned to a use that is consistent with long-term land and resource management plans (Forest Service 2004). Current and historic land uses on National Forest System lands surrounding the Pinto Valley Mine include low-density cattle grazing, public recreation, and mining activities. Pinto Valley Mining Corp. has identified a range of post-closure land uses for the Pinto Valley Mine that are consistent with these nearby uses including recreation (hunting, hiking, horseback riding, and camping), grazing, and wildlife habitat.

Closure of tailings storage facilities under the no-action alternative would require an updated closure plan to be submitted to the Arizona Department of Environmental Quality based on closure timeframes associated with the no-action alternative. A portion of the Tailings Storage Facility No. 4 embankment is already reclaimed with a Gila Conglomerate soil and rock armor cover. The remaining portion of the embankment would be covered at closure. Greater than 98 percent of the top surface of the tailings storage facility is expected to be covered with a rocky soil cover (after approximately 10 years of draindown occurs to allow safe access of equipment). Limited final grading would then occur to prepare the top surface for rock armor placement. Following placement, 2 percent (approximately 15 acres) of the top surface of Tailings Storage Facility No. 4 may remain uncovered in the lowest topographic portion of the surface. This low area will accumulate storm water during seasonal storm events. The water will largely evaporate during the dry seasons (within a few weeks to 2 months following the winter and summer storm events). Pinto Valley Mining Corp. is exploring various options such as solar-powered misters to enhance evaporation, if needed seasonally. Based on observations of inactive tailings storage facilities elsewhere in southern Arizona, the uncovered pond area would eventually develop a 0.5- to 2-foot-thick crust of interlayered calcium carbonate (caliche) and fine sediment that acts to impede infiltration.

The Open Pit, waste rock dumps, and Leach Piles would not be built to the intended slopes, heights, or depth in the case of the Open Pit. Therefore, new closure plans would have to be developed to account for these changes.

Post-closure uses of National Forest System roads used by Pinto Valley Mining Corp. would be determined by the Forest Service prior to mine closure. The Forest Service anticipates that all access roads on National Forest System lands would be decommissioned during the post-closure period after Pinto Valley Mining Corp.’s use of these roads ceases, within approximately 36 months of mine closure.

2.3.2 Alternative 1 – Authorization of Existing Uses of National Forest System Lands

Alternative 1 is a continuation of the existing condition and encompasses the following broad categories of actions that would extend the mine life for approximately 7 more years[18] than under the no-action alternative:

- Authorization of existing uses and permitted disturbances at the Pinto Valley Mine (including all State and Federal authorizations on public or private lands), but no new surface disturbance on National Forest System lands. Refer to table 1-1 in chapter 1 for a description of historical authorizations at the Pinto Valley Mine.
- Authorization of existing legacy encroachments on approximately 29 acres of National Forest System lands from activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand (map 1-1 in appendix A).
- Continuation of existing mining activities on private land and additional activities on private land that would be conducted to maximize the operational life of the mine without further expansion of facilities onto National Forest System lands. A description of private land activities is included and analyzed in the direct and indirect impacts analysis section in chapter 3 because the activities on private land and Federal land constitute an integrated mine.

The majority of the Pinto Valley Mine is located on patented claims or private land (private Pinto Valley Mining Corp. property). However, some facilities and operations are located on unpatented lode and mill site claims, or other land, on the Tonto National Forest as previously authorized by the Forest Service or the U.S. Department of the Interior, Bureau of Land Management through rights-of-way, plans of operations, special use permits, or letter agreements. The Bureau of Land Management rights-of-way were transferred to the Forest Service in 1989. The authorizations date from as early as the 1940s and have been amended, updated, and reauthorized over the years. However, all previous authorizations on National Forest System lands have since expired or were nontransferable to the current mine owner. Refer to table 1-1 for a list of prior authorizations at the Pinto Valley Mine.

Additionally, some facilities were placed or expanded onto unpatented claims held by Pinto Valley Mining Corp.'s predecessor on National Forest System lands without authorization from the Forest Service. The approximately 29 acres of encroachments on National Forest System lands include roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser (see map 1-1 in appendix A). These legacy encroachments on National Forest System land would be authorized as part of alternative 1.

Map 2-2 in appendix A depicts the layout of existing and planned mining facilities and other physical mine components under alternative 1. Table 2-7 summarizes existing, proposed, and total surface disturbance for all project components under alternative 1 broken out by total surface disturbance, Forest Service disturbance, and private land disturbance. Because Pinto Valley Mine is an ongoing operation, footprints of some active facilities have continued to change during the course of this National Environmental Policy Act process. Estimates of the area of existing surface disturbance reported in this document typically represent the size of facility footprints between submittal of the proposed mining plan of operations in May 2016 (Capstone Mining Corp. 2016a) and the receipt of additional information provided by Pinto Valley Mining Corp. through April 2018. Additionally, some

[18] The mine life under alternative 1 is actually anticipated to be 6 years and 10 months longer than that of the no-action alternative when accounting for the estimated 2 months of continued mine operations under the no-action alternative. For simplicity and ease of comparison, the estimated difference in mine life has been rounded up to 7 years for purposes of analysis in this final EIS.

areas proposed for facility expansions would be in areas of existing disturbance and therefore would not constitute new surface disturbance.

Table 2-7. Estimated surface disturbance for alternative 1

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Mining									
Open Pit	746	9	754	219	-	219	965	9	973
Inert Limestone Stockpile	7	-	7	48	-	48	55	-	55
Main Dump	96	-	96	361	-	361	457	-	457
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	(<1)	-	(<1)	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	20	-	20	44	-	44
West Dump	-	-	-	247	-	247	247	-	247
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	601[19]	-	601	623	-	623
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*1,466*	-	*1,466*	*2,499*	*84*	*2,583*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1 & 2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	30	-	30	294	6	300
Tailings Storage Facility No. 4	704	-	704	269	-	269	973	-	973
Leach Piles	654	-	654	(41)	-	(41)	613	-	613
Pregnant Leach Solution Pond/ancillary facilities	19	-	19	(19)	-	(19)	-	-	-
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	*208*	-	*208*	*2,441*	*293*	*2,733*

[19] The 601 acres of surface disturbance associated with the borrow and riprap sources encompass 244 acres in areas that overlap existing disturbance areas and 357 acres of new surface disturbance. As a result, only the 357 acres of new disturbance associated with borrow and riprap sources are carried forward for the new surface disturbance totals.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Total Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
***Transportation*[20]**									
National Forest System Roads	18	81	99	(1)	-	(1)	17	81	99
Access Roads	3	44	47	-	-	-	3	44	47
Subtotal, Transportation Facilities	*21*	*124*	*145*	*(1)*	*-*	*(1)*	*20*	*124*	*145*
Utilities									
Electrical Power Lines[21]	37	20	57	(7)	(1)	(8)	30	19	49
***Water Supply, Distribution, Use, and Treatment*[22]**									
Peak Wells[23]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[24]	2	10	11	(1)	(<1)	(1)	1	9	10
Water Pipelines (Surface)[25]	26	20	46	(1)	(<1)	(1)	25	20	45
Ponds and Reservoirs[26]	55	41	96	(12)	0	(12)	43	41	84
Water Storage Tanks[27]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	(13)	(<1)	(13)	73	71	144
TOTAL	**3,349**	**566**	**3,915**	**909**	**(1)**	**908**	**4,258**	**565**	**4,823**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this final EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of "existing disturbance" in this final EIS are close approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

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[20] Disturbance for National Forest System roads and access roads was calculated based on an assumed disturbance width of 25 feet. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this final EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[21] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[22] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[23] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[24] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[25] Ibid.

[26] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[27] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

2.3.2.1 **Mining Facilities**

2.3.2.1.1 Open Pit

Alternative 1 would increase the footprint of the Open Pit on private property to approximately 965 acres, an expansion of 219 acres from its current footprint, by the end of the operational life of the mine. The entirety of the Open Pit expansion area has been disturbed by prior mining activities. This expansion would allow Pinto Valley Mining Corp. to access ore deposits north and west of the existing pit. No additional expansion would occur on National Forest System lands.

For purposes of analysis, total mining tonnages are assumed to continue at a constant throughput rate of approximately 58,000 tons of ore and 82,000 tons of waste rock per day during the 7-year operational life of the mine under alternative 1. The Pinto Valley Mine could process an estimated cumulative total of 148,190,000 tons of ore and 209,510,000 tons of waste rock during the alternative 1 mine life.

Expanding the Open Pit on private property would extend the mine life by approximately 7 more years than under the no-action alternative and also increase the depth to the pit bottom (lower elevation). Under alternative 1, the anticipated pit bottom elevation at the end of active mining operations is estimated to be approximately 2,510 feet above mean sea level, approximately 90 feet deeper than under the no-action alternative.

Use of existing facilities on National Forest System lands related to the Open Pit that are within encroachment areas would be authorized and continue through the life of mine, after which the disturbed areas would be reclaimed in accordance with the reclamation plan for National Forest System lands).

Blasting would be required to excavate the ore and waste rock in the Open Pit. Blasting operations would generally continue to be conducted once daily during daylight hours, between 10 a.m. and 2 p.m. Pinto Valley Mining Corp. uses explosives to break up rock in the mining process in the Open Pit, but does not store any explosives on National Forest System lands. A blasting contractor typically conducts this work. Blasting personnel are specifically trained on this task and closely comply with Mine Safety and Health Administration and the Bureau of Alcohol, Tobacco and Firearms standards. This use of explosives would continue throughout active mining operations.

2.3.2.1.2 Inert Limestone Stockpile

Alternative 1 would expand the stockpile onto approximately 48 acres of private land outside the footprint of the Main Dump. There would be no use of National Forest System lands for the Inert Limestone Stockpile and all limestone would originate from private lands at Pinto Valley Mine. The limestone would be available for use as riprap, armor plating to minimize erosion, and reclamation purposes at the end of mine life. The estimated top elevation of the Inert Limestone Stockpile at the end of active mining operations is 4,940 feet above mean sea level.

2.3.2.1.3 Waste Rock Dumps

Use of the active and planned waste rock dumps on private land would continue under alternative 1 and none of these facilities would be located on National Forest System lands. An estimated total of 292,000,000 tons of additional waste rock would be generated for storage in active waste rock dumps at the Pinto Valley Mine under alternative 1. Existing inactive dump facilities are not currently expected to be reactivated. Table 2-8 summarizes waste rock dump characteristics under alternative 1.

Table 2-8. Summary of Pinto Valley Mine waste rock dumps for alternative 1

Waste Rock Dumps	Status	Permitted Capacity (million metric tons)	Approximate Height (feet)	Final Top Elevation (feet above mean sea level)	Approximate Final Footprint (acres)
Main Dump	Active	419.9	820 [2018]	5,075 [2018]	457 (principally overlying Leach Piles)
Castle Dome Marginal Dump	Active	10	360 [2018]	4,370 [2018]	44 (principally overlying former Castle Dome Mine processing area)
North Barn Marginal Dump	Planned	11	257	4,175	36 (100% overlying a disturbed area used for maintenance buildings and other infrastructure)
West Dump[28]	Planned	153	600	4,085	247 (principally overlying other waste and processing facilities in Gold Gulch)
Northside Dumps 9.1, 9.11, 9.12, and 9.3	Inactive	23.74	170–435	4,050–4,190	102
Southside Dump 13	Inactive	1	100	4,025	6
Southside Dump 14	Inactive	-	0	3,905	213 acres (included within Tailings Storage Facility No. 1 footprint and material used to reclaim Tailings Storage Facility No. 1)
19.1 Dump	Inactive	1	80	4,065	3
19 Dump	Inactive	27	395	4,425	76
19 Extension Dump[29]	Planned	19	0	Not applicable	Not applicable

Source: Capstone Mining Corp. 2016a with updates in 2018 as indicated by “[2018]” in table.

Main Dump

The footprint of the Main Dump on private land would be expanded from approximately 96 acres to 457 acres and would dominantly overlie the existing Leach Piles.

A total of approximately 345,700,000 tons of waste rock would be generated for storage at the Main Dump under alternative 1. The maximum top elevation of the Main Dump would be approximately 4,895 feet above mean sea level (Pinto Valley Mining Corp. 2020a). The outer slope would not likely exceed a ratio of 1.5 horizontal to 1 vertical.

Castle Dome Marginal Dump

The footprint of the Castle Dome Marginal Dump on private land would be expanded from approximately 25 acres to 44 acres.

This dump is expected to remain operational through 2025 and would store an estimated 10,000,000 tons of waste rock. The dump would be composed primarily of quartz monzonite and granodiorite. The height of the dump would not exceed 360 feet at a top elevation of 4,370 feet above mean sea level and its outer slope would not exceed a ratio of 1.5 horizontal to 1 vertical.

[28] The West Dump elevation and approximate footprint are estimated based on current information and are subject to change as the facility is further designed.
[29] The 19 Extension Dump is permitted, but there are no plans to construct the extension at this time.

North Barn Marginal Dump

The North Barn Marginal Dump is a permitted, planned facility located entirely on private lands along the west-southwest side of the Open Pit. The footprint of the North Barn Marginal Dump would be approximately 36 acres, all of which would be located in areas of existing disturbance.

An estimated 11,000,000 tons of waste rock would be generated for storage at the North Barn Marginal Dump. The dump would be composed primarily of quartz monzonite, diabase, granite porphyry, and granodiorite. The height of the dump would not exceed 257 feet at a top elevation of 4,175 feet above mean sea level and its outer slope would not exceed a ratio of 1.5 horizontal to 1 vertical. The facility would overlie the North Barn maintenance area and a small part of the Southside Dump 13. The North Barn truck shop and fuel-storage facilities in the maintenance area would be relocated.

West Dump

The West Dump is a planned facility that would extend west into Gold Gulch onto 247 acres of private land; there is no use of National Forest System lands planned for this facility. The footprint would substantially overlie other processing and waste facilities including the Leach Piles, Northside Dump 9.11, Tailings Storage Facility No. 3, and the retired Gold Gulch 1A Pregnant Leach Solution Pond. Construction of the West Dump is anticipated to begin in 2021. This dump is expected to become operational in 2023 and would be used to store waste rock under alternative 1.

An estimated 153,000,000 tons of waste rock would be generated for storage over the life of the mine at the West Dump. The top elevation of the dump is not expected to exceed 4,085 feet above mean sea level and its outer slope would not exceed a ratio of 1.5 horizontal to 1 vertical.

Northside Dumps 9.1, 9.11, 9.12, and 9.3

These dumps are located entirely on private land and are expected to remain inactive under alternative 1 and a portion of Northside Dump 9.11 would be covered during the construction of the West Dump under alternative 1.

Southside Dumps 13 and 14

Southside Dumps 13 and 14 are located entirely on private land and are expected to remain inactive under alternative 1.

19.1 Dump

The 19.1 Dump is located entirely on private land and would remain inactive under alternative 1.

19 Dump

The 19 Dump is located on National Forest System lands and was previously authorized by Forest Service plan of operations POO-0003 in 1984. As under the no-action alternative, the 19 Dump would remain inactive under alternative 1; however, a portion of the stored overburden may be used as borrow and riprap sources and removed for use as cover material to reclaim certain features at the end of the mine life. The area of the dump where the material would be removed would be regraded, with no net change to the facility’s footprint or top elevation (the 19 Dump has an elevation of approximately 4,425 feet above mean sea level). The reclamation plan for National Forest System lands will address reclamation for the 19 Dump (such as slope ratios and revegetation).

19 Extension Dump

The 19 Extension Dump, which is a potential waste rock dump on National Forest System lands that is not yet built, is permitted with the State of Arizona under the Arizona Department of Environmental Quality Aquifer Protection Permit program. Under the State of Arizona permit, the facility would include approximately 19,000,000 tons of waste rock and would cover approximately 156 acres. However, Pinto Valley Mining Corp. currently has no plans to construct the 19 Extension Dump.

2.3.2.1.4 Borrow and Riprap Sources

Borrow and riprap sources would be the same as under the no-action alternative.

2.3.2.2 **Milling and Processing**

2.3.2.2.1 Mill and Concentrator

Use of the existing mill, concentrator, and ancillary facilities on approximately 152 acres of private land would continue and use of 13 acres of National Forest System lands would be reauthorized under alternative 1. Pinto Valley Mine could produce an estimated cumulative total of 895,300,000 pounds of copper concentrate and 8,750,000 pounds of molybdenum during the alternative 1 mine life.

2.3.2.2.2 Cottonwood Tailings Impoundment

Cottonwood Tailings Impoundment is inactive and would remain so for the duration of alternative 1. Ongoing and routine maintenance for reclamation and closure of this facility would continue. These activities could include regrading and covering the embankment face and recontouring portions of the surface to direct storm water off the facility. The reclamation plan for National Forest System lands will address reclamation for the Cottonwood Tailings Impoundment (such as reclamation objectives and revegetation).

2.3.2.2.3 Tailings Storage Facility No. 1/2

Tailings Storage Facility No. 1/2 would remain inactive for the life of the mine.

2.3.2.2.4 Tailings Storage Facility No. 3

Use of Tailings Storage Facility No. 3 would continue intermittently under alternative 1, primarily as a backup to Tailings Storage Facility No. 4 for disposing of tailings from the mill. The previously authorized uses of National Forest System lands for Tailings Storage Facility No. 3 under mining plans of operations POO-0001 and POO-0002 and use of associated, unauthorized encroachment areas would be authorized under a new, consolidated mining plan of operations.

If needed, boundary dams would be constructed along the property boundary to retain tailings on private land. Similar to the no-action alternative, the top elevation of Tailings Storage Facility No. 3 would not exceed 3,785 feet above mean sea level if additional tailings are added over the life of the mine. At this elevation, Tailings Storage Facility No. 3 would have a capacity of 2,900,000 tons of tailings at a settled density of 90 pounds per cubic foot. A total of 97 million tons of tailings would be stored in Tailings Storage Facility No. 3 at the end of mine life, approximately 7 years after the record of decision.

The sediment trap adjacent to the Tailings Storage Facility No. 3 embankment, which is on National Forest System lands, would not be subsumed by further development of Tailings Storage Facility No. 3 on private land under alternative 1.

2.3.2.2.5 *Tailings Storage Facility No. 4*

Under alternative 1, use of Tailings Storage Facility No. 4 would continue as the primary location for the disposal of tailings from the mill and the facility's footprint would increase to approximately 973 acres.

The existing boundary dams would be raised along the property boundary to retain tailings on private land under alternative 1. The top elevation of Tailings Storage Facility No. 4 would raise to 4,090 feet above mean sea level as tailings are added over the life of the mine, which represents an increase of 132 feet compared to the no-action alternative. At 4,090 feet above mean sea level, the top elevation would be less than the maximum elevation permitted by the approved Aquifer Protection Permit (4,250 feet above mean sea level). At this elevation, Tailings Storage Facility No. 4 would have an increased capacity of approximately 225 million tons of additional tailings at a settled density of 95 pounds per cubic foot. The toe to top surface of the Tailings Storage Facility No. 4 tailings dam would be approximately 885 feet at the end of active mining operations.

2.3.2.2.6 *Leach Piles*

Similar to the no-action alternative, the leaching operation encompassing approximately 654 acres on private land would eventually be terminated. There is no current and there would be no future use of National Forest System lands for the Leach Piles. Much of the existing leaching operation would be covered by expansion of the Main Dump. Pinto Valley Mining Corp. continues to evaluate the business case of curtailing active leaching. Current copper prices support (2020) the continued operation of Pinto Valley Mining Corp.'s leach facilities on private land. Pinto Valley Mining Corp. is also evaluating multiple potential projects for increasing copper production as a means of reducing unit costs. This applies to the leaching facilities as well as the concentrator. Pinto Valley Mining Corp. will pursue the most promising projects for the business. Potential business cases could include curtailing hydrometallurgical operations while continuing to operate the mine and concentrator, or there could be an option to repeat past business decisions of curtailing the mine and concentrator operations while continuing hydrometallurgical operations. These decisions for operations on private lands will be driven entirely by market conditions and are independent of the action alternatives analyzed in this EIS.

Pinto Valley Mining Corp. plans to buttress the current leach facilities with rock that is below the cutoff grade for ore being sent to the concentrator. This will be the West Dump, which will cover a portion of the embankment of the Leach Piles, Northside Dump 9.11, and Tailings Storage Facility No. 3. The Main Dump will also cover large portions of the current leach facilities. Pinto Valley Mining Corp. is evaluating whether it will be economical to leach fresh material placed in either the West Dump or Main Dump. These evaluations are also independent of the action alternatives analyzed in this EIS.

2.3.2.2.7 *Pregnant Leach Solution Ponds and Ancillary Facilities*

Use of the Pregnant Leach Solution Ponds (Gold Gulch 1 and Gold Gulch 1A), Raffinate Pond, and ancillary facilities encompassing approximately 19 acres of private land would eventually be terminated as planned under alternative 1. There would be no use of National Forest System lands for these facilities. When leaching operations are curtailed or terminated, these facilities, or something similar in function, would continue to be used for some time as the Leach Piles drain down. A collection pond will be required downstream from the leach facilities to collect and manage solutions draining from the toe.

Placement of material in the West Dump will require the leach solution collection pond to be relocated. The Gold Gulch 1A dam will be breached and solutions will be diverted to a new lined facility in the area of the current Gold Gulch 2 Reservoir, on private Pinto Valley Mining Corp. property.

As Gold Gulch is repurposed for waste rock disposal in the West Dump, the current Pregnant Leach Solution Pond Gold Gulch 1A will be replaced by a new double-lined impoundment (the Gold Gulch 2 Process Solution Pond). Before transitioning to the new Gold Gulch 2 Process Solution Pond, requisite modifications to existing pipelines on private land will be made to connect the new pond to the leach circuit. When Pinto Valley Mine transitions from active mining operations to closure and post-closure, minor modifications to the pumping and piping systems may again be necessary to direct residual pregnant leach solution draindown from the future Gold Gulch 2 Process Solution Pond to the Open Pit on a permanent basis.

2.3.2.2.8 Solvent Extraction and Electrowinning Plant

Use of the Solvent Extraction and Electrowinning Plant encompassing approximately 17 acres of private land would continue or be terminated as planned. There would be no use of National Forest System lands for this facility.

2.3.2.3 **Roads**

2.3.2.3.1 National Forest System Roads

Pinto Valley Mining Corp.'s use of approximately 29.8 miles of National Forest System roads to support active mining operations would be reauthorized under alternative 1. A road use permit under the potential authorization of the mining plan of operations would be developed to authorize Pinto Valley Mining Corp. to perform maintenance on National Forest System Road 287. Access along National Forest System Road 287 across private land would be maintained and potential realignment would be considered as needed. Maintenance and necessary improvement projects on the paved portion of National Forest System Road 287 would be undertaken pursuant to either the relevant provisions of a road use permit or a future negotiated easement. Pinto Valley Mining Corp. would maintain unpaved National Forest System roads as needed for its use by performing routine maintenance activities, vegetation removal, and periodic grading and dust suppression.

Pinto Valley Mining Corp.'s anticipated use and reclamation of National Forest System roads for reclamation, and closure and post-closure activities would be the same as described under the no-action alternative, except mine closure would begin approximately 7 years later.

2.3.2.3.2 Access Roads

Under alternative 1, Pinto Valley Mining Corp.'s use of approximately 15.2 miles of access roads on National Forest System lands previously authorized by right-of-way PHX-080933 and special use permits GLO-445302, GLO-445303, and Tonto 468 would be reauthorized under a new, consolidated mining plan of operations (Capstone Mining Corp. 2020b). Pinto Valley Mining Corp. may realign some existing haul and access roads on private land; there would be no change in the use of existing access roads on National Forest System lands under alternative 1.

Pinto Valley Mining Corp.'s anticipated use of access roads on National Forest System lands for reclamation and closure and post-closure activities would be the same as described under the no-action alternative, except mine closure would begin approximately 7 years later.

Access roads on National Forest System lands would be reclaimed in accordance with the National Forest System land reclamation plan. In general, access roads would be decommissioned when no longer needed.

2.3.2.3.3 Dust Control

Pinto Valley Mining Corp. has developed a fugitive dust control plan that describes dust control strategies that will be employed at the Pinto Valley Mine to control fugitive and windblown dust emissions following approval of the mining plan of operations (Capstone Mining Corp. 2021). The plan describes dust-control measures, including dust control on unpaved roads, and operational practices to minimize and control fugitive dust as required by Arizona Department of Environmental Quality Air Quality Permit 65025, as amended, as well as dust control practices necessary to demonstrate general conformity within the nonattainment area for particulate matter of 10 microns diameter and smaller (see section 3.2, “Air Quality,” and appendix I, “General Conformity Determination,” for more information on general conformity and the nonattainment area).

2.3.2.4 **Utilities**

2.3.2.4.1 Electrical Power Lines

There is no anticipated change in power requirements from the current levels described for the no-action alternative. The Pinto Valley Mine substation and all power lines branching from the substation are owned by Pinto Valley Mining Corp. Use of National Forest System lands for electrical power lines previously authorized under plan of operations POO-0002 and special use permits GLO-445302, GLO-445303, and Tonto 468 would be reauthorized under a new, consolidated mining plan of operations. Pinto Valley Mining Corp. may realign some existing electrical power lines on private land to accommodate local earthwork. Pinto Valley Mining Corp. would realign an existing electrical power line to accommodate expansion of Tailings Storage Facility No. 4. This realignment would result in the eventual abandonment of an existing power line on National Forest System lands, the timing of which has not been determined.

In general, Pinto Valley Mining Corp. would decommission and begin reclamation on electric distribution lines not required for closure and post-closure activities within 24 months of mine closure.

2.3.2.4.2 Lighting

Lighting at the Pinto Valley Mine would be the same as described under the no-action alternative, except that lighting during active mining would continue for approximately 7 more years than under the no-action alternative. Additionally, the locations of mobile light plants stationed at active areas of the Open Pit and waste rock dumps may shift slightly with continued excavation and deposition of mined materials.

2.3.2.5 **Water Supply, Distribution, Use, and Treatment**

Due to modification of water supply and distribution facilities as described in the section below, the estimated area occupied by these facilities would decrease to 73 acres of private land and 71 acres of National Forest System lands under alternative 1.

Pinto Valley Mine would use approximately 2,536 acre-feet of fresh water[30] per year and 13,146 acre-feet of reclaimed water[31] for a total of 15,682 acre-feet of water per year from all sources. Pinto Valley

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[30] Fresh water sources include the Hoops 2 and Miller No. 5 Wells and Myberg Basin in the east water system and Peak Well 37 and approximately 30 percent of the remaining Peak Well field supply from the west water system.

[31] Reclaimed water sources include the Old Dominion Mine and treated groundwater from the east water system and 70 percent of the Peak Well field, Tailings Storage Facility No. 4 reclaim water, and water collected from the Open Pit.

Mine operations would use an estimated 109,772 acre-feet of water (including 17,750 acre-feet of fresh water and 92,022 acre-feet of reclaimed water) over the estimated 7 years of ongoing mine operations. Table 2-9 presents a summary of water supply and consumption for the Pinto Valley Mine and the water system is further described below. Table 2-7 presents the estimated surface disturbance associated with the water supply system, and map 2-2 in appendix A depicts the location of water supply components.

Table 2-9. Pinto Valley Mine consumptive water use for alternative 1

Water Supply Source	Average Water Use (gallons per minute)	Estimated Water Use Rate (gallons per minute)			
		Mill Use	Dust Control	Potable Water	Other Uses
East Water System[32]	1,700	1,350	350	-	-
West Water System	-	-	-	-	-
Peak Well Field	3,500	3,250	100	-	150
Peak Well 37[33]	22	-	-	22	-
Tailings Storage Facility No. 4 Reclamation Water (recycled water)	4,200	4,200	-	-	-
Open Pit Pumping (recycled water)	300	300	-	-	-
Total	9,722	9,100	450	22	150

Note: The table above presents total water consumption associated with active mining operations including water recycled on site (Tailings Storage Facility No. 4 Decant Water) and fresh water.

2.3.2.5.1 Peak Well Field (West Water System)

The Forest Service would authorize continued use of power lines and pipelines to service the existing Peak Wells on National Forest System land (see map 2-2 in appendix A) and the Peak Well field on private land and National Forest System lands would continue to supply water for the Pinto Valley Mine under alternative 1. Peak Well 37 is the only active water supply well for Pinto Valley Mine that is located on National Forest System lands. Use of the Peak Well field on National Forest System lands, including the well and pipelines previously authorized under Right-of-Way PHX-080742, plan of operations POO-0002, and special use permits GLO-445303 and Tonto 468, would be reauthorized under a new, consolidated mining plan of operations. Table 2-9 presents the average water consumption under alternative 1. Table 2-7 presents the estimated surface disturbance associated with the Peak Well field and map 2-2 in appendix A depicts the location.

Under alternative 1, one water pipeline to Peak Well 11 would be installed. Pinto Valley Mining Corp. would reinstall a 6- to 12-inch-diameter, high-density, polyethylene pipeline to Peak Wells 11 and 13, adding 1.9 miles to the current Peak Well pipeline field.

Pinto Valley Mining Corp. would replace segments of the Peak Well field pipelines as needed. The replacement segments may vary in material (steel or high-density polyethylene) and diameter (such as 12-, 16-, and 18-inch) from the current arrangement. During any pipeline replacement actions, adjacent National Forest System road or access road berms and drainage channels would be restored to minimize erosion.

[32] East water system comes from multiple sources transmitted to the Pinto Valley Mine site by the Burch pipeline including the Old Dominion mine site, BHP's Diamond H Pit, Myberg Basin, and three groundwater wells. These systems are further described in the sections below.
[33] Peak Well 37 provides potable water to Pinto Valley Mine.

2.3.2.5.2 Burch Pipeline System (East Water System)

Use of the Burch pipeline would continue under alternative 1, including the use of National Forest System lands for pipeline segments previously authorized under special use permit GLO-445303, which would be reauthorized under a new, consolidated mining plan of operations. Segments of the Burch pipeline on Bureau of Land Management lands would continue to be authorized under AZA-007282. Pinto Valley Mining Corp. would replace segments of the Burch pipeline as needed. The replacement segments may vary in material (steel or high-density polyethylene) and diameter (such as 12-, 16-, and 18-inch) from the current arrangement. During any pipeline replacement actions, adjacent National Forest System Road or access road roadway berms and drainage channels would be restored to minimize erosion. Portions of the abandoned concentrate line may be removed during the Burch pipeline maintenance and replacement. Pinto Valley Mining Corp. would decommission and begin reclamation on the Burch Pipeline within 36 months of mine closure.

2.3.2.5.3 Other Water Pipelines

Use of existing active water pipelines on private land and National Forest System lands would continue under alternative 1. The use of National Forest System lands for the well and pipelines previously authorized under right-of-way PHX-080742, plan of operations POO-0002, and special use permits GLO-445303 and Tonto 468 would be reauthorized under a new, consolidated mining plan of operations. In general, Pinto Valley Mining Corp. would decommission and begin reclamation on pipelines not required for closure and post-closure activities within 36 months of mine closure.

2.3.2.5.4 Ponds and Reservoirs

Use of existing water supply reservoirs, storm water management ponds, and seepage collection ponds on private lands and National Forest System lands would continue under alternative 1. Use of reservoirs, including Cottonwood Reservoir, that was previously authorized under rights-of-way PHX-080742 and PHX-080933 and any ponds or tanks in the encroachment areas would be reauthorized under a new, consolidated mining plan of operations. Any ponds and reservoirs that were previously authorized or encroached onto National Forest System lands would be authorized and continue to be used through the end of mine life. Pinto Valley Mining Corp. would continue to use and be responsible for the maintenance of Cottonwood Reservoir and the associated equipment and infrastructure under alternative 1. These facilities would then be closed in accordance with the reclamation plan for National Forest System lands.

2.3.2.5.5 Water Storage Tanks

Use of existing potable and emergency (fire) water storage tanks on National Forest System lands would be reauthorized and would continue under alternative 1 during active mining operations and reclamation and closure.

2.3.2.5.6 Storm Water Management

Storm water would continue to be managed in accordance with the storm water pollution prevention plan, storm water multi-sector general permit (and any future revisions), and Arizona Pollutant Discharge Elimination System permit.

2.3.2.5.7 Wastewater Treatment

Use of the existing wastewater treatment plant on private land would continue under alternative 1. There would be no use of National Forest System lands for wastewater treatment.

2.3.2.6 Monitoring and Inspection

Monitoring and inspection procedures for project facilities would be the same as described under the no-action alternative but would continue for approximately 7 more years due to the longer operational life of the mine under alternative 1. In general, monitoring and inspection procedures would be applied and updated as necessary during operations, closure, and post-closure.

Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," for additional information on monitoring and mitigation responsibilities.

2.3.2.7 Support Facilities

2.3.2.7.1 Plant Site

Use of the existing administration and maintenance building on private land at the plant site would be the same as under the no-action alternative except that the use would be longer due to the longer operational life of the mine under alternative 1.

2.3.2.7.2 Pinto Valley Mine Sign, Fencing, and Security

The Pinto Valley Mine sign would be the same as described under the no-action alternative except that the sign would persist for longer due to the longer operational life of the mine under alternative 1.

Fencing and security at the Pinto Valley Mine would be the same as described under the no-action alternative except that fencing would extend around the expanded footprint of the Open Pit and fencing installation and security monitoring during closure and reclamation would begin approximately 7 years later than under the no-action alternative due to the longer operational life of the mine under alternative 1.

2.3.2.8 Sanitary and Solid Waste Disposal

Sanitary and solid waste management and disposal would be the same as described under the no-action alternative except that sanitary and solid wastes would be generated during a longer period due to the longer operational life of the mine under alternative 1.

2.3.2.9 Hazardous Materials and Waste Management

The use, transport, and disposal of hazardous materials and waste would generally be the same as described under the no-action alternative except that hazardous materials may be used and transported for a longer duration and the overall quantities of materials would increase due to the longer operational life of the mine under alternative 1. As under the no-action alternative, with the exception of petroleum products for powering, lubricating, or cooling motor vehicles or transformers, no regulated, radioactive, hazardous, or toxic substances would be used on National Forest System lands in any of the activities described under alternative 1. No regulated, radioactive hazardous, or toxic substances would be generated, stored, or disposed of on National Forest System lands.

2.3.2.10 Safety and Fire Protection

Unlike the no-action alternative, blasting activities under alternative 1 would continue throughout the operational life of the mine—approximately 7 years longer than under the no-action alternative. Pinto Valley Mining Corp. would employ the same standard operating procedures for safety (such as closure orders and an exclusion zone) described under the no-action alternative for the current blasting program.

2.3.2.11 **Exploration Activities**

Pinto Valley Mining Corp. may occasionally conduct exploration on private lands. Non-intrusive geophysical techniques such as seismic reflection, seismic refraction, or magnetotelluric surveys are commonly conducted in the first phase of exploration. Confirmatory drilling campaigns that may follow involve significantly greater planning and cost.

There are no proposed exploration activities on National Forest System lands associated with alternative 1. Any exploration activities that would be proposed on National Forest System lands would be undertaken in accordance with the applicable mining regulations and subject to the Forest Service's necessary compliance with other applicable Federal environmental laws.

2.3.2.12 **Workforce, Vehicle Trips, and Schedule**

2.3.2.12.1 Workforce

Pinto Valley Mining Corp. maintains a work crew of up to 690[34] employees at the Pinto Valley Mine. The mine normally operates 24 hours per day, 365 days per year. Security staff are also on site 24 hours per day, 365 days per year. This workforce and schedule would continue throughout active mining operations under alternative 1.

Leading up to closure, the Pinto Valley Mining Corp. workforce will inevitably be curtailed. If closure is performed concurrent with mining operations or with Pinto Valley Mining Corp. personnel and equipment, the number of contractors will be minimal. If, however, closure activities are performed largely by contractors, the Pinto Valley Mining Corp. workforce will be minimal. It would be reasonable to expect that approximately 100 people will be required to support closure operations for approximately 12 to 36 months.

2.3.2.12.2 Vehicle Trips

Table 2-10 identifies the estimated number of annual mine-related vehicle roundtrips by project phase for the Pinto Valley Mine under alternative 1.

Table 2-10. Pinto Valley Mine estimated average annual mine-related vehicle roundtrips for alternative 1

Phase	Years After Record of Decision	Type 1 Vehicles	Type 2 Vehicles	Type 3 Vehicles	Total per Phase	Areas Closed/Reclaimed During Period
Mine Operation[35]	0–6	165,260	11,315	14,965	191,540	None
Closure/Reclamation Phase 1	7–9	728	77	7	812	West Dump, Leach Piles, Main Dump
Closure/Reclamation Phase 1	7–9	1,014	83	33	1,130	Mined Land Reclamation Plan Items, Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 embankments

[34] The number of reported employees reflects estimated full-time-equivalent jobs including Pinto Valley Mine salaried employees, hourly workers, and contractor staff.

[35] Mine-related vehicle roundtrips during operations assumes roundtrip travel by 557 salaried employees 5 days a week combined with 42,720 annual vehicle roundtrips by 133 contractors and part-time employees (estimated by Pinto Valley Mining Corp.).

Phase	Years After Record of Decision	Type 1 Vehicles	Type 2 Vehicles	Type 3 Vehicles	Total per Phase	Areas Closed/Reclaimed During Period
Closure/Reclamation Phase 2	10–16	149	10	0	159	Tailings Storage Facility No. 3, Tailings Storage Facility No. 4 draindown period
Closure/Reclamation Phase 3	17–19	1,709	82	15	1,806	Tailings Storage Facility No. 3, Tailings Storage Facility No. 4 reclamation
Post-closure	20–49	149	10	2	161	Site-wide Maintenance

Notes:
Type 1 Vehicle = light duty (such as pickup trucks, personal vehicles, small service trucks)
Type 2 Vehicle = medium duty (such as vacuum trucks, medium-duty service trucks)
Type 3 vehicle = large transports (semi-trucks or larger)

2.3.2.12.3 Schedule

Recoverable copper production at Pinto Valley Mine is projected to continue for approximately 7 more years under alternative 1. The actual mine life may be shortened or lengthened depending on actual annual production rates achieved and other factors such as unforeseen temporary curtailment of mining operations, discovery of new mining technologies, commodity prices, etc.

2.3.2.13 **Reclamation and Closure**

Similar to under the no-action alternative, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed.

Whereas activities at Pinto Valley Mine under the no-action alternative would proceed directly to final reclamation after the 6-month transition period, reclamation under alternative 1 may be completed in three phases: interim, concurrent, and final reclamation. Interim reclamation consists of activities intended to stabilize facilities but does not include final closure. Concurrent reclamation consists of closure activities that are undertaken while other components of the mine are operational. Interim and concurrent reclamation, if conducted, would precede final reclamation. Final reclamation consists of the activities to close the site and prepare it for post-mining use. Post-closure maintenance and monitoring would continue after final reclamation. The estimated closure schedule may be shortened or lengthened depending on numerous factors. The following sections outline the interim, concurrent, and final reclamation concepts for Pinto Valley Mining Corp. facilities on National Forest System lands.

In accordance with Forest Service regulations at 36 CFR 228.13, the Forest Service has the authority to require financial assurances for reclaiming disturbances on National Forest System lands before approving a mining plan of operations. The agency may conduct additional comprehensive bond reviews and adjust the amount after modification of a reclamation or operating plan, an annual overview, or an inspection of the permit area. Bond release would be conducted in accordance with established criteria to meet the requirements of 36 CFR 228.8(g). At the time of the final EIS release, the Forest Service has not determined the amount of financial assurance required in accordance with 36 CFR 228.13(a), but Pinto Valley Mining Corp. will be required to provide such assurance prior to approving the mining plan of operations.

2.3.2.13.1 Best Available Demonstrated Control Technology Monitoring

Best available demonstrated control technology monitoring as required by the Pinto Valley Mining Corp.'s Aquifer Protection Permit would be the same as described under the no-action alternative but would commence approximately 7 years later due to the longer operational life of the mine under alternative 1.

2.3.2.13.2 Interim Reclamation and Closure

Interim closure may occur if there is a temporary suspension of mining, production, or other operations, or placement into standby status. Interim reclamation for specific Pinto Valley Mining Corp. facilities may be implemented on disturbed areas that are not needed at the time for active operations but may be used subsequently. The principal focus of interim reclamation will be to reduce wind and water erosion of inactive facilities using the appropriate best management practices. These facilities may be reactivated during the life of mine if warranted. Pinto Valley Mining Corp. has developed a plan for interim reclamation that details the procedures to be implemented during those times. Personnel requirements and site-wide and facility-specific procedures have been developed to provide for public safety and environmental protection while facilitating resumption of operations when appropriate. The areas subject to interim reclamation may include inactive tailings impoundments, waste rock dumps, and other disturbed areas that are not used for specific purposes.

2.3.2.13.3 Concurrent Reclamation

Where practical, Pinto Valley Mining Corp. will implement concurrent reclamation of facilities that reach capacity or have no further operational purpose, such as tailings impoundments or embankment faces, prior to conclusion of the active mining operations. Concurrent reclamation activities will be consistent with final closure requirements and meet the standards and goals listed below. The amount of concurrent reclamation accomplished each year will be tracked and reported to the Forest Service and Arizona State Mine Inspector’s Office.

2.3.2.13.4 Final Reclamation and Closure

Reclamation and closure operations for the majority of facilities would generally be the same as described under the no-action alternative, with a few key differences:

- Reclamation and closure activities would commence approximately 7 years later than under the no-action alternative due to the longer operational life of the mine under alternative 1.
- Some facilities may have already been partially reclaimed through interim or concurrent reclamation by the time of mine closure, as described above. Final reclamation would require any facilities that were subject to interim or concurrent reclamation to meet final reclamation goals.
- Closure plans for Tailings Storage Facility No. 4 would be different than under the no-action alternative in that closure of Tailings Storage Facility No. 4 would be conducted to provide positive drainage across the top surface, allowing storm water to drain off the facility and not collect on the top surface.
- After closure, the top surface of the tailings storage facilities would be regraded and covered to minimize infiltration of ongoing precipitation. A channel system would be constructed to convey non-contact water over the top of the reclaimed tailings to discharge directly to tributaries to Pinto Creek.

2.3.3 Proposed Action – Authorization of New and Existing Uses of National Forest System Lands

This section describes Pinto Valley Mining Corp.'s proposed action for the Pinto Valley Mine based on Pinto Valley Mining Corp.'s proposed mining plan of operations submitted to the Forest Service in May 2016. The proposed action, with the application of the monitoring and mitigation measures identified in section 4.4 in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," is the Forest Service preferred alternative.

In general, the majority of activities on private land would be the same as described under alternative 1; however, the proposed action includes additional expansion of mine facilities onto National Forest System lands. The description of the proposed action identifies and describes those project components that differ from alternative 1. For project components that would be the same as alternative 1, the sections below refer to the corresponding section in alternative 1.

The proposed action encompasses the following broad categories of actions that would extend the mine life by approximately 12 years compared to alternative 1 and 19 years[36] compared to the no-action alternative:

- Consolidation and authorization of previously authorized activities and permitted disturbances on National Forest System lands at the Pinto Valley Mine. Power lines, pipelines, roads, and other facilities and infrastructure on National Forest System lands at the Pinto Valley Mine are integral to the mining operations at the mine. As such, their authorization is most appropriate under a consolidated mining plan of operations.
- Authorization of new operations on National Forest System lands including expansion of the Open Pit and Tailings Storage Facilities Nos. 3 and 4, and construction or relocation of linear features (access roads, electrical power distribution lines, pipelines).
- Authorization of existing legacy encroachments on approximately 29 acres of National Forest System lands from prior mine operators associated with activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand (see map 1-1 in appendix A).

In addition to the activities described above that require Forest Service approval, the integrated mining operations at Pinto Valley Mine also includes Pinto Valley Mining Corp.'s actions on private lands that support ongoing and expanded mining operations. While the Forest Service does not have authority to regulate activities on private land, the actions on private lands are described and analyzed in accordance with 40 CFR 1508.25. These other activities on private lands are interdependent parts of the integrated mining operations at the Pinto Valley Mine, they are closely related to the proposed operations on National Forest System lands, and they generally would not occur unless the Forest Service takes action to approve previously authorized activities. The description of activities at the Pinto Valley Mine in this section distinguishes between activities that would occur on private land and those that would occur on National Forest System lands, and the effects of these actions are analyzed in chapter 3, "Affected Environment and Environmental Consequences."

Map 2-3 in appendix A shows the layout of existing and planned mining facilities and other physical mine components for the proposed action. Table 2-11 summarizes existing, proposed, and total surface

[36] The mine life under the proposed action is actually anticipated to be 18 years and 10 months longer than that of the no-action alternative when accounting for the estimated 2 months of continued mine operations under the no-action alternative. For simplicity and ease of comparison, the estimated difference in mine life has been rounded up to 19 years for purposes of this analysis.

disturbance for all project components under this alternative broken out by total, Forest Service, and private land. As noted previously, Pinto Valley Mine is an ongoing operation and active facility footprints have changed during the National Environmental Policy Act process. Existing surface disturbance reported in this EIS generally corresponds to facility footprints between submittal of the proposed mining plan of operations in May 2016 and additional information provided by Pinto Valley Mining Corp. during the EIS process. Additionally, some surface disturbance resulting from expansion of existing facility footprints would occur in areas of existing disturbance and would not constitute new surface disturbance.

Under the proposed action, recoverable copper production at Pinto Valley Mine is projected to extend the mine life by approximately 12 years compared to alternative 1 and approximately 19 years compared to the no-action alternative. The actual mine life may be shortened or lengthened depending on actual annual production rates achieved and other factors. Reclamation may be completed in three phases: interim, concurrent, and final reclamation. Interim reclamation consists of activities intended to stabilize facilities, but does not include final closure; concurrent reclamation consists of closure activities that are undertaken while other components of the mine are operational; and final reclamation consists of the activities to close the site and prepare it for post-mining use. Post-closure maintenance and monitoring would continue after final reclamation. Under the proposed action, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed. This estimated closure schedule may vary depending on numerous factors that would be determined during final closure and post-closure planning. Mining operations and facilities are described below for each phase of operations: active mining, reclamation, and post-closure.

Table 2-11. Estimated surface disturbance for the proposed action

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Final Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Mining									
Open Pit	746	9	754	219	19	238	965	27	992
Inert Limestone Stockpile	7	-	7	48	-	48	55	-	55
Main Dump	96	-	96	361	-	361	457	-	457
Northside Dumps Nos. 9.1, 9.3, 9.11	102	-	102	(<1)	-	(<1)	102	-	102
Southside Dump 13	6	-	6	-	-	-	6	-	6
North Barn Marginal Dump	36	-	36	-	-	-	36	-	36
Castle Dome Marginal Dump	25	-	25	20	-	20	44	-	44
West Dump	-	-	-	247	-	247	247	-	247
19.1 Dump	3	-	3	-	-	-	3	-	3
19 Dump	-	76	76	-	-	-	-	76	76
Borrow & Riprap Sources	22	-	22	668[37]	171	839	691	171	862
Subtotal, Mining Facilities	*1,033*	*84*	*1,118*	*1,603*	*114*	*1,717*	*2,637*	*198*	*2,835*
Milling and Processing									
Mill and Concentrator/Plant Site	152	13	165	-	-	-	152	13	165
Cottonwood Tailings Impoundment	44	278	322	-	-	-	44	278	322
Tailings Storage Facility Nos. 1 & 2 (includes Southside Dump 14 footprint, which lies atop these tailings storage facilities)	404	-	404	-	-	-	404	-	404
Tailings Storage Facility No. 3	264	6	270	21	22	43	285	27	312
Tailings Storage Facility No. 4	704	-	704	406	102	508	1,110	102	1,212
Leach Piles	654	-	654	(41)	-	(41)	613	-	613
Pregnant Leach Solution Pond/ancillary facilities	19		19	(19)	-	(19)	-	-	-
Solvent Extraction and Electrowinning Plant	17	-	17	-	-	-	17	-	17
Subtotal, Milling and Processing Facilities	*2,233*	*293*	*2,526*	*362*	*124*	*485*	*2,595*	*416*	*3,011*

[37] The 668 acres of surface disturbance associated with the borrow and riprap sources encompass 244 acres in areas that overlap existing disturbance areas and 425 acres of new surface disturbance. As a result, only the 425 acres of new disturbance associated with borrow and riprap sources are carried forward for the new surface disturbance totals.

Facility	Approximate Area of Existing Disturbance (acres)			Approximate Area of Additional Disturbance (acres)			Approximate Final Area of Disturbance (acres)		
	Private	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*	*Private*	*National Forest System*	*Total*
Transportation[38]									
National Forest System Roads	18	81	99	(1)	-	(<1)	17	81	99
Access Roads	3	44	47	3	7	11	6	51	57
Subtotal, Transportation Facilities	*21*	*124*	*145*	*3*	*7*	*10*	*24*	*132*	*155*
Utilities									
Electrical Power Lines[39]	37	20	57	(7)	(1)	(8)	30	19	49
Water Supply, Distribution, Use, and Treatment[40]									
Peak Wells[41]	2	1	3	-	-	-	2	1	3
Water Pipelines (Buried)[42]	2	10	11	(1)	(<1)	(1)	1	9	10
Water Pipelines (Surface)[43]	26	20	46	(1)	<1	(<1)	25	21	46
Ponds and Reservoirs[44]	55	41	96	(12)	(3)	(15)	43	38	81
Water Storage Tanks[45]	3	<1	3	-	-	-	3	<1	3
Subtotal, Water Use and Treatment Facilities	*86*	*72*	*158*	*(13)*	*(2)*	*(15)*	*73*	*70*	*143*
TOTAL	**3,349**	**566**	**3,915**	**1,087**	**229**	**1,317**	**4,436**	**795**	**5,232**

Notes: The Forest Service estimated surface disturbance for existing and proposed mining facilities using geographic information system data provided by Pinto Valley Mining Corp. representing the outer footprint of each facility. The sum of acreages of individual mining facilities may not add to subtotals and subtotals may not sum to totals due to overlap between footprints of some facilities and rounding of numbers. There may be slight differences between acreages reported in this final EIS that were calculated using geographic information system software and acreages reported in the mining plan of operations, permits, and other documents that may be derived from land surveys or other sources. Because Pinto Valley Mine is an active mine, facility footprints vary over time. Estimates of "existing disturbance" in this final EIS are close approximations of actual facility sizes and locations as of April 2018 and are considered sufficient for this environmental analysis but may not reflect current conditions exactly. Additionally, acreages of individual features by land ownership may not sum to row or column totals due to independent rounding.

[38] Disturbance for National Forest System roads and access roads was calculated based on an assumed disturbance width of 25 feet. There may be slight variations in total road length and acreages of disturbance among road permits, the mining plan of operations, and this final EIS due to changes in road status over time, reclamation status, geospatial data sources, and other factors.

[39] In general, power lines are within alignments of National Forest System roads, access roads, or other project components and overhead power lines are accessed by using the access roads. As a result, surface disturbance associated with power lines only includes those power lines that are not within the disturbance reported for the National Forest System roads and access roads. Power line disturbance was calculated based on assumed width of 18 feet.

[40] The only existing wastewater treatment facilities are located on Pinto Valley Mining Corp. property within disturbance areas accounted for under other facilities.

[41] Assumed a disturbance area of 0.06 acre per well for all Peak Wells.

[42] In general, water pipelines are within alignments of National Forest System roads, access roads, or other project components and the pipelines are accessed by using the access roads. As a result, surface disturbance reported for pipelines only includes those pipelines that are not within the alignments of National Forest System roads or access roads; surface disturbance for these pipelines was calculated based on an assumed width of 18 feet.

[43] Ibid.

[44] Surface disturbance for storm water facilities is included under ponds and reservoirs and other water use and treatment facilities.

[45] Only one water tank was located outside the footprints of other project components. Disturbance from this water tank was estimated to be less than 1 acre based on aerial imagery.

2.3.3.1 **Mining Facilities**

2.3.3.1.1 Open Pit

The Open Pit would be used in the same manner as described under the alternative 1; however, in addition to the planned extension of the Open Pit to the north and west onto 219 additional acres of private land, the pit would also be extended to the east onto approximately 19 acres of National Forest System lands by the end of the operational life of the mine (map 2-3 in appendix A). The Open Pit expansion onto mining claims on National Forest System lands would occur in the southeast corner of the existing Open Pit. This expansion will facilitate an increase in total pit depth, address areas of slope instability in the southeastern portion of the pit, and allow Pinto Valley Mining Corp. to access mineralization that extends onto the claims on National Forest System lands. Under the proposed action, the anticipated pit bottom elevation at the end of active mining operations is estimated to be approximately 2,240 feet above mean sea level, approximately 360 feet deeper than under the no-action alternative and approximately 270 feet deeper than under alternative 1.

The extension onto National Forest System lands would subsume existing infrastructure within an encroachment area east of the current pit footprint, into an authorized use area. Existing infrastructure southeast of the current pit footprint would be incorporated into the new authorization.

The area of unstable ground mentioned under the no-action alternative would be reconstructed as a temporary ramp to allow haul trucks to access a waste rock dump on the private Pinto Valley Mining Corp. property; this ramp would be subsumed by the pit after the waste rock dump reaches capacity.

Blasting would be conducted similar to that under alternative 1 except that blasting activities would continue for 12 years longer due to the longer operational life of the mine under the proposed action.

Pond K, a storm water pond that lies largely on private Pinto Valley Mining Corp. property south of the Open Pit, would be almost completely filled by the Castle Dome Marginal Dump. The small portion of Pond K that extends onto National Forest System lands would not be filled by the dump.

Several of the existing facilities on National Forest System lands would be removed or subsumed by the expanded Open Pit, including:

- The buried pipeline between the Mine Reservoir and the two water stands would be repositioned to accommodate the new Open Pit footprint (partially on National Forest System lands) and the Castle Dome Marginal Dump (entirely on private Pinto Valley Mining Corp. property).
- The electrical power line and poles would be removed.
- The powder magazine buildings would be removed
- The existing storm water ponds would be subsumed by further pit expansion, but the area would continue to be managed as a zero-discharge basin.

Total mining tonnages are forecast to remain at 58,000 tons of ore and 82,000 tons of waste rock per day and then gradually decrease during the last 7 years of active mining. Assuming a constant throughput rate, the mine could process an estimated total of 402,230,000 tons of ore and 568,670,000 tons of waste rock during the 19-year operational life of the mine under the proposed action.

2.3.3.1.2 Inert Limestone Stockpile

The Inert Limestone Stockpile would be used in the same manner as described for alternative 1, except that under the proposed action, an estimated 16,000,000 tons of limestone would be generated for storage over the life of the mine. The estimated top elevation of the Inert Limestone Stockpile at the end of active mining operations would be the same as under alternative 1 at an estimated 4,940 feet above mean sea level, and its outer slope would not exceed a ratio of 1.5 horizontal to 1 vertical. The Inert Limestone Stockpile would be constructed to maintain a 1.3 static factor of safety at the end of mine life.

2.3.3.1.3 Waste Rock Dumps

Main Dump

The Main Dump would be used in the same manner as described under alternative 1 with the footprint of the facility on private land expanding from 96 acres to 457 acres and predominantly overlying the existing Leach Piles; there would be no use of National Forest System lands for this facility. However, due to the increased duration of active mining operations under the proposed action, the top elevation of the Main Dump would be increased to approximately 5,075 feet above mean sea level, which represents an increase of approximately 180 feet compared to alternative 1 and an increase of approximately 410 feet compared to the no-action alternative.

Northside Dumps 9.1, 9.3, and 9.11

Northside Dumps 9.1, 9.3, and 9.11 would remain inactive as described under alternative 1. A portion of inactive Dump 9.11 would be covered by the West Dump when the West Dump is constructed. There would be no use of National Forest System lands for these facilities.

Southside Dumps 13 and 14

Southside Dumps 13 and 14 are located entirely on private land and would remain inactive as described under alternative 1. Southside Dump 14 is considered to be in a post-closure status by the Arizona Department of Environmental Quality and the Arizona State Mine Inspector.

Castle Dome Marginal Dump

The Castle Dome Marginal Dump would be constructed on private lands and used in the same manner as described under alternative 1. There would be no use of National Forest System lands for this facility.

West Dump

The West Dump would be constructed on private lands and used in the same manner as described under alternative 1, except the facility may have a higher final elevation because a larger quantity of waste rock would be generated from the Open Pit. An additional 153,000,000 estimated tons of waste rock would be generated for storage over the life of the mine at the West Dump. The West Dump would partially overlie two existing waste storage facilities (Dump 9.11, Tailings Storage Facility No. 3) and two processing facilities (embankment of the Leach Piles, Pregnant Leach Solution Pond area). There would be no use of National Forest System lands for this facility.

19.1 Dump

The 19.1 Dump would remain inactive as described under alternative 1. There would be no use of National Forest System lands for this facility.

19 Dump

Under the proposed action, the original use of National Forest System lands for the 19 Dump previously authorized under right-of-way PHX-080742 and plan of operations POO-003 would be reauthorized under a new, consolidated mining plan of operations. As described under alternative 1, the 19 Dump would remain inactive, but a portion of the stored overburden would likely be removed for use as cover material to reclaim certain features at the end of mine life as described in detail in the Mined Land Reclamation Plan. The reclamation plan for National Forest System lands will address reclamation for the 19 Dump (such as slope ratios and revegetation).

19 Extension Dump

As under the no-action alternative and alternative 1, Pinto Valley Mining Corp. has no current plans to construct the 19 Extension Dump and this facility is not included in the proposed mining plan of operations.

2.3.3.1.4 Borrow and Riprap Sources

Map 2-3 in appendix A depicts the locations of proposed borrow sources for the proposed action. Borrow and riprap sources on private land would be used in the same manner as described under alternative 1, but there would be approximately 67 additional acres of borrow and riprap sources developed on private lands under the proposed action, for a total of 731 acres of borrow and riprap sources on private lands. Approximately 287 of these acres would be located in areas of existing disturbance.

For the proposed action, Pinto Valley Mining Corp. also identified three new borrow sources on National Forest System lands totaling 171 acres that could be available to perform future reclamation of existing or proposed disturbances at Pinto Valley Mine on National Forest System lands. Approximately 76 acres of the proposed borrow sources would be located in areas of existing disturbance. The locations of these potential borrow sources were originally identified in appendix D-13 to the proposed mining plan of operations (SRK Consulting, Inc. 2016b), with some refinements made during development of the EIS. Pinto Valley Mining Corp. identified the following locations and intended uses for borrow sources on National Forest System lands:

- Borrow materials could be excavated from an area south of the Cottonwood Reservoir that abuts the eastern edge of the Cottonwood Tailings Impoundment, and used to cover the bottom of the drained, regraded Cottonwood Reservoir.
- An existing material stockpile at 19 Dump could be used to cover a small portion of the western embankment of Tailings Storage Facility No. 3 on National Forest System lands.
- New stockpiles could be created from materials excavated during the construction of a perimeter access road along the southeastern boundary of the Tailings Storage Facility No. 4 expansion area and used to cover the portion of Tailings Storage Facility No. 4 located on National Forest System lands, and potentially the eastern area of Tailings Storage Facility No. 4 on Pinto Valley Mining Corp’s private property.

2.3.3.2 <u>**Milling and Processing**</u>

2.3.3.2.1 Mill and Concentrator

The mill and concentrator site would be used in the same manner as described under alternative 1, except that approximately 254,040,000 more tons of ore would be generated for milling, and the mill and concentrator operational period would be approximately 12 years longer than under alternative 1 and 19 years longer than under the no-action alternative. Assuming a constant throughput rate, the mine could produce an estimated 2,430,100,000 pounds of copper concentrate and 23,750,000 pounds of molybdenum over the life of the mine.

2.3.3.2.2 Cottonwood Tailings Impoundment

Use of National Forest System lands for the inactive Cottonwood Tailings Impoundment would be the same as described under alternative 1. The reclamation plan for National Forest System lands will address reclamation for the Cottonwood Tailings Impoundment (such as reclamation objectives, maintenance, and revegetation).

2.3.3.2.3 Tailings Storage Facility No. 1/2

Tailings Storage Facility No. 1/2 would remain inactive as described under alternative 1. Tailings Storage Facility No. 1 is considered to be in post-closure status by the Arizona Department of Environmental Quality and the Arizona State Mine Inspector.

2.3.3.2.4 Tailings Storage Facility No. 3

Tailings Storage Facility No. 3 would be used intermittently in the same manner as described under alternative 1, except that its footprint would extend onto approximately 22 additional acres of unpatented claims on National Forest System lands to store a larger quantity of tailings, for a total of 27 acres on National Forest System lands. Tailings Storage Facility No. 3 would be extended onto an additional 21 acres of privately owned lands for a total acreage of 285 acres on private lands. The total area of the final facility footprint, including National Forest System and private lands, is estimated to be 312 acres.

The tailings already deposited on these claims (as previously authorized by plan of operations POO-001) would be covered, as would the infrastructure described above (as previously authorized by mining plan of operations POO-002, except the sediment trap). The elevation of Tailings Storage Facility No. 3 would be raised from the existing (2020) 3,785 feet above mean sea level up to 75 feet to a maximum elevation of 3,860 feet above mean sea level, consistent with the elevation permitted in the Aquifer Protection Permit. At this elevation, Tailings Storage Facility No. 3 would have an increased capacity of 23 million tons of additional tailings at a settled density of 90 pounds per cubic foot. The maximum extent of tailings on unpatented claims at the end of the proposed mining plan of operations would occupy approximately 27 acres of National Forest System lands. A larger quantity of tailings would be generated for storage at Tailings Storage Facility No. 3 and the operational period of Tailings Storage Facility No. 3 would be approximately 12 years longer than under alternative 1 and 19 years longer than under the no-action alternative.

The Tailings Storage Facility No. 3 supernatant pool may extend onto National Forest System lands as the impoundment expands and the reclaimed water system may be modified from its current trailer-mounted pump configuration. A barge pump with electrical power lines and return water line may be installed in the pool and, depending upon the size and depth of the pond, could be situated on National Forest System lands.

2.3.3.2.5 Tailings Storage Facility No. 4

Tailings Storage Facility No. 4 would be used in the same manner as described under alternative 1, but the boundary dams would not be raised further and the facility would be extended onto approximately 102 acres of National Forest System lands, subsuming the existing roads and electrical power lines near

Tailings Storage Facility No. 4 previously authorized by special use permit GLO-445302. Tailings Storage Facility No. 4 would be extended onto an additional 406 acres of privately owned lands for a total acreage of 1,110 acres on private lands. The total area of the final facility footprint, including National Forest System and private lands, is estimated to be 1,212 acres.

The top elevation of Tailings Storage Facility No. 4 would raise to a maximum elevation of 4,250 feet above mean sea level as tailings are added over the life of the mine, which represents an increase of approximately 160 feet compared to alternative 1 and an increase of approximately 292 feet compared to the no-action alternative. The final toe to top height would be approximately 1,045 feet. After expansion, Tailings Storage Facility No. 4 would be capable of storing 752 million tons dry weight of tailings at a settled dry density of approximately 95 pounds per cubic foot.

Raising the embankment top and the impoundment surface top elevation would extend the top surface as well as the tailings and supernatant pond onto adjacent unpatented claims on National Forest System lands. In addition, a portion of the embankment would be expanded onto National Forest System lands. One and possibly both of the barge-mounted pumps and related pipeline for the reclaimed water system would be moved to National Forest System lands to accommodate the supernatant pond when it extends onto National Forest System lands.

2.3.3.2.6 Leach Piles

The use of the Leach Piles would be as described under alternative 1.

2.3.3.2.7 Pregnant Leach Solution Pond and Ancillary Facilities

The use of the Pregnant Leach Solution Pond and ancillary facilities would be as described under alternative 1.

2.3.3.2.8 Solvent Extraction and Electrowinning

Operation of the Solvent Extraction and Electrowinning Plant would be as described under alternative 1.

2.3.3.3 **Roads**

2.3.3.3.1 National Forest System Roads

Pinto Valley Mining Corp. would continue to use National Forest System roads in the same manner as described under alternative 1, but their use to support active mining would continue for approximately 12 more years. Under the proposed action, Pinto Valley Mining Corp. would continue to maintain National Forest System Road 287 as described under alternative 1 and potential realignment would be considered as needed. Pinto Valley Mining Corp. will maintain public access to National Forest System Road 287 across Pinto Valley Mining Corp.'s private lands in accordance with the Forest Service's easement. Pinto Valley Mining Corp. would coordinate with the Forest Service on any realignments of National Forest System Road 287.

2.3.3.3.2 Access Roads

Use of access roads would be similar to that described under alternative 1, with the exceptions noted below.

A new perimeter road would be constructed around the proposed final footprint of the Open Pit. Pinto Valley Mining Corp. plans to design and construct the perimeter road within a buffer zone around the proposed final Open Pit footprint, on unpatented claims. The actual road alignment has not yet been determined. The road would likely average 25 feet wide of surface disturbance, with cut and fill areas of various widths to accommodate vehicle and mobile equipment crossing the rugged terrain. Water from the dispenser system (currently used only on private Pinto Valley Mining Corp. property) would be used for dust control on the new perimeter road as needed.

A 2.7-mile-long perimeter access road would be constructed around the proposed final footprint of Tailings Storage Facility No. 4 to access the facility for monitoring purposes. Approximately 2,835,000 cubic yards of excess material from the cuts is expected to be generated by the road construction. The excess material would be stockpiled adjacent to the perimeter road in three locations, generally on the downhill (west) side of the road where topography is suitable for material storage and future recovery. Pinto Valley Mining Corp. intends to use stockpiled materials from access road construction for reclamation of Tailings Storage Facility No. 4. The preliminary design of the stockpiles, based on the quantity of material that would be generated and the local topography, suggests that the three stockpiles would occupy approximately 44 acres of National Forest System lands adjacent to the perimeter road.

Some existing access roads previously authorized under plan of operations POO-0002 and special use permit GLO-445303 would be subsumed by further expansion of the Open Pit, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4. The total length of the access roads that would be subsumed is estimated to be approximately 2.5 miles.

2.3.3.3.3 Dust Control

Similar to alternative 1, Pinto Valley Mining Corp. would apply the fugitive dust control plan (Capstone Mining Corp. 2021) and dust-control practices on the road network to reduce fugitive dust emissions.

2.3.3.4 **Utilities**

2.3.3.4.1 Electrical Power Lines

Use of electrical power lines would be similar to that described under alternative 1 except:

- Electrical infrastructure use for active mining would be extended 12 years.
- Some electrical power lines previously authorized by special use permit GLO-445302 would be subsumed by Tailings Storage Facility No. 4.

Approximately 1 acre of the electrical infrastructure would be subsumed by the proposed further development of the Open Pit and Tailings Storage Facility No. 4. The only power line Pinto Valley Mining Corp. intends to add on National Forest System lands is for continued operation of the Tailings Storage Facility No. 4 reclaim barge as the supernatant pond extends up Eastwater Canyon in a southeasterly direction. The alignment of this power line has not been determined; it is assumed that the alignment would approximately follow the existing alignment of the power line from the private Pinto Valley Mining Corp. property to the Tailings Storage Facility No. 4 footprint, but for an unknown length. It is also assumed that the new power line length would be approximately the same as the removed power line length. Potential realignments of power lines would be coordinated with the Forest Service and Forest Service approval would be required prior to realignments.

2.3.3.4.2 Lighting

Lighting at the Pinto Valley Mine would be the same as described under alternative 1, except that lighting during active mining would continue for approximately 12 more years than under alternative 1.

Like alternative 1, the locations of mobile light plants stationed at active areas of the Open Pit and waste rock dumps may shift slightly with continued excavation and deposition of mined materials.

2.3.3.5 **Water Supply, Distribution, Use, and Treatment**

Water supply, distribution, use, and treatment would generally be the same as described under alternative 1, except that water use for active mining operations would continue for approximately 12 more years. As a result, Pinto Valley Mine operations would use an estimated 297,952 acre-feet of water (including 48,177 acre-feet of fresh water and 249,775 acre-feet of reclaimed water) over the estimated 19 years of ongoing mine operations.

2.3.3.5.1 Peak Well Field

Forest Service authorization and use of the water pipelines and power lines to the Peak Well field would be the same as described under alternative 1 except its use would continue for approximately 12 more years of active mining operations.

2.3.3.5.2 Burch Pipeline System

Use of the Burch Pipeline System would be the same as described under alternative 1 except its use for active mining would continue for approximately 12 more years. Additionally, the northernmost segment of the pipeline between the Mine Reservoir and the water fill stations would be relocated to accommodate the extended Open Pit.

2.3.3.5.3 Other Water Pipelines

Use of other water pipelines would be the same as described under alternative 1 except their use would continue for approximately 12 more years of active mining operations.

2.3.3.5.4 Ponds and Reservoirs

Use of ponds and reservoirs would be the same as described under alternative 1, except their use would continue for approximately 12 more years of active mining operations and some existing storm water ponds in encroachment areas would be subsumed by the Open Pit.

2.3.3.5.5 Water Storage Tanks

Use of water storage tanks on National Forest System lands would be the same as described under alternative 1 but would be reauthorized for approximately 12 more years under a new, consolidated mining plan of operations and would continue during active mining operations and reclamation and closure.

2.3.3.5.6 Storm Water Management

Storm water management would be the same as described under alternative 1 but would be extended for approximately 12 more years. Additionally, some storm water management structures would be reconfigured to accommodate expansions of the Open Pit, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4.

2.3.3.5.7 Wastewater Treatment

Use of the wastewater treatment plant would be the same as described under alternative 1 but would be extended by approximately 12 years.

2.3.3.6 **Monitoring and Inspections**

Monitoring and inspections would be the same as described under alternative 1 but would continue for approximately 12 additional years due to the longer operational life of the mine.

Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," for additional information on monitoring and mitigation responsibilities.

2.3.3.7 **Support Facilities**

2.3.3.7.1 Plant Site

Use of the plant site would be as described under alternative 1, but its operational period would be extended by approximately 12 years.

2.3.3.7.2 Pinto Valley Mine Sign, Fencing, and Security

Use of the Pinto Valley Mine sign would be as described under alternative 1, but the use of National Forest System lands for the sign previously authorized under special use permit GLO-445301 would be reauthorized under a new, consolidated mining plan of operations.

Security personnel schedules and practices during mine operation would be the same as described under alternative 1. The installation of security fencing would occur as described under alternative 1, except fencing would extend around the expanded footprint of the Open Pit and fencing installation and security monitoring during closure and reclamation would begin approximately 12 years later than under the no-action alternative due to the longer operational life of the mine under alternative 1.

2.3.3.8 **Sanitary and Solid Waste Disposal**

Sanitary and solid waste disposal would be performed as described under alternative 1, but disposals associated with active mining would be extended by approximately 12 years.

2.3.3.9 **Hazardous Materials Management**

2.3.3.9.1 Reagent Transportation and Storage

Reagent transportation and storage would be performed as described under alternative 1, but activities associated with active mining including the delivery of reagents to Pinto Valley Mine via National Forest System Road 287 would be extended by approximately 12 years.

2.3.3.9.2 Spill Prevention and Emergency Response

Spill prevention and emergency response would be performed as described under alternative 1, but activities associated with active mining would be extended by approximately 12 years.

2.3.3.9.3 Waste Management

Waste management would be performed as described under alternative 1, but activities associated with active mining would be extended by approximately 12 years. As under alternative 1, with the exception of petroleum products for powering, lubricating, or cooling motor vehicles or transformers, no regulated, radioactive, hazardous, or toxic substances would be used on National Forest System lands in any of the activities described under the proposed action. No regulated, radioactive, hazardous, or toxic substances would be generated, stored, or disposed of on National Forest System lands.

2.3.3.10 **Safety and Fire Protection**

Safety and fire protection would be performed as described under alternative 1, but activities associated with active mining would continue for approximately 12 more years and would encompass approximately 229 additional acres of National Forest System lands authorized for use.

2.3.3.10.1 Stability Monitoring for Mining Facilities

Stability monitoring for the Open Pit and other facilities would be the same as described under alternative 1, but activities associated with active mining would continue for approximately 12 more years.

2.3.3.11 **Exploration Activities**

Pinto Valley Mining Corp. may occasionally conduct exploration activities on private lands as described under alternative 1. Expansion of the Open Pit onto National Forest System lands may increase Pinto Valley Mining Corp.'s need to conduct exploration activities on Tonto National Forest; however, there are no proposed exploration activities on National Forest System lands associated with the proposed action. As under alternative 1, any additional future exploration activities proposed on National Forest System lands would be undertaken in accordance with the applicable mining regulations and subject to the Forest Service's necessary compliance with other applicable Federal environmental laws.

2.3.3.12 **Workforce, Vehicle Trips, and Schedule**

2.3.3.12.1 Workforce

The workforce would be the same as described under alternative 1, except employment of up to 690 staff associated with active mining would continue for approximately 12 more years.

2.3.3.12.2 Vehicle Trips

Vehicle trips would be the same as described under alternative 1, except the estimated 191,540 average annual mine-related vehicle trips associated with mine operation would continue for approximately 12 more years.

2.3.3.12.3 Schedule

The life of mine schedule under the proposed action would be extended by approximately 12 years compared to alternative 1 and by 19 years compared to the no-action alternative.

2.3.3.13 **Reclamation and Closure**

Similar to under alternative 1 and the no-action alternative, final reclamation would begin the year following cessation of operations and is expected to last approximately 12 years. Post-closure activities are anticipated to extend 30 years after reclamation is completed.

Reclamation activities would be performed as described under alternative 1 but would begin approximately 12 years later and an additional 229 acres of disturbed National Forest System lands would be subject to reclamation (with the exception of approximately 19 acres of National Forest System lands affected by expansion of the Open Pit that would generally not be reclaimed) in accordance with the reclamation plan for National Forest System lands. Compared to alternative 1, an additional 178 acres of disturbed private lands would be subject to reclamation in accordance with the Pinto Valley Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a).

2.3.3.14 **Post Closure**

Post-closure activities would be performed as described under alternative 1, but would begin approximately 12 years later and would be modified to account for the expanded facilities on National Forest System lands.

2.4 Alternatives Considered but Eliminated from Detailed Study

Reasonable alternatives include those "that are practical or feasible from technical and economic standpoints and using common sense, rather than simply desirable from the standpoint of the applicant" (Council on Environmental Quality 1981). The Forest Service evaluated a range of reasonable alternatives to the proposed action. A variety of alternatives were eventually eliminated from detailed analysis because they did not meet the following criteria as described in the Forest Service Handbook (Forest Service Handbook 1909.15), Council on Environmental Quality guidance (40 CFR 1500–1508), and other sources such as the Council on Environmental Quality Forty Most Asked Questions Concerning National Environmental Policy Act Regulations (Council on Environmental Quality 1981):

1. Does the alternative meet the purpose and need for the action?
2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?
3. Is the alternative technically feasible?
4. Is the alternative economically feasible?
5. Is the alternative illegal?
6. Does the alternative cause unreasonable environmental harm?
7. Is the alternative available?

Considering these criteria, the responsible official determined which alternatives would be evaluated in the EIS and which would be eliminated from detailed consideration. A summary of alternatives considered but eliminated from detailed study follows. The descriptions capture the general rationale for eliminating from detailed study general groups of alternative themes. Refer to section 4.0, "Alternatives Considered but Eliminated from Detailed Analysis," of the Final Alternatives Report (Forest Service 2019a) for more information.

2.4.1 Alternative Locations or Configurations for Tailings Storage Facilities

From 2014 through 2016, prior to the start of the environmental review process, Pinto Valley Mining Corp. conducted an extensive analysis of potential tailings storage facility locations as part of long-term planning for mine development. Initial work consisted of screening studies of potential sites near Pinto Valley Mine within the area that tailings could be cost-effectively transported from the mill, using U.S. Highway 60 as the southern boundary and Pinto Creek as the western boundary of the analysis area.

Pinto Valley Mining Corp. evaluated 14 potential tailings storage facility sites: Barnes Peak, Granite Basin North, Granite Basin South, Myberg Basin, Bohme Ranch, Upper Ripper Spring, Lower Ripper Spring, Baseline, Upper Cottonwood, Upstream Tailings Storage Facility No. 4, Setback Tailings Storage Facility

No. 4, Incidental Tailings Storage Facility No. 3 Extension (into the lower segment of Gold Gulch), and Miller Gulch. Pinto Valley Mining Corp. evaluated the 14 sites to determine if they met the project objective: storage of 400–435 million metric tons of tailings in a single impoundment, or if necessary, split between two impoundments. Five sites moved forward for a concept-level study: Barnes Peak, Granite Basin South, Upper Cottonwood, Tailings Storage Facility No. 3 Extension, and Setback Tailings Storage Facility No. 4. These five sites underwent additional screening criteria, including land availability, geology, biological resources and habitat, extent of known cultural resources, known or suspected historic mine workings, surface management constraints, liability implications, permitting complexity, conceptual engineering, and operational logistics. The following sections summarize the results of this screening process for the five sites and map 2-4 in appendix A depicts the location of the five alternate site locations that were considered for the tailings storage facilities.

Pinto Valley Mining Corp. also evaluated whether Tailings Storage Facilities No. 3 and No. 4 could accommodate tailings generated by continued active mining operations for 19 years without expansion onto National Forest System lands (AMEC 2014a).

Detailed results of the screening process are documented in memos and reports prepared by AMEC Foster Wheeler, Inc. (2015a, 2015b, 2017a) on behalf of Pinto Valley Mining Corp.

2.4.1.1 **Barnes Peak**

Pinto Valley Mining Corp. evaluated the potential to develop a new tailings storage facility north of the existing Tailings Storage Facility No. 4, east of Pinto Creek. The Barnes Peak site is situated within portions of Sections 25, 35, and 36 of Township 2 North, Range 13 East. The site would be accessed via National Forest System Road 287 and on existing roads to the Peak Well field. This alternative could reduce the risk of dam failures and slope stability issues associated with the proposed expansion and raising of Tailings Storage Facility No. 4 (issue 8 in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

This alternative would result in several environmental and resource conflicts that, alone or in combination with other factors, resulted in elimination of this alternative. The site is located entirely on National Forest System lands and would likely require relocation of twin 500-kilovolt transmission lines, resulting in a larger area of disturbance on National Forest System lands than the proposed action. In addition, development of a tailings storage facility in this location would affect several Pinto Valley Mine water supply wells, would require seepage control for five drainages, and could increase the potential for adverse impacts on water quality in nearby Pinto Creek.

Criterion 3. Is the alternative technically feasible?

Using this site as a stand-alone tailings repository is technically infeasible due to its limited capacity and high embankment ratio.

2.4.1.2 **Granite Basin South**

Pinto Valley Mining Corp. evaluated the potential to develop a new tailings storage facility in Granite Basin, east of the Webster Mountain ridgeline and within the Pinal Creek watershed. The Granite Basin South site is within portions of Sections 3, 4, and 5 of Township 1 North, Range 14 East, and Sections 32, 33, and 34 of Township 2 North, Range 14 East. The site would be accessed via National Forest System Road 225 from Arizona State Route 88, but additional access would be required to reach the site. This alternative could reduce the risk of dam failures and slope stability issues associated with the proposed expansion and raising of Tailings Storage Facility No. 4 (issue 8 in chapter 1) and avoid further impacts on groundwater and surface water in the Pinto Creek watershed (issue 9 in chapter 1). This alternative was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

This alternative would result in several environmental and resource conflicts that, alone or in combination with other factors, resulted in elimination of this alternative. The site is located entirely on National Forest System lands, resulting in a larger area of disturbance on National Forest System lands than the proposed action. Historic mine workings may present unique geologic hazards, the area contains several natural springs that could be affected by development, and there is no existing access to the site.

Criterion 4. Is the alternative economically feasible?

Pinto Valley Mining Corp. determined that this alternative would not be economically feasible because of high startup and operational costs due to distance, geologic hazards, and the need for extensive data collection.

2.4.1.3 Upper Cottonwood

Pinto Valley Mining Corp. evaluated the potential to develop a new tailings storage facility south of the Pinto Valley mill and immediately east (upgradient) and south of the existing inactive Cottonwood Tailings Impoundment. The embankment would be approximately 2 miles north of U.S. Highway 60 and would be visible from the highway. The site is within portions of Sections 32 and 33 of Township 1 North, Range 14 East. The site would be accessed from National Forest System Roads 287 and 287B. This alternative could reduce the risk of dam failures and slope stability issues associated with the proposed expansion and raising of Tailings Storage Facility No. 4 (issue 8 in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 3. Is the alternative technically feasible?

Pinto Valley Mining Corp. determined that using this site as a standalone tailings repository is technically infeasible because the steep terrain would result in unacceptable embankment raise rates.

Criterion 4. Is the alternative economically feasible?

Pinto Valley Mining Corp. determined that this alternative would not be economically feasible because it would require significant infrastructure relocation to develop this site, including relocation of 115-kilovolt power lines, the Carlota Substation, National Forest System Road 287, and National Forest System Road 287B.

2.4.1.4 Tailing Storage Facility No. 3 Extension

Pinto Valley Mining Corp. evaluated the potential to extend the existing Tailings Storage Facility No. 3 to the north and to the east, almost entirely on private Pinto Valley Mining Corp. property. The embankment would extend from the northwest corner of the existing Tailings Storage Facility No. 3 across Gold Gulch. The Tailings Storage Facility No. 3 extension site is located within Sections 13, 14, and 23–25 in Township 1 North, Range 13 East. This site would likely be accessed through Pinto Valley Mine and National Forest System Road 287, but would require a major realignment of National Forest System Road 287. Designs for this facility could accommodate gravity placement of all tailings over much of the planned mine life. This alternative would result in less disturbance of National Forest System lands than the proposed action that could have long-term impacts on landscape productivity and function (issue 3 in chapter 1) and could reduce the risk of dam failures and slope stability issues associated with the proposed expansion and raising of Tailings Storage Facility No. 4 (issue 8 in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 6. Does the alternative cause unreasonable environmental harm?

Due to its proximity to Pinto Creek, this alternative may not provide adequate environmental safeguards for tailings seepage and surface water management. A U.S. Army Corps of Engineers–issued Approved Jurisdictional Determination recognized waters within this site as draining to waters of the U.S., which would necessitate Clean Water Act section 404 permitting. This alternative was eliminated because, in accordance with 40 CFR 230.10(a), no discharge of dredged or fill material should be permitted if there is a practicable alternative (in this case the proposed action) that would have less adverse impact on the aquatic ecosystem.

Criterion 7. Is the alternative available?

After the selection of the extended Tailings Storage Facility No. 4 as the preferred site for tailings management, a large portion of the Tailings Storage Facility No. 3 Extension site was evaluated and selected as the site for waste rock deposition (the West Dump) and is no longer available for tailings management.

2.4.1.5 Setback Tailings Storage Facility No. 4 and Higher Mill Throughput Rate

Pinto Valley Mining Corp. evaluated the potential to extend the existing Tailings Storage Facility No. 4 to accommodate tailings generated with a higher mill throughput rate than achieved under current and proposed operations (as much as 99,000 tons per day versus the current rate of approximately 58,000 tons per day). Under this alternative, Tailings Storage Facility No. 4 would be expanded to the east onto National Forest System lands within the Eastwater Canyon drainage and raised to its maximum elevation of approximately 4,200 feet. The site is located within Sections 1, 12, and 13 in Township 1 North, Range 13 East, and Sections 6, 7, 8, 17, and 18 of Township 1 North, Range 14 East. Access to the site would be through Pinto Valley Mine. This alternative was considered by Pinto Valley Mining Corp. for economic reasons. This alternative would result in a shorter mine life, which would decrease the duration of impacts on recreation and traffic and transportation (issue 6 in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 3. Is the alternative technically feasible?

Pinto Valley Mining Corp. determined that use of the expanded Tailings Storage Facility No. 4 as a standalone tailings storage facility would be technically infeasible at a mill throughput rate of 99,000 tons per day because it would result in unacceptably high embankment raise rates.

2.4.1.6 Do not Extend Tailings Storage Facilities onto National Forest System Lands

Pinto Valley Mining Corp. evaluated whether Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 could accommodate tailings from continued mining through 2039 without expansion onto National Forest System lands. This alternative would result in less disturbance of National Forest System lands than the proposed action that could have long-term impacts on landscape productivity and function (issue 3 in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 3. Is the alternative technically feasible?

A prefeasibility report prepared by AMEC Foster Wheeler, Inc. (2014a) determined that it is not technically feasible to expand the Open Pit onto National Forest System lands without also expanding

Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 onto National Forest System lands because the existing tailings storage capacity cannot accommodate tailings from an expanded Open Pit. Expansion of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 onto private land instead of National Forest System lands is limited due to topography, existing facilities, and other factors.

2.4.2 Water Supply Alternatives

The Forest Service evaluated potential alternatives available at the time of this EIS to address water resource issues listed in chapter 1, including alternative water supply and delivery options, as described below. Pinto Valley Mining Corp. will continue to evaluate alternate water supply sources as opportunities arise.

2.4.2.1 Developing a New Well Field Farther Downstream of Pinto Valley Mine and Transporting Water to Pinto Valley Mine by Pipeline

An alternative was considered in which Pinto Valley Mining Corp. would develop a new well field farther downstream of Pinto Valley Mine than the existing Peak Well field. For example, a new well field could be developed closer to Roosevelt Lake and then water could be pumped to Pinto Valley Mine by pipeline. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1). This alternative was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

Depending on the source, groundwater withdrawals from the new well field would likely generate a cone of depression that could infringe on senior surface and groundwater rights, creating a resource conflict. If groundwater withdrawals affect stream flow or shallow groundwater, this alternative could also result in adverse environmental effects by reducing water availability for vegetation, wildlife, and stream flow. Development of the new well field farther downstream in the Tonto National Forest would also necessitate surface disturbance on National Forest System lands and other lands for construction of drill pads, maintenance roads, booster stations, power lines, and pipelines that could have a variety of adverse environmental effects.

Criterion 4. Is the alternative economically feasible?

Pinto Valley Mining Corp. has made substantial economic investments in ongoing operation of, maintenance of, and modifications to the Peak Well field. The additional costs that would be necessary to construct a new well field farther downstream combined with forgone investments in the existing Peak Well field would be economically infeasible for Pinto Valley Mining Corp.

Criterion 7. Is the alternative available?

Pinto Valley Mining Corp. does not own any land downstream of the mine closer to Roosevelt Lake. Therefore, Pinto Valley Mining Corp. would have to obtain Forest Service authorization to use National Forest System lands or acquire lands in the location of the new well field in order to implement the alternative.

2.4.2.2 Developing a New Deep-water Well without Hydraulic Connectivity to the Pinto Creek Watershed

An alternative was considered in which Pinto Valley Mining Corp. would develop a new deep-water well that has no or negligible hydraulic connectivity to surface water resources in the Pinto Creek watershed. Development of such a well could resolve potential conflicts with the administration of water rights in the Pinto Creek watershed and decrease environmental impacts associated with reduced flow in Pinto Creek from continued groundwater pumping in the Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 3. Is the alternative technically feasible?

This alternative may be technically infeasible because competent, low-permeability bedrock encountered at deeper levels below the ground surface is not likely to produce needed quantities of water. Additionally, the shallow alluvial groundwater system may be hydraulically connected to the deeper bedrock groundwater flow system, though the effects of drawdown may not be evident at the surface for a longer period of time than for shallower alluvial wells.

2.4.2.3 Increasing Water Supply from the East Water System thereby Reducing New Withdrawals from the Peak Well Field

Pinto Valley Mine currently receives an average of 1,700 gallons per minute of water from the East Water system. This water comes from multiple sources transmitted to the Pinto Valley Mine site by the Burch pipeline including the Old Dominion mine, the Diamond H Open Pit dewatering, the Myberg Basin, treated water from the Pinal Creek Project (a groundwater remediation project funded dominantly by Freeport-McMoRan), and three groundwater wells on private land. To address potential impacts on Pinto Creek from water withdrawals at the Pinto Valley Mine Peak Well field in the Pinto Creek watershed, an alternative was considered that would increase the water supply from the East Water system, which could reduce the amount of water needed from the Peak Well field and thus reduce potential impacts on the Pinto Creek watershed (issues 9A, 9C, and 9E in chapter 1). This alternative was eliminated because it would not meet the following criterion.

Criterion 7. Is the alternative available?

Water withdrawals from existing sources feeding the Burch pipeline are at or near maximum capacity and the water rights are held by BHP.

2.4.2.4 Water Supply from Freeport-McMoRan

Pinto Valley Mining Corp. has and continues to pursue water-sourcing arrangements with Freeport-McMoRan Miami, Inc. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1). This alternative was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

Sourcing water from the Miami Mine would present a variety of environmental and resource conflicts due to the lack of existing pumping and piping infrastructure and power supply, and the additional land use authorizations that would be required for a new pipeline system connecting the Miami Mine to the Pinto Valley Mine. Additional pipelines, pumps, and other infrastructure would result in surface disturbance and other environmental impacts.

Criterion 7. Is the alternative available?

Freeport-McMoRan Miami, Inc. has stated that it will not entertain the transfer or sale of fresh water. Pinto Valley Mining Corp. has also expressed interest in obtaining water from Freeport-McMoRan Miami, Inc. from the various onsite pits and catchments at the Miami Mine. Freeport-McMoRan Miami, Inc. is considering this possibility, but a variety of technical and economic challenges would accompany the transfer of any water from the Miami Mine.

2.4.2.5 Water Supply from the Town of Miami

Pinto Valley Mining Corp. met with the Miami town manager in late 2014 to explore the use of public water supply and wastewater treatment effluent from the town to supply water to the Pinto Valley Mine. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

As with the "Water Supply from Freeport-McMoRan" alternative considered above, sourcing water from the Town of Miami would present a variety of environmental and resource conflicts due to the lack of existing pumping and piping infrastructure and power supply, and the additional land use authorizations that would be required for a new pipeline system connecting the Town of Miami to the Pinto Valley Mine. Additional pipelines, pumps, and other infrastructure would result in surface disturbance and other environmental impacts.

Criterion 7. Is the alternative available?

The town manager reported that the Town of Miami has no water supply system of its own. The Arizona Water Company, a private water purveyor in the area, provides the Town of Miami with its water supply. Freeport-McMoRan already contracted with the Town of Miami to acquire all wastewater treatment effluent and there is no further source of water or wastewater to acquire from the Town of Miami (see "Water Supply from Freeport-McMoRan" above).

2.4.2.6 Water Supply from the City of Globe

Pinto Valley Mining Corp. explored the potential for water supply from the City of Globe in early 2015. The City of Globe maintains a well field in the Cutter Basin, east of the Pinal Creek watershed and extending onto the adjacent San Carlos Apache Reservation. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 7. Is the alternative available?

The City of Globe has indicated that there is no excess water to transfer and was considering installation of additional wells near its existing well field just to meet water demands for the city. In addition, the City of Globe's wastewater treatment effluent is currently subject to an undisclosed agreement with Freeport-McMoRan.

2.4.2.7 Resolution Copper Mine Dewatering Supply to the Pinto Valley Mine

As part of the Resolution Copper project, Resolution Copper is “dewatering,” or removing large amounts of water, deep within the bedrock. An alternative was considered that would use some of the water from Resolution Copper Mine dewatering to offset new fresh water withdrawals from the Peak Well field. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

The Resolution Copper project is approximately 8.4 miles from Pinto Valley Mine. Creating a water delivery system to the Pinto Valley Mine would present a variety of environmental and resource conflicts due to the lack of existing pumping and piping infrastructure and power supply, and the additional land use authorizations that would be required for a new pipeline system connecting the Resolution Copper Mine to Pinto Valley Mine. Additional pipelines, pumps, and other infrastructure would result in surface disturbance and other environmental impacts.

Criterion 7. Is the alternative available?

Water resulting from Resolution Copper dewatering operations is already treated and used for irrigation purposes.

2.4.2.8 Diverting Carlota Mine Water Use to the Pinto Valley Mine Following Closure of the Carlota Mine

The Carlota Mine, adjacent to the Pinto Valley Mine site, is estimated to continue leaching operations for several more years. The Forest Service estimates that transfer of the Carlota Mine authorized use to Pinto Valley Mining Corp. could result in an additional flow of 500 to 600 gallons per minute for use by Pinto Valley Mine. An alternative was considered that would divert this water for use at Pinto Valley Mine instead of the water returning directly to Pinto Creek. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

The Forest Service determined that this option for water supply might not provide overall net benefits to water resources because continued withdrawals could result in a net loss of water from the Haunted Canyon watershed.

Criterion 7. Is the alternative available?

The Carlota Mine is projected to continue operations for several more years. As such, diverting Carlota Mine water for use at the Pinto Valley Mine is currently not available.

2.4.2.9 Develop and Implement a Peak Well Field Pumping Plan

Pumping from some Peak Wells may have a greater effect than others based on well depth and proximity to Pinto Creek. The Forest Service considered the potential for developing and implementing a Peak Well field pumping plan that reduces water withdrawal from Peak Wells that draw a greater volume of alluvial water versus water from deeper bedrock aquifers. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criterion.

Criterion 3. Is the alternative technically feasible?

This alternative would be technically infeasible because Pinto Valley Mining Corp. does not have excess pumping capacity that would allow for idling of Peak Wells closest to Pinto Creek.

2.4.2.10 Using Water from the Carlota Mine Pit Lake

An alternative was considered that would divert water from the Carlota Mine Pit Lake to reduce or replace new fresh water withdrawals from the Peak Well field. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 1: Does the alternative meet the purpose and need for the action?

No. The purpose of and need for the action is to consolidate prior land use authorizations, authorize prior inadvertent encroachments, and authorize expansion of certain mine facilities onto National Forest System lands. Water is needed to operate the mine, but it is not the purpose of and need for the action. Furthermore, the volume of water available from the Carlota Mine Pit is insufficient to offset the volume of water available from the Peak Well field.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

The Forest Service determined that withdrawals from the Carlota Mine Pit Lake would delay natural equilibration of the pit lake water as monitored and approved.

Criterion 7. Is the alternative available?

The Carlota Mine is projected to continue operations for several more years. As such, diverting Carlota Mine pit lake water for use at the Pinto Valley Mine is currently not available. Pinto Valley Mining Corp. will continue to coordinate with Carlota Copper Company on potential use of Carlota Mine pit lake and Carlota Mine water wells.

2.4.2.11 Increasing the Capacity of the Burch Pipeline

Pinto Valley Mining Corp. continues to search for supplemental water sources for use at Pinto Valley Mine. The most viable sources of supplemental water from outside the Pinto Creek watershed are anticipated to be from the east or north. Existing infrastructure, including the Burch pipeline and pump station, extend east of Pinto Valley Mine and are capable of conveying greater volumes of water than currently utilized. Should other sources of water become available, Pinto Valley Mining Corp. intends to maximize the existing capacity of the Burch pipeline. The pipeline itself requires regular maintenance and replacement. Were a source or sources of water of substantially greater volume identified and made available, twinning the existing Burch pipeline or upgrading the existing pipeline diameter or pressure tolerances would be given priority before pursuit of an alternate pipeline alignment (such as along the U.S. Highway 60 right-of-way).

The corridor currently connects Pinto Valley Mine with local land holdings of Freeport-McMoRan Miami, Inc. and BHP. The Burch pipeline corridor might well serve interests of Capstone Mining Corp., Freeport-McMoRan Miami, Inc., BHP, or others operating in the area. Much as it was used in the past for copper concentrate slurry, the Burch pipeline corridor could conceivably serve to host infrastructure for transport of affected water, copper concentrate, tailings, waste rock, ore, or other materials in addition to its current use for water and electricity. The corridor is well established and generally hidden from public view.

Criterion 7. Is the alternative available?

This alternative will be periodically reevaluated over the life of the mine in the event that supplemental water sources become available. However, for reasons described in previous water supply alternatives, no viable supplemental water sources have been identified at this time.

2.4.3 Other Alternatives

2.4.3.1 Partial Backfilling of the Open Pit and Pumping and Treating Pit Lake Water

The Forest Service considered the potential for partial backfilling of the Open Pit to prevent the formation of a post-closure pit lake. This alternative could reduce evaporative water loss from the pit lake and address potential ecological risk associated with the projected post-closure pit lake water chemistry (such as ingestion and exposure by wildlife) (issue 9F in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

Pit lake geochemical modeling results indicate that the pit lake water quality is anticipated to be acidic and exceed reference water quality standards for several metals, metalloids, and other constituents (SRK Consulting, Inc. 2019b). The Pinto Valley Mine Groundwater Modeling for Mine Extension report (SRK Consulting, Inc. 2019c) concludes that the engineering system (pregnant leach solution ponds, caissons) captures the majority of Leach Pile seepage. Less than 5 percent of the total pregnant leach solution draindown is predicted to infiltrate directly into the groundwater directly beneath the footprint of the Leach Pile. Of this, approximately 36 percent will not be captured by engineering controls and will slowly flow downgradient toward Pinto Creek without backfilling the pit. With a partial backfilling, the Open Pit would no longer be a hydraulic sink, causing a loss of containment in the pit lake. In this scenario, the flow-through pit lake water would migrate downgradient toward Pinto Creek along with the Leach Pile seepage. The flow-through pit water is likely to have low pH and elevated metals and other constituents that could eventually migrate toward and negatively affect Pinto Creek water quality.

Criterion 4. Is the alternative economically feasible?

The Forest Service noted that if the Open Pit is backfilled, potential impacts could be mitigated with a downgradient pump and treat system whereby water is pumped to the surface, treated, and then appropriately disposed. While technically feasible, Pinto Valley Mining Corp. determined that this alternative would not be economically feasible because of significant capital expenditure and continuous operations and maintenance costs that would be needed for the pump and treat system. Pinto Valley Mining Corp. estimates that partial backfilling operations could cost between $126,800,000 and $62,000,000 and could take 3.4 to 4.3 years to complete. Treatment of contaminated water that may move downgradient of the Open Pit, if hydraulic containment is lost, would also generate treatment sludges that would require storage in the Open Pit, which is the only viable containment system large enough to handle the expected volume. Treatment sludges are jelly-like substances that should be stored sub-aqueously, not on top of a backfilled pit where they may dry out and become a potential source of environmental contamination.

Criterion 5. Is the alternative illegal?

The pit lake would be located entirely on private land. The Mined Land Reclamation Plan approved by the Arizona State Mine Inspector's Office governs reclamation of the Open Pit on private land under Arizona law and does not require backfill. The Forest Service does not have authority to require backfilling of the Open Pit.

2.4.3.2 Use a Dry-stack Tailing System Instead of the Current Wet Tailings Slurry System

An alternative was considered in which Pinto Valley Mining Corp. would modify its operations to use a dry-stack process (dry-stack tailings) instead of the current wet tailings slurry process. This alternative was considered on the basis that it may reduce potential impacts on Pinto Creek and associated water rights from ongoing groundwater withdrawals from the existing Peak Well field (issues 9A, 9C, and 9E in chapter 1), but was eliminated because it would not meet the following criteria.

Criterion 3. Is the alternative technically feasible?

A dry-stack system was evaluated and dismissed at the ASARCO Ray Mine Complex (AMEC 2014b) because the technology is unproven at the mine's throughput rate, which is lower than that of Pinto Valley Mine. Currently, there are no dry-stack facilities in the world with throughput rates as high as that of Pinto Valley Mine. Additionally, the current wet tailings slurry process was recently upgraded and has already been permitted by the State of Arizona.

Criterion 4. Is the alternative economically feasible?

Pinto Valley Mining Corp. determined that this alternative would not be economically feasible because of the capital expenditures required to retrofit the existing wet tailings system and the higher cost per ton for tailings storage using a dry-stack system. Although a dry-stack tailing process would conserve water, it carries a high financial cost due to additional infrastructure needed to accommodate dry-stack tailings production, which would include a filter plant, conveyor system, heavy equipment, and water storage facility.

2.4.3.3 Lower Mining Rate to Avoid Exceedances of Air Quality Standards

An alternative was considered in which Pinto Valley Mining Corp. would operate at a lower mining rate to avoid potential exceedances of air quality standards. This alternative was considered because a lower mine rate could decrease the rate of pollutant emissions, avoiding potential exceedances of air quality standards (issue 1 in chapter 1). This alternative was eliminated because it would not meet the following criteria.

Criterion 2. Does the alternative avoid, minimize, or mitigate environmental or resource conflicts?

Based on updates to the air quality modeling since the release of the draft EIS, which account for newly available information (such as site-specific silt sampling), additional commitments from Pinto Valley Mining Corp. (such as a fugitive dust control plan), and overall refinements to the air quality modeling, air quality modeling conducted to support the final EIS did not show any exceedances of National Ambient Air Quality Standards attributable to the alternatives considered in detail. As a result, this alternative was no longer necessary to avoid exceedances of air quality standards.

Criterion 4. Is the alternative economically feasible?

A lower mining rate would decrease revenue from mine outputs relative to fixed operational costs. Crushers, mills, and other equipment are sized to run optimally at a set capacity. A significantly lower mine rate may require mill or mine stoppages or equipment purchases that would threaten the economic viability of Pinto Valley Mine.

Criterion 5. Is the alternative illegal?

The Forest Service does not have authority to limit the rate of mining operations on private lands or for activities that are compliant with standards and permitting requirements administered by the Arizona Department of Environmental Quality, Air Quality Division.

2.4.3.4 Higher Design Standards for Tailings Storage Facilities No. 3 and No. 4

Tailings Storage Facility No. 4 was originally designed, and the starter dams constructed, in 1977. The embankment of the facility is raised using upstream construction methods. The engineering design criteria originally used for the facility included consideration of a design seismic event with a 1,000-year recurrence interval in pseudo-static limit equilibrium analyses of embankment stability. Dynamic modeling of seismic events on tailings dams was not standard engineering practice when the facility was designed. With the proposed expansion of Tailings Storage Facilities No. 3 and No. 4 onto National Forest System lands under the proposed action, the Forest Service considered the need for an alternative that would require the expanded tailings storage facilities to meet higher design standards than the existing or planned facilities. There are a variety of other guidance documents and programs that include higher design criteria for tailings storage facilities than required under the Arizona Department of Environmental Quality Best Available Demonstrated Control Technology design criteria for tailings storage facilities, such as the National Dam Safety Program as organized under the Federal Emergency Management Agency guidance documents for dam classification and design criteria (Federal Emergency Management Agency 2004a, 2004b, 2005, 2013a) and dam safety risk management (Federal Emergency Management Agency 2015), and the International Council on Mining and Metals and associated Global Industry Standard on Tailings Management (International Council on Mining and Metals 2020).

Specifically, the Forest Service considered an alternative tailings storage facility configuration that would meet the maximum credible earthquake seismic event, probable maximum precipitation, and probable maximum flood storm event considering downstream hazard potential in terms of potential life loss, environmental and cultural losses, and infrastructure and economic losses in the event of a catastrophic failure of the tailings facilities. Potential failure modes under earthquake loading may be critical risk drivers, potentially liquefiable nature of the tailings materials, and use of upstream construction methods for the tailings storage facilities at the mine. There is precedent established for use of the maximum credible earthquake seismic event, probable maximum precipitation, and probable maximum flood storm event design criteria for tailings impoundments in recently permitted tailings impoundments on National Forest System lands and other Federal lands. The current design criteria for Tailings Storage Facilities No. 3 and No. 4 are for containment of the probable maximum precipitation storm water volume during the operational life. Applying more stringent design criteria for Tailings Storage Facilities No. 3 and No. 4 could reduce the risk of tailings dam failure (issue 8 in chapter 1). This alternative was eliminated because it would not meet the following criterion.

Criteria 3. Is the alternative technically feasible?

There are potential design modifications for the tailings storage facilities that could achieve improved maximum credible earthquake resistance, including a toe buttress, deposition changes through conversion to filtered tailings stacking, phreatic surface reductions through a system of drains or wells, or embankment slope reductions. However, given the geometry of the tailings storage facilities and the hydraulic properties of the impounded tailings, it is not clear that adequate phreatic surface reductions could be rapidly achieved through a system of drains or wells or other modifications. A transition to filtered tailings would allow decreased loading of and infiltration to the Tailings Storage Facility No. 4 embankment, but it may take many years for the existing tailings to drain and consolidate sufficiently to withstand the maximum credible earthquake. Embankment slope reductions could, over time, increase resistance to the maximum credible earthquake, but this approach would result in inadequate tailings storage capacity for the proposed mining plan of operations (Pinto Valley Mining Corp. 2020b).

In addition, Tailings Storage Facilities No. 3 and No. 4 were designed and constructed prior to the development of higher and more stringent design and seismic criteria. Redesigning and reconstructing the existing tailings storage facilities to meet higher design standards would not be technically feasible at the Pinto Valley Mine. Typically, the higher design criteria are associated with new tailings storage facilities designed using centerline or downstream embankment raising methods and not the upstream-raised methods used at the Pinto Valley Mine.

Criteria 4. Is the alternative economically feasible?

Tailings Storage Facilities No. 3 and No. 4 are existing and operating facilities located primarily on private land. Applying higher design standards for these facilities would generally require redesign and extensive modification of these facilities including relocating waste rock and tailings placement, relocating power lines and electrical infrastructure, relocating and redesigning water management facilities, replacing water supply infrastructure and point-of-compliance wells, constructing new haul roads, constructing a filter plant and upgrading pumping and piping infrastructure, replacing tailings thickeners, and other substantial capital investments (Pinto Valley Mining Corp. 2020b). Redesigning and retrofitting these facilities would require substantial capital investment and could require an extended period of curtailment of operations at the Pinto Valley Mine. As a result, Pinto Valley Mining Corp. has indicated that reconstructing these facilities to achieve higher design standards would not be economically feasible for the Pinto Valley Mine (Pinto Valley Mining Corp. 2020b).

2.5 Comparison of the Alternatives

Table 2-12 provides a comparison of the key features of the two action alternatives and no-action alternative.

Table 2-12. Comparison of the alternatives

Feature	No-action Alternative	Alternative 1	Proposed Action
Overview			
Previous authorizations and disturbance on National Forest System lands	The previously authorized but expired rights-of way, plans of operations, and special use permits on National Forest System lands would not be authorized.	Authorization and continuation of previously authorized activities and permitted disturbances on National Forest System lands.	Same as alternative 1.
New authorizations and disturbance on National Forest System lands	There would be no new Forest Service authorization for use of National Forest System lands for the Pinto Valley Mine unless necessary for reclamation and closure.	Existing uses and disturbances authorized on National Forest System lands but no new disturbance unless necessary for reclamation and closure. Some facilities on private lands would be modified to maximize the operational life of the mine without the option to expand onto National Forest System lands.	Existing uses and disturbances authorized on National Forest System lands. Expansion of the Open Pit and Tailings Storage Facility No. 3 and No. 4 onto approximately 229 acres of National Forest System lands, and associated construction and reconfiguration of supporting linear features (access roads, electrical power transmission lines) on public and private lands.
Estimated operational life of mine duration following the record of decision	6 months (including 2 months of active mining operations).	7 years	19 years
Existing legacy encroachments	Existing encroachments on National Forest System lands that are not necessary for orderly closure and reclamation would be decommissioned and reclaimed after the 6-month transition period.	Alternative 1 includes authorization of existing legacy encroachments on National Forest System lands from activities appurtenant to mining, such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand.	Same as alternative 1.
Estimated duration of reclamation and closure	12 years	Same as no-action alternative.	Same as no-action alternative and alternative 1.
Estimated duration of post-closure	30 years	Same as no-action alternative.	Same as no-action alternative and alternative 1.
Mining Facilities			
Estimated ore and waste rock production during operational life of the mine	3,480,000 tons of ore and 4,920,000 tons of waste rock.	148,190,000 tons of ore and 209,510,000 tons of waste rock.	402,230,000 tons of ore and 568,670,000 tons of waste rock.

Feature	No-action Alternative	Alternative 1	Proposed Action
Open pit	Stabilization of the Open Pit walls. Active mining of sulfide ore and overburden would cease as soon as active mining faces can be stabilized and readied for closure and reclamation. Pit bottom elevation of 2,600 feet above mean sea level at the end of active mining operations.	Expansion of the Open Pit onto 219 additional acres of private land, but no expansion onto National Forest System lands. Active mining of the Open pit would continue for approximately 7 more years than under the no-action alternative. Pit bottom elevation of 2,510 feet above mean sea level at the end of active mining operations.	Expansion of the Open Pit onto 219 additional acres of private land and 19 additional acres of National Forest System lands. Changes to existing facilities to accommodate expansion of the Open Pit. Pit bottom elevation of 2,240 feet above mean sea level at the end of active mining operations.
Waste rock	Continued use of two existing waste rock dumps during the 6-month transition period, but no new dumps.	Continued use of two existing waste rock dumps and up to two planned waste rock dumps on private land. These facilities would operate for approximately 7 more years than under the no-action alternative.	Same as alternative 1, except more waste rock would be produced and stored in waste rock dumps due to the extended mine life.
Exploration activities	There would be no further exploration activities conducted under the no-action alternative.	There are no proposed exploration activities on National Forest System lands associated with alternative 1. Any exploration activities that would be proposed on National Forest System lands would be undertaken in accordance with the applicable mining regulations and subject to the Forest Service's necessary compliance with other applicable Federal environmental laws.	Same as alternative 1.
Milling and Processing			
Estimated copper and molybdenum production	21,024,658 pounds of copper concentrate and 205,480 pounds of molybdenum.	895,300,000 pounds of copper concentrate and 8,750,000 pounds of molybdenum.	2,430,100,000 pounds of copper concentrate and 23,750,000 pounds of molybdenum.
Mill and Concentrator	Continued use of the existing mill, concentrator, and ancillary facilities on private land for approximately 2 months. Pinto Valley Mine could produce an estimated cumulative total of 21,024,658 pounds of copper concentrate and 205,480 pounds of molybdenum during the 2 months of operations.	Same as the no-action alternative, except these facilities would operate for approximately 7 more years than under the no-action alternative.	Same alternative 1, except these facilities would operate for approximately 19 more years than under the no-action alternative.

Feature	No-action Alternative	Alternative 1	Proposed Action
Tailings Storage Facility No. 3	There would be no anticipated expansion of Tailings Storage Facility No. 3 under the no-action alternative. Top surface elevation of approximately 3,785 feet above mean sea level at the end of active mining operations.	Expansion of the Tailings Storage Facility No. 3 footprint onto an additional 30 acres of private land, but no expansion onto National Forest System lands. Furthermore, this facility would remain active for approximately 7 more years than under the no-action alternative. Top surface elevation of approximately 3,785 feet above mean sea level at the end of active mining operations.	Expansion of Tailings Storage Facility No. 3 onto 21 additional acres of private land and 22 additional acres of National Forest System lands. Furthermore, this facility would remain active for approximately 19 more years than under the no-action alternative. Top surface elevation of approximately 3,860 feet above mean sea level at the end of active mining operations.
Tailings Storage Facility No. 4	Expansion of Tailings Storage Facility No. 4 onto 10 additional acres of private land, but no expansion onto National Forest System lands. Top surface elevation of approximately 3,958 feet above mean sea level at the end of active mining operations.	Expansion of Tailings Storage Facility No. 4 onto 269 additional acres of private land, but no expansion onto National Forest System lands. Furthermore, this facility would remain active for approximately 7 more years than under the no-action alternative. Top surface elevation of approximately 4,090 feet above mean sea level at the end of active mining operations.	Expansion of Tailings Storage Facility No. 4 onto 406 additional acres of private land and 102 additional acres of National Forest System lands. Furthermore, this facility would remain active for approximately 19 more years than under the no-action alternative. Top surface elevation of approximately 4,250 feet above mean sea level at the end of active mining operations.
Transportation and Utilities			
National Forest System roads	Continued use of approximately 29.8 miles of National Forest System roads to access the Pinto Valley Mine site and various Pinto Valley Mining Corp. facilities on both patented and unpatented claims on National Forest System lands for 2 months of active mining operations. With the exception of National Forest System Road 287 (12.0 miles), which Pinto Valley Mining Corp. would continue to use during the post-closure period, use of the remaining National Forest System roads is expected to cease within 24 months (12.4 miles) or 36 months (5.3 miles) of mine closure.	Same as no-action alternative, except use of National Forest System roads for active mining operations would continue for approximately 7 more years and National Forest System Road 287 may be periodically realigned within private Pinto Valley Mining Corp. property to accommodate mine development.	Same as alternative 1, except use of National Forest System roads for active mining operations would continue for approximately 19 more years than under the no-action alternative.

Feature	No-action Alternative	Alternative 1	Proposed Action
Access roads	Continued use of approximately 15.2 miles of access roads on National Forest System lands for 2 months of active mining operations. Pinto Valley Mining Corp. anticipates that use of all access roads on National Forest System lands would cease within 24 months (10.6 miles) or 36 months (4.6 miles) of mine closure.	Same as no-action alternative, except use of access roads on National Forest System lands for active mining operations would continue for approximately 7 more years.	Same as alternative 1, except use of access roads on National Forest System roads for active mining operations would continue for approximately 19 more years than under the no-action alternative and some existing access roads would be removed or constructed to accommodate changes in mining facility footprints.
Electrical power use	Limited conditional use of electrical power supply from the existing Salt River Project transmission lines as necessary for the 6-month transition period and reclamation and closure of Pinto Valley Mine. Following the 6-month transition period, nonessential power lines on National Forest System lands would be decommissioned and reclaimed.	Electrical power supply from the existing Salt River Project transmission lines of approximately 47 megawatts and minimum transmission voltage of 115 kilovolts during the operation life of the mine, which would be approximately 7 years longer than under the no-action alternative.	Same as alternative 1, except power supply needs during the operational life of the mine would continue for approximately 19 more years than under the no-action alternative.
Electrical power distribution	Electrical power to the Pinto Valley Mine is currently provided by Salt River Project transmission lines and delivered to usage sites by Pinto Valley Mining Corp.–owned distribution lines that cross both private Pinto Valley Mining Corp. property (approximately 37 acres) and National Forest System lands (approximately 20 acres).	Same as the no-action alternative, except power lines would continue to operate for approximately 7 more years. Realignments of existing electric power lines to accommodate changes in mining facility footprints.	Same as the no-action alternative, except power lines would continue to operate for approximately 19 more years. Realignments of existing electric power lines to accommodate changes in mining facility footprints and construction of a new electric power line on National Forest System lands to Tailings Storage Facility No. 4.
Hazardous Materials Management			
Waste management	With the exception of petroleum products for powering, lubricating, or cooling motor vehicles or transformers, no regulated, radioactive, hazardous, or toxic substances would be used on National Forest System lands in any of the activities described under the proposed action. No regulated, radioactive, hazardous, or toxic substances would be generated, stored, or disposed of on National Forest System lands. Solid waste generated by any activities conducted by Pinto Valley Mining Corp. would continue to be disposed of in a manner consistent with applicable local, State, and Federal regulations.	Same as the no-action alternative, except use of petroleum products on National Forest System lands would continue for approximately 7 more years.	Same as the no-action alternative, except use of petroleum products on National Forest System lands would continue for approximately 19 more years and use would occur on a larger area of National Forest System lands.

Feature	No-action Alternative	Alternative 1	Proposed Action
Water Supply, Distribution, Use, and Treatment			
Estimated water use during active mining operations	Average of 9,722 gallons per minute (plus or minus 20 percent) of water production and use for 2 months of active mine operations. Approximately 19.3 percent of water use is estimated to be fresh water, with the remainder from reclaimed sources.	Same usage rate as the no-action alternative, except water use would continue for approximately 7 more years with an average annual use of 2,535.6 acre-feet of fresh water and 13,146.0 acre-feet of reclaimed water for a total of 15,681.7 acre-feet of water per year from all sources.	Same usage rate as the no-action alternative and alternative 1, and use of water during active mining operations would continue for approximately 19 more years than under the no-action alternative.
Water use over the life of the mine	Estimated total water use of 2,578 acre-feet (including 417 acre-feet of fresh water and 2,161 acre-feet of reclaimed water) during 2 months of active mine operations.	Estimated total water use of 109,772 acre-feet (including 17,750 acre-feet of fresh water and 92,022 acre-feet of reclaimed water). Water use during operations would continue for approximately 7 more years than the no-action alternative.	Estimated total water use of approximately 297,952 acre-feet (including 48,177 acre-feet of fresh water and 249,775 acre-feet of reclaimed water).
West Water supply system	Limited conditional supply of water from the West Water supply system, as necessary for the 6-month transition period and reclamation and closure of Pinto Valley Mine.	Continued supply of water for approximately 7 years of mine operations from the West Water supply system, consisting of fresh water from the Peak Well field on private lands, reclaimed water from wells on private land recharged by seepage from Tailings Storage Facility No. 4, and pumping from the Open Pit.	Same as the no-action alternative and alternative 1. Water supply would continue for approximately 19 more years than the no-action alternative.
East Water supply system	Continued supply of water from the East Water supply system, as necessary for the 6-month transition period and reclamation and closure of Pinto Valley Mine.	Continued supply of water for approximately 7 years of mine operations from the East Water supply system, consisting of water from the Burch pipeline from BHP's Diamond H Pit, private wells located near the city of Globe, and underground mine workings from the Old Dominion Mine.	Same as the no-action alternative and alternative 1. Water supply would continue for approximately 19 more years than the no-action alternative.

Feature	No-action Alternative	Alternative 1	Proposed Action
Workforce and Vehicle Trips			
Workforce	During the 6-month transition period, Pinto Valley Mining Corp. would retain the workforce necessary to continue active mining and milling for approximately 2 months (up to 690 employees) and then workforce would be reduced as the mine is transitioned to reclamation and closure. Workforce reductions would commence with an immediate hiring freeze and notification of impending layoffs in conformance with the Worker Adjustment and Retraining Notification Act. Nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities would be laid off first (approximately 400 in the first 3 months).	Up to 690 employees supporting active mining operations, which would continue for approximately 7 more years than under the no-action alternative. Following active mining, an estimated 100 employees supporting reclamation closure operations would remain employed for 12 to 36 months.	Up to 690 employees supporting active mining operations, which would continue for approximately 19 more years than under the no-action alternative. Following active mining, an estimated 100 employees supporting reclamation and closure operations would remain employed for 12 to 36 months.
Vehicle trips during active mining operations	Estimated 525 average daily mine-related vehicle roundtrips (approximately 8 percent trucks) to Pinto Valley Mine during active operations. Total of 31,923 vehicle trips for active operations (months 1–2) and total of 29,180 vehicle trips during transition period (months 3–6). Less-frequent vehicle trips throughout mine closure and reclamation and post-closure.	Same as the no-action alternative, except vehicle trips during active operations would continue for approximately 7 more years (191,540 average annual vehicle trips during active operations).	Same as the no-action alternative and alternative 1, except vehicle trips during active operations would continue for approximately 19 more years than under the no-action alternative (191,540 average annual vehicle trips during active operations).
Reclamation, Closure, and Post-Closure (months/years after record of decision)			
Closure construction and final reclamation of all remaining Pinto Valley Mining Corp. facilities, except Tailings Storage Facilities No. 3 and No. 4	month 3–year 3	year 7–year 9	year 19–year 21
10-year rest period for draindown of Tailings Storage Facilities No. 3 and No. 4	month 3–year 10	year 7–year 16	year 19–year 28

Feature	No-action Alternative	Alternative 1	Proposed Action
Closure construction and final reclamation of Tailings Storage Facilities No. 3 and No. 4	year 11–year 13	year 17–year 19	year 29–year 31
Post-closure maintenance and monitoring to ensure that the closed facilities meet reclamation requirements	year 14–year 44	year 20–year 49	year 32–year 61

3.0 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the existing natural and human environment that may be affected by the alternatives. It also discloses the direct, indirect, and cumulative impacts of each of the alternatives. The analysis areas described in this chapter include the extent of potential impacts that could result from the alternatives, regardless of surface ownership. The analysis of impacts on the natural and human environment is grouped by resource topic. An analysis area is defined for each resource topic, which considers both the temporal bounds and the spatial area that is appropriate for analyzing impacts specific to that resource. In some cases (such as soils), the analysis area is the Pinto Valley Mine project boundary because that is the extent of the effects on the resource. In other cases (such as air quality), the analysis area may be larger because the effects on the resource extend beyond the Pinto Valley Mine project boundary. The Pinto Valley Mine project boundary includes (1) Pinto Valley Mining Corp. private land (including patented mining claims and other private lands owned or controlled by Pinto Valley Mining Corp.), (2) unpatented mining claims and mill sites on National Forest System lands with existing or proposed mining facilities as described in chapter 2, “Proposed Action and Alternatives,” and (3) linear corridors for mine-related pipelines, power lines, and roads.

These bounds help to focus the analysis on the area and timeframe of potential impacts and influence the methods used to quantify impacts, including units of measure. Acreages presented in this chapter were calculated using geographic information system technology. Minor variations in acreages are possible due to clipping of the geographic information system data, topology, rounding, and other factors. As a result, acreages throughout the environmental impact statement (EIS) should be considered approximate. Any variations in acreages are considered to be negligible.

The discussion under each resource topic included in this chapter is divided into four parts: “Resource Indicators,” “Relevant Laws, Regulations, and Policy,” “Affected Environment,” and “Environmental Consequences.” The following sections describe content included for each of these subsections.

3.1.1 Key Issues for Detailed Analysis

Based on internal issue identification and external (public) scoping, the Forest Service identified key issues and concerns for analysis in this EIS (see section 5.0 of the “Pinto Valley Mine Environmental Impact Statement Draft-Final Scoping and Issues Report” [Forest Service 2017a] for more information). Some resources (such as fire and fuels management) may not be linked to a specific issue or cause and effect relationship, but are still evaluated as part of the National Environmental Policy Act to accomplish public disclosure of potential impacts. See table 3-1 for a list of the resource topics that discuss each key issue.

Table 3-1. Resource topics that address key issues

Key Issue	Resource Topics that Address Key Issue
Key Issue 1: Air Quality Impacts Resulting from Project-Related Emissions and Dust Generated from Project Activity	Air Quality; Greenhouse Gas and Climate Change Impacts
Key Issue 2: Biological Resource Impacts Resulting from Surface Disturbance, Human Activity, and other Project-Related Effects on Ecosystems and Ecosystem Components	Noise; Soils; Vegetation; Fish and Wildlife and Special Status Species

Key Issue	Resource Topics that Address Key Issue
Key Issue 3: Long-Term Impacts on Landscape Productivity and Function Resulting from Surface Disturbance and other Project Activity	Soils
Key Issue 4: Cultural Resource Impacts Resulting from Project-Related Activity, Facilities, and Surface Disturbance	Cultural Resources; Visual Resources
Key Issue 5: Impacts on Public Health and Safety from Construction, Operation, and Reclamation of the Pinto Valley Mine Project	Hazardous and Nonhazardous Materials; Public Health and Safety; Traffic and Transportation
Key Issue 6: Impacts on Recreation and Recreational Access from Project-Related Traffic, Surface Disturbance, and other Project Activities	Noise; Recreation and Wilderness; Traffic and Transportation; Visual Resources
Key Issue 7: Impacts on Social and Economic Conditions, including to Environmental Justice, Resulting from Expansion and Operation of the Pinto Valley Mine Project	Environmental Justice; Socioeconomic Conditions
Key Issue 8: Potential Risk to Resources from Geotechnical or Stability Issues Associated with Expansion of the Tailings Storage Facilities and Open Pit	Geology, Minerals, Geotechnical Stability, and Paleontology
Key Issue 9: Impacts on Groundwater and Surface Water in the Pinto Creek Watershed during Construction, Operation, Reclamation, Closure, and Post-Closure of the Pinto Valley Mine Project	Water Resources and Hydrogeochemistry

3.1.2 Relevant Laws, Regulations, and Policy

A brief, annotated list of key Federal, State, and local laws, regulations, and policies relevant to this EIS analysis is provided for each resource topic. Federal agencies operate under the U.S. Code and the Code of Federal Regulations. These laws help form Forest Service directives and policies on Forest Service management of national forests and grasslands. Each “Relevant Laws, Regulations, and Policy” section also provides applicable management provisions and desired conditions identified in the Tonto National Forest Plan as amended (Forest Service 1985).

3.1.3 Resource Indicators

Resource indicators are provided for each resource topic as a means to measure and disclose potential impacts from implementation of the alternatives. The resource indicators were developed in accordance with the analysis approaches identified in the “Pinto Valley Mine Environmental Impact Statement Draft-Final Scoping and Issues Report” (Forest Service 2017a). Resource indicators are used to structure the analysis and measure the extent of the impacts most likely to affect each resource topic.

3.1.4 Affected Environment

The affected environment is composed of areas in and adjacent to the project area that are likely to experience effects as a direct or indirect result of the alternatives. Each “Affected Environment” section describes existing conditions for the resource qualitatively or quantitatively, depending on the resource indicators and measures appropriate for that specific resource topic and on information available to the interdisciplinary team. The existing conditions provide a baseline to use in analyzing and understanding the effects of the alternatives.

A variety of past and ongoing actions, including the current operation of the Pinto Valley Mine, may have contributed to or are currently affecting the existing condition of the natural and human environment. These actions are briefly identified in each “Affected Environment” section.

3.1.5 Environmental Consequences

The “Environmental Consequences” section discloses the methodology and assumptions used in each impact analysis and assesses the direct, indirect, and cumulative effects of each alternative on the resource topic. Impacts are compared to the existing conditions, as described in the “Affected Environment” section and to the other considered alternatives. Impacts are analyzed as appropriate for each resource indicator.

3.1.5.1 **Direct and Indirect Impacts**

Direct effects occur at the time and place the action is implemented, whereas indirect effects occur off site or at a later point in time. The analysis of direct and indirect impacts in this chapter present the potential impacts of the alternatives independent of the monitoring and mitigation measures identified at the end of each section and in appendix H, “Environmental Protection Measures, Monitoring, and Mitigation.”

3.1.5.2 **Cumulative Impacts**

On July 16, 2020, the Council on Environmental Quality published a final rule to amend its regulations implementing the National Environmental Policy Act of 1969 (Council on Environmental Quality 2020). The amended regulations include a variety of changes to how ongoing and reasonably foreseeable actions are considered and how cumulative impacts are described and analyzed under the National Environmental Policy Act. The amended regulations apply to any National Environmental Policy Act review process begun after September 14, 2020. The Notice of Intent for the Pinto Valley Mine EIS was published in March 2017. As a result, analysis of potential cumulative impacts as part of the Pinto Valley Mine National Environmental Policy Act review and associated EIS are proceeding under the previous Council on Environmental Quality 1978 regulations, as amended, and their existing agency National Environmental Policy Act procedures (Council on Environmental Quality 1978).

Council on Environmental Quality regulations (Council on Environmental Quality 1978) define a cumulative impact as one that “results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (Title 40, Part 1508.7 of the Code of Federal Regulations [CFR]). To estimate the potential for and significance of cumulative impacts, the effects of each alternative are considered in conjunction with past and present actions and those of the reasonably foreseeable actions (see section 3.1.5.3, “Past, Present, and Reasonably Foreseeable Future Actions,” for a list of all reasonably foreseeable actions considered).

The Forest Service’s National Environmental Policy Act regulations (36 CFR 220.4(f)) additionally provides that cumulative effects analysis begins with consideration of direct and indirect effects that are expected or likely to result from the alternative proposals. The agency then evaluates the present effects of past actions that are relevant and useful if they have a significant cause-and-effect relationship with the direct and indirect effects of the proposed action and its alternatives. As indicated in 36 CFR 220.4(f), the Council on Environmental Quality regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Only qualifying present effects of past actions warrant consideration to the extent that the effects of the proposed action or alternatives will add to, modify, or mitigate those effects.

Cumulative impact analysis areas are defined to delineate the geographic scope of the analysis for each resource. The cumulative impact analysis areas for each resource can be different than the analysis area for direct impacts and the geographic scope may extend beyond the operational areas of Pinto Valley Mine. The timeframe for the cumulative impact analysis for each resource is based on the anticipated duration of the impacts resulting from the alternatives. The cumulative impacts analysis timeframe for certain resources (such as water resources) is longer than the life of the mine to encompass impacts that last beyond the life of the project.

The cumulative impacts analysis for each resource presents a cumulative impact analysis area and cumulative impacts analysis timeframe that applies to all alternatives and is based on the alternative with the greatest geographic and temporal scope of effects, which is typically the proposed action unless otherwise noted. As such, the cumulative impacts analysis areas and timeframes capture the greatest extent of cumulative effects.

3.1.5.3 **Past, Present, and Reasonably Foreseeable Future Actions**

Current effects from past and present actions are generally incorporated into the description of the affected environment in each resource section in this chapter. The primary types of relevant past and present actions contributing to cumulative impacts include historic and ongoing mineral development and exploration, livestock grazing and agricultural activities, industrial projects (such as smelters), traffic and vehicle use on roads, existing infrastructure and utilities (such as pipelines and transmission lines), and wildfires. These types of activities have a significant cause and effect relationship to the direct and indirect effects of the proposed action and alternatives.

Reasonably foreseeable actions are defined as those federal and non-Federal activities not yet undertaken, for which there are existing decisions, funding or identified proposals that would occur or lie within the temporal and spatial bounds as the alternatives (36 CFR. §220.3). Such actions of the Forest Service include circumstances where the Forest Service has a goal and is actively preparing to make a decision on one or more means of accomplishing that goal (36 CFR § 220.4(a)(1)).

The Forest Service identified the present and reasonably foreseeable actions in table 3-2 as the primary actions having the potential to contribute to cumulative effects in the future. Present and reasonably foreseeable actions were considered in the cumulative analysis if they have potential future impacts that would overlap the geographic and temporal scope of impacts of the alternatives analyzed in detail in this final EIS. The Forest Service considered a variety of other present and reasonably foreseeable actions for the cumulative impacts analysis that were not carried forward for detailed analysis because the project was speculative in nature with no formal proposal received, the project would not contribute cumulative effects, the project impacts would be outside of cumulative impact analysis areas, or the timeframe of the project impacts would not overlap the timeframe of impacts from the alternatives considered in this EIS.

Table 3-3 identifies the present and reasonably foreseeable actions that could contribute to cumulative impacts in the future for each resource category analyzed in detail in this final EIS.

Table 3-2. Present and reasonably foreseeable actions that could contribute to cumulative effects in the future

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Mining Projects			
Carlota Copper Mine	3,050 acres	The Carlota Copper Mine is an open pit copper mine southwest of the Pinto Valley Mine. Mining and production at the Carlota Mine site began in 2008. The mine has operated for most its life at approximately 40,000 metric tons per day, producing on average 11.2 thousand tons of copper cathodes per year. In 2013, the Carlota Mine began concurrent reclamation and revegetation activities throughout the property and initiated detailed studies on the more complex facilities in preparation for mine closure. Mining operations from the Carlota/Cactus open pit ceased in 2014. However, residual copper production has continued using surface and subsurface leaching via injection wells. In 2018, Carlota Copper Company announced it would start mining a small satellite copper oxide deposit, known as Eder South, on Carlota's patented claims. The Eder South portion of the mine consists of a small open pit (approximately 22 acres), one main haul road, and several support roads. The project is anticipated to continue for approximately 3 years. Mining consists of blasting and hauling of ore with 4-150T haul trucks to the existing lined heap leach pad for copper recovery. Mining operations at the Carlota Mine are anticipated to cease in several years. Residual copper leaching from surface and subsurface will continue for an unknown amount of time. There is no additional surface disturbance anticipated at the Carlota Mine.	Less than 1 mile
Resolution Copper Project and Land Exchange	14,950 total	Resolution Copper submitted a general plan of operations for large-scale underground mining of a copper-molybdenum deposit 5,000 to 7,000 feet below the ground surface. The project would be located in the Globe and Mesa Ranger Districts on the Tonto National Forest. Project components include the mine site, associated infrastructure, a transportation corridor, and a tailings storage facility. Resolution Copper estimates that the mine would take approximately 10 years to construct, would have an operational life of approximately 40 years, and would be followed by 5 to 10 years of reclamation activities. This project would also include a related, legislatively mandated land exchange involving transfer of an approximately 2,422-acre parcel (Oak Flat Parcel) to Resolution Copper for mining-related activities. The project would result in an estimate 14,950 acres of surface disturbance, including 3,497 acres of disturbance in the Globe Ranger District. For any National Forest System lands subject to the legislatively mandated land exchange, this final EIS considered potential cumulative effects based on the management of these lands as components of the National Forest System prior to completion of the land exchange and their transfer to private ownership.	4.25 miles

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Freeport-McMoRan Miami Copper Mine	6,800 acres	The Freeport-McMoRan Miami Copper Mine is one of the oldest copper mines in Arizona, with production starting in 1915. Copper was mined underground until after World War II, when the first open-pit mining began. The success of a solvent extraction and electrowinning plant commissioned in 1979 ended vat leaching by the mid-1980s and ultimately the concentrator in 1986 as well. Active mining operations at the Freeport-McMoRan Miami Copper Mine ended in 2015, while leaching and solvent extraction and electrowinning operations continued. As of 2020, the Freeport-McMoRan Miami Copper Mine is currently in care and maintenance mode with only limited leaching operations occurring from stockpiles until 2023.	5 miles
Freeport-McMoRan Miami Smelter	123 acres	The Freeport-McMoRan Miami Smelter is close to the Miami Mine. The plant's smelter was modernized in 1974 to meet Clean Air Act standards and further modernized and expanded in 1992 and in 2017. The smelter's base load concentrate comes primarily from Freeport-McMoRan's mining operations at the Sierrita and Bagdad mines. The copper concentrate throughput for the smelter has an estimated capacity of 900,000 tons per year. The expanded smelter capabilities comply with the new U.S. Environmental Protection Agency ambient air quality standard for sulfur dioxide emissions. Much of the 2016 construction was related to emission control systems to capture virtually all fugitive gases and particulate emissions. The result captures over 99 percent of the sulfur dioxide and other emissions from the Freeport-McMoRan Miami Smelter operations. The additional concentrate to feed the expanded smelter comes primarily from Freeport-McMoRan's Morenci and Chino (New Mexico) operations.	7 miles
Copper King Exploration Drilling Project on National Forest System Lands	20 acres	The Tonto National Forest received a proposed plan of operations from Bronco Creek Exploration, Inc., on behalf of Kennecott Exploration Company, to drill 18 of 27 potential drill sites over a 10-year period. Proposed activities include road improvements and laydown yard, in addition to drilling.	10 miles
Dragon's Tail Exploration Drilling on National Forest System Lands	2.5 acres	The Tonto National Forest received a proposed plan of operations to drill 7 of 11 potential drill sites that would be accessed by helicopter.	2 miles
The Hook Exploration Drilling on National Forest System Lands	1.1 acres	BHP Mineral Resources, Inc. proposed exploration drilling at two sites. The proposed activities consist of the construction of two drill pads with adjacent laydown yards, turnaround yard, the use of existing roads, improvements to approximately 0.25 mile of Forest Service System roads, and construction of 700 feet of access road.	10 miles

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Jasper Canyon Exploration Drilling on National Forest System Lands	1.6 acres	The Tonto National Forest authorized Bronco Creek Exploration, Inc. to drill five of seven possible drill sites on National Forest System lands to explore for locatable minerals. The authorized activities include use of National Forest System roads and temporary overland access routes and require reclamation of all surface disturbances within 1 year of the initial disturbance.	6 miles
Red Top Exploration Drilling on National Forest System Lands	3 acres	The Tonto National Forest authorized Bronco Creek Exploration, Inc., on behalf of Desert Star Resources Ltd., to drill 10 of 22 possible drill sites on National Forest System lands to explore mineral deposits. The authorized activities also include use of National Forest System roads and temporary overland access routes and require reclamation of all surface disturbances within 1 year of the initial disturbance.	6 miles
Superior West Exploration Drilling on National Forest System Lands	7 acres	The Tonto National Forest received a proposed plan of operations from Bronco Creek Exploration, Inc., on behalf of Kennecott Exploration Company, to drill 25 of 79 potential drill sites over a 10-year period. Most sites would be accessed by existing roads or helicopter, but the proposed plan also identified three potential overland routes.	11 miles
ASARCO Ray Mine	10,000 acres	The Ray Mine is an operating copper mine in Gila and Pinal Counties, Arizona. The Ray Mine consists of a 250,000-ton-per-day open pit mine with a 30,000-ton-per-day concentrator, a 103-million-pound-per-year solvent extraction-electrowinning operation, and associated maintenance, warehouse, and administrative facilities. Cathode copper produced in the solvent extraction-electrowinning operation is shipped to outside customers and the ASARCO Amarillo Copper Refinery. A local railroad, Copper Basin Railway, transports ore from the mine to the Hayden concentrator, concentrate from the Ray concentrator to the smelter, and sulfuric acid from the smelter to the leaching facilities.	20 miles
Ray Land Exchange	9,339 acres	In October 2019, the Bureau of Land Management approved the Ray Land Exchange. Under the approved land exchange, the Bureau of Land Management transferred 9,339 acres of public land adjacent to ASARCO's Ray Mine Complex and Copper Butte properties near Kearny for mine expansion. This included 7,196 acres of full estate and 2,143 acres of subsurface mineral estate, the surface of which is already owned by ASARCO. In exchange, the Bureau of Land Management acquired 7,196 acres of ASARCO-owned land in Pinal and Mohave Counties, consolidating checkerboard land ownership in those areas, allowing better management of wildlife migration corridors, and improving access to existing public lands for hunting and other family recreation.	20 miles

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Ray Mine Ripsey Wash Tailings Storage Facility	2,290 acres	ASARCO plans to construct and operate a new tailings storage facility to receive tailings generated at the Ray Mine. The tailings storage facility site is in Ripsey Wash, approximately 4 miles southwest of the existing Elder Gulch tailings storage facility, which is the present site used at the Ray Mine for tailings disposal. The new Ripsey Wash tailings storage facility is located on surface owned by ASARCO, some of which is split estate underlain by Federal minerals administered by the Bureau of Land Management.	26 miles
ASARCO Hayden Smelter	750 acres	The Hayden Smelter operations consist of a 27,400-ton-per-day concentrator and a 720,000-ton-per-year copper smelter consisting of an oxygen flash furnace, converters, anode casting, oxygen plant, acid plant, and associated maintenance, warehouse, and administrative facilities. Anodes produced at the smelter are shipped to the Amarillo Copper Refinery. The sulfuric acid produced at the acid plant is used in the leaching operations or sold into the market. A local railroad, Copper Basin Railway, transports ore from the Ray Mine to the Hayden concentrator, concentrate from the Ray concentrator to the smelter, and sulfuric acid from the smelter to the leaching facilities at the ASARCO Ray Mine site.	30 miles
Gibson Copper Mine	270 acres	The Gibson Mine is an underground copper mine that first started production in the early 1900s with production continuing sporadically through the 1970s. Historic operation of the Gibson Mine resulted in copper contamination in Pinto Creek. The first remedial actions at the mine were started in 2007 with a variety of remedial activities occurring until the present. The Arizona Department of Environmental Quality is conducting additional onsite water quality and soil sampling to inform future planned remedial measures. The remedial design is generally focused on additional control measures to address identified contamination hotspots at the mine site.	4 miles
Pipelines, Transmission Lines, and other Utility Projects			
Bureau of Land Management Rights-of-Way	Varies	There are more than 50 rights-of-way on Bureau of Land Management land near the Pinto Valley Mine. The rights-of-way range in use, including power transmission facilities (approximately 718 acres), telecommunication facilities (approximately 5 acres), water facilities (approximately 265 acres), and forest land (Special Recreation Permit lands) (approximately 7,159 acres). These rights-of-way may contribute to cumulative effects in the future based on the long-term persistence of the right-of-way, maintenance of the right-of-way, and eventual decommissioning and reclamation of the right-of-way.	Varies

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
National Forest System Land Special Use Permits	Varies	The Forest Service has issued a variety of special use permits in the vicinity of the Pinto Valley Mine including transmission lines, pipelines, communications facilities, and other infrastructure and facilities. These special use permits may contribute to cumulative effects in the future based on the long-term persistence of the special use permit, maintenance of the special use permit, and eventual decommissioning and reclamation of the special use permit.	Varies
Roads and Road Improvement Projects			
Arizona Department of Transportation Pinto Creek Bridge Replacement	700 feet	The Arizona Department of Transportation and the Federal Highway Administration are currently replacing the Pinto Creek Bridge, located on U.S. Highway 60 about 6 miles west of Miami, Arizona. The project involves constructing a new bridge adjacent to the existing bridge, and then removing the existing bridge. The project began in 2019 and is expected to take 2 years to complete. The existing bridge will remain in service until the new bridge is completed, but occasional restrictions and closures of U.S. Highway 60 will be required.	1.3 miles
Ongoing vegetation treatment along U.S. Highway 60	Varies	Occurs when the Arizona Department of Transportation applies for or the Forest Service requests that the Arizona Department of Transportation manage vegetation with pesticides or other treatment.	1.3 miles
Resource Management Plans and Forest Service Authorizations			
Tonto National Forest Plan Revision	Tonto National Forest Wide Management	The Forest Service is revising the existing Tonto National Forest Plan, which was approved in 1985. The revised Land and Resource Management Plan will describe the strategic intent of managing the Tonto National Forest for the next 10 to 15 years and will address the identified needs for change to the existing land management plan. The revised plan will provide management direction in the form of desired conditions, objectives, standards, guidelines, and suitability of lands. It will delineate new management areas; identify the timber sale program quantity; make recommendations to Congress for wilderness designation; and list rivers and streams eligible for inclusion in the National Wild and Scenic Rivers System. The revised plan will also describe the role of the Tonto National Forest within the broader landscape, identify watersheds that are a priority for maintenance or restoration, include a monitoring program, and identify reasonably foreseeable actions over the life of the plan. Plan components may promote infrastructure (such as roads, trails, and recreation and administrative facilities), a wide range of silvicultural practices, or other resource uses that are maintained at a sustainable level for multiple-use activities. These management decisions can contribute to cumulative impacts due to changes in future resource management that may change under the revised plan. The revised draft plan and draft EIS was published in December 2019.	Pinto Valley Mine is within the Tonto National Forest

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Tonto National Forest Motorized Travel Management Plan	Tonto National Forest Wide Management	The Tonto National Forest Service has prepared a motorized travel management plan designating motor vehicle use for roads, trails, and areas on the Tonto National Forest in compliance with the 2005 Travel Management Rule. The Tonto National Forest released the final Supplemental Environmental Impact Statement and draft Record of Decision on October 4, 2019. Travel management decisions would apply to National Forest System roads used for access to and adjacent to Pinto Valley Mine. Specific mining operation required transportation resources would be approved in the mining plan of operations in compliance with the 2005 Travel Management Rule.	0 miles
Grazing Permit Authorizations	Varies by allotment	The Tonto National Forest processes changes to grazing permit authorizations on an as needed basis, including that Pinto Creek and Sleeping Beauty Complex Allotments that intersect the Pinto Valley Mine, and other allotments in proximity to the mine such as the Hicks-Peak Allotment. Grazing permits authorizations can include changes to authorized number of livestock in the allotment, grazing durations, grazing management strategies, and structural range improvements in the allotments.	Varies
Vegetation and Fire and Fuels Management Projects			
Pinaladera Wildland Urban Interface Fuels Management	83,558 acres	Fuels reduction on approximately 83,558 acres south of Globe, including the Pinal Mountain Recreation Area.	10 miles
Highway Tanks Tribal Forest Protection Act Project	115,000 acres	This project would focus on restoration of fire-adapted ecosystems, including mechanical thinning and prescribed burning, to accomplish landscape restoration objectives as proposed by the tribe that are on the Tonto National Forest and tribal land. Treatments would occur over time, as needed, and consist of prescribed fire, wildfire, or mechanical vegetation treatments. The 115,000 acres encompass most of the “thumb” on the Tonto National Forest. The San Carlos Tribe will be treating an additional 125,000 acres on adjoining tribal lands. However, the total surface disturbance area is uncertain and would be based on the type of treatment (such as thinning versus prescribed fire)	15 miles
Four Forest Restoration Initiative Rim Country Project	Approximately 299,710 acres on the Payson and Pleasant Valley Ranger Districts of the Tonto National Forest	The Four Forest Restoration Initiative is a planning effort designed to restore forest resilience and ecosystem function in ponderosa pine forests and associated ecosystems across four national forests in Arizona including the Coconino, Kaibab, Apache-Sitgreaves, and Tonto National Forests. The Rim Country Project continues the ecosystem restoration efforts on about 1,240,000 acres on the Mogollon Rim and Red Rock Ranger Districts of the Coconino National Forest, the Black Mesa and Lakeside Ranger Districts of the Apache-Sitgreaves National Forests, and the Payson and Pleasant Valley Ranger Districts of the Tonto National Forest.	24 miles

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Recreation			
Trail maintenance	Varies	Ongoing and occurs annually as the Forest Service receives funding.	Primarily conducted on the east side of Superstition Wilderness. Approximately 3.5 miles away.
Arizona National Scenic Trail Comprehensive Plan	800 miles	Preparation of a comprehensive plan for the Arizona National Scenic Trail, a Congressionally designated trail, to (1) meet the legislative requirements for national scenic trails under the National Trails System Act and (2) provide a shared vision for long-term administration of the trail and coordinated management across Federal and non-Federal lands to protect the nature and purposes of the trail; the significant natural, historic, scenic, and cultural resources within the trail corridor; and the nationally significant recreation experience for which the trail was designated.	8 miles
Watershed Management/Improvement			
Pinto Creek Erosion Control Reconstruction/Bank Stabilization Project	1,200 feet	Bank stabilization along approximately 1,200 feet of Pinto Creek and Wildcat Creek near the eastern end of Roosevelt Lake, Gila County, Arizona. The project will take place on private land and National Forest System land to maintain embankments along the northwestern edge of Pinto Creek and the northern edge of Wildcat Creek that protect residential developments during periods of high flow. Embankments are currently deteriorated and at risk of failure. Materials used will consist of rock from an existing pile at Grapevine Airstrip. Embankment will be reconstructed to be approximately 6 feet wide and 9 feet high.	12 miles
Pinal Creek Project Groundwater Remediation Activities	N/A	The Pinal Creek Project is a state-mandated remediation project associated with clean-up of the BHP Copper and Miami mining projects. These remediation activities provide treated groundwater to the Diamond H open pit at BHP's Copper Cities Unit. As described in section 2.2.5.2, "Burch Pipeline System (East Water System)," the Diamond H pit provides water to the Pinto Valley Mine through the Burch Pipeline. For the foreseeable future, the Pinal Creek Project groundwater remediation activities will continue to supply water to the Diamond H open pit that is piped to the Pinto Valley Mine.	7 miles

Present or Reasonably Foreseeable Future Action	Approximate Project Area Size (acres) or Length (miles)	Description	Approximate Distance from Pinto Valley Mine Project (at closest points)
Wildland Fires			
Wildland Fires	Varies	From 2000 to 2019 there were approximately 3,900 wildfires recorded in the Tonto National Forest that burned an estimated 909,069 acres (Forest Service 2020a). From 2000 to 2019, the Tonto National Forest averaged approximately 65 wildfires per year with an estimated burn area of 19,000 acres per year (Forest Service 2020a). The potential occurrence and severity of future wildfires are expected to follow these trends and potentially increase in size and severity due to climate change effects. There have also been a variety of recent wildland fires that burned areas in the Tonto National Forest near the Pinto Valley Mine. The recent Woodbury Fire, which burned 124,000 acres in June and July of 2019 mostly within the Superstition Wilderness Area west of the analysis area, also burned areas along Little Campaign Creek northwest of the Pinto Valley Mine. In addition, in 2020 several other fires burned in the Tonto National Forest, affecting existing ecological conditions and potentially contributing to cumulative effects. The closest of these fires to the Pinto Valley Mine was the Salt Fire in August and September of 2020, which burned over 21,000 acres north and east of the Pinto Valley Mine.	Varies

EIS = environmental impact statement; Forest Service = U.S. Department of Agriculture, Forest Service

Table 3-3. Present and reasonably foreseeable actions in cumulative impact analysis areas

Resource Area		Direct or Indirect Effects from Proposed Action?	Carlota Copper Mine	Resolution Copper Project	Freeport-McMoRan Miami Copper Mine	Freeport-McMoRan Miami Smelter	Copper King Expl. Drilling	Dragon Trail Expl. Drilling	The Hook Expl. Drilling	Jasper Canyon Expl. Drilling	Red Top Expl. Drilling	Superior West Expl. Drilling	ASARCO Ray Mine	Ray Land Exchange	Ray Mine Ripsey Wash TSF	ASARCO Hayden Smelter	Gibson Copper Mine	BLM Rights-of-Way	TNF Special Use Permits	ADOT Pinto Creek Bridge	US60 Vegetation Treatment	TNF Forest Plan Revision	TNF Travel Mgmt. Plan	TNF Grazing Permit Auth.	Pinaladera WUI Fuels Mgmt.	Highway Tanks Tribal FPA	4FRI Rim Country Project	TNF Trail Maintenance	AZNST Plan	Pinto Creek Erosion Control	Pinal Crk. Groundwater Rem.	Wildland Fires
Section	***Title***																																
3.2	**Air Qual.**[1]	Yes	✓[2]	✓	✓	✓	O[3]	O	O	O	O	O	O	O	O	✓	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
3.3	**Biological**	Yes	✓	✓	✓	[4]	O	O	O	O	O	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓		✓	✓
3.4	**Climate**	Yes	✓	✓	✓	✓	O		O				✓	✓	✓	✓		✓	✓	✓	✓	O	O	O	✓	✓	✓	O	O	O	O	✓
3.5	**Cultural**	Yes	✓		✓													✓	✓		O	O	✓	✓				✓			O	✓
3.6	**Tribal**	Yes	✓	O	✓	O	O		O				O	O	O	O	O	✓	✓		O	O	✓	✓				✓			O	✓
3.7	**Env. Just.**	No[5]	O	O	O	O			O	O		O		O		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
3.8	**Fire/Fuels**	Yes	✓	✓	✓		O	O	O	O	O	✓		✓			O	✓	✓	O	✓	✓	✓	✓		✓		✓	✓		O	✓
3.9	**Geo./Min.**	Yes	✓					O			O							O	O			O	O									O
3.10	**Paleo.**	Yes																O	O			O	O	O				O			O	O
3.11	**Haz. Mat.**	Yes																O	O			O	O	O				O			O	O
3.12	**Land Own.**	Yes	O		O													✓	✓			✓	✓	✓				O			O	O
3.13	**Grazing**	Yes	✓		✓													✓	✓		O	✓	O	✓				O			O	✓

[1] All actions marked with "✓" in this row are considered to be accounted for in the monitored background concentrations.
[2] ✓ = The project is within the cumulative impacts analysis area for this resource and may contribute to cumulative impacts.
[3] O = The project is within the cumulative impacts analysis area for this resource but would not likely contribute to cumulative impacts to this resource because the timeframe of the project impacts would not overlap the timeframe of impacts from the alternative, because the project has no identified impacts to this resource, or other factors.
[4] Blank = The project is outside the cumulative impacts analysis area for this resource and would not contribute to cumulative impacts.
[5] Minority and low-income communities would experience direct and indirect effects from the Proposed Action but would not be disproportionately affected.

Resource Area		Direct or Indirect Effects from Proposed Action?	Carlota Copper Mine	Resolution Copper Project	Freeport-McMoRan Miami Copper Mine	Freeport-McMoRan Miami Smelter	Copper King Expl. Drilling	Dragon Trail Expl. Drilling	The Hook Expl. Drilling	Jasper Canyon Expl. Drilling	Red Top Expl. Drilling	Superior West Expl. Drilling	ASARCO Ray Mine	Ray Land Exchange	Ray Mine Ripsey Wash TSF	ASARCO Hayden Smelter	Gibson Copper Mine	BLM Rights-of-Way	TNF Special Use Permits	ADOT Pinto Creek Bridge	US60 Vegetation Treatment	TNF Forest Plan Revision	TNF Travel Mgmt. Plan	TNF Grazing Permit Auth.	Pinaladera WUI Fuels Mgmt.	Highway Tanks Tribal FPA	4FRI Rim Country Project	TNF Trail Maintenance	AZNST Plan	Pinto Creek Erosion Control	Pinal Crk. Groundwater Rem.	Wildland Fires
Section	***Title***																															
3.14	**Noise**	Yes	✓		✓	✓		O									O	✓	✓	✓	O	O	✓	O				✓			O	O
3.15	**P. Health**	Yes																O	O	O	O	O	O	O				O			O	O
3.16	**Rec./Wild.**	Yes	✓	✓	✓		O	O			O	✓		✓			O	✓	✓	O	O	✓	✓	O				✓	✓			✓
3.17	**Socioecon**	Yes	✓	✓	✓	✓			O	O		✓		✓		✓	✓	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
3.18	**Soils**	Yes																✓	✓			O	O	O				✓			O	✓
3.19	**Transport**	Yes	✓	✓	O							O						✓	✓	✓	O	O	✓	O		O	O	O	O		O	O
3.20	**Visual**	Yes	✓	✓	✓	✓	O	O	O	O	O	O	O	O			O	✓	✓	O	O	O	O	O		O		O	O	O	O	✓
3.21	**Water**	Yes	✓					O			O						✓	✓	✓	✓	O	✓	O	✓				✓	O	O	✓	✓

✓ = The project is within the cumulative impacts analysis area for this resource and contributes to cumulative impacts
O = The project is within the cumulative impacts analysis area for this resource but would not likely contribute to cumulative impacts on this resource because the timeframe of the project impacts would not overlap the timeframe of impacts from the alternative, because the project has no identified impacts on this resource, or other factors.
Blank = The project is outside the cumulative impacts analysis area for this resource and would not contribute to cumulative impacts

3.1.6 Mitigation Measures

Mitigation is an important mechanism that Federal agencies can use to minimize the potential adverse environmental impacts associated with their actions. As described in the Council on Environmental Quality regulations at 40 CFR 1508.1(s), mitigation refers to measures that avoid, minimize, or compensate for effects caused by a proposed action or alternatives as described in an environmental document or record of decision and that have a nexus to those effects. While the National Environmental Policy Act requires consideration of mitigation, it does not mandate the form or adoption of any mitigation. Mitigation includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

This chapter summarizes mitigation measures identified to minimize potential impacts environmental consequences associated with the key resource issues for analysis identified as part of the Federal agency National Environmental Policy Act review and compliance process. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” for additional information on monitoring and mitigation. The alternatives that are described in detail in Chapter 2, “Proposed Action and Alternatives,” and that are analyzed in this chapter generally do not include the monitoring and mitigation measures that are identified in Appendix H, “Environmental Protection Measures, Monitoring, and Mitigation.” These monitoring and mitigation measures were identified based on the potential adverse impacts associated with the alternatives carried forward for detailed analysis that are described in this chapter. The monitoring and mitigation measures would be part of the selected action in the record of decision.

In addition to resource-specific mitigation measures presented in this chapter and in appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” the Forest Service identified eight general mitigation measures that apply to project operations and to a range of resources. This section provides a summary of these general monitoring and mitigation measures. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.1, “General Mitigation Measures,” for additional information on the mitigation measures and the impacts being mitigated, the timing of the measures, the regulatory authority for the measures, and the potential effectiveness of the measures.

- **Mitigation Measure MM-1: Annual Status Report to the Forest Service.** This measure would ensure effective coordination between the Forest Service and Pinto Valley Mining Corp. during operations, closure, and post-closure. This measure would require Pinto Valley Mining Corp. to submit to the Forest Service an annual summary of mining operations, reclamation, and other activities on National Forest System lands that occurred in the previous year and a summary of planned mining activities in the upcoming year.
- **Mitigation Measure MM-2: Updating and Maintaining Plans during Operations, Closure, and Post-Closure.** This measure addresses potential impacts that could occur on the range of resources on National Forest System lands if operational plans and mitigation and monitoring plans are not maintained during operations, closure, and post-closure. Under this measure,

Pinto Valley Mining Corp. would maintain and review annually all required monitoring and mitigation plans and operating plans that are included or part of the mining plan of operations approval. During annual reviews of plans, Pinto Valley Mining Corp. would determine if there is new information, changing circumstances, or other factors that would require updates.

- **Mitigation Measure MM-3: Interim Shutdown Procedures.** This measure addresses potential impacts on the range of resources that could result from interim shutdown of the mine. This measure requires Pinto Valley Mining Corp. to execute an interim closure plan no later than 60 days after cessation of operations on National Forest System lands and includes a requirement for an updated closure plan no later than 60 days after cessation of active mining operations. Additionally, upon approval of the updated interim closure plan, Pinto Valley Mining Corp. must execute the updated plan and supply annually an updated interim closure plan for approval. The Forest Service may choose to conduct annual bond reviews and recalculations as well as direct Pinto Valley Mining Corp. to implement final reclamation and closure plans in the event of noncompliance.
- **Mitigation Measure MM-4: National Forest System Land Reclamation Plan.** This plan would address existing and proposed surface disturbance on National Forest System lands and associated impacts on the long-term productivity of soils, vegetation, and other ecosystem components. Under this measure, Pinto Valley Mining Corp. would prepare a reclamation plan specific to all areas of disturbance and reclamation on National Forest System lands, including but not limited to the 19 Dump, Cottonwood Tailings Impoundment, Tailings Storage Facilities No. 3 and No. 4, power lines and corridors, pipeline and corridors, and roads. The plan would identify reclamation standards, objectives, and practices to meet desired conditions and land uses following closure of the mine. The reclamation plan would be reviewed and approved by the Forest Service prior to new disturbance on National Forest System lands.
- **Mitigation Measure MM-5: Post-Closure Maintenance and Monitoring**. This measure addresses potential impacts on the range of resources that could persist longer than the identified 3-year maintenance period and the 30-year monitoring period. If site conditions or monitoring indicates that impacts are likely to occur after the proposed 3-year maintenance period and the 30-year post-closure monitoring period (such as reclamation success criteria not being met or water quality monitoring exceeding established thresholds), Pinto Valley Mining Corp. would coordinate with the Forest Service to continue ongoing maintenance, monitoring, and mitigation activities beyond their proposed periods until the potential issues are resolved.
- **Mitigation Measure MM-6: Pipeline and Power Line Operation, Inspection, and Reporting.** This measure addresses the proposed activities at Pinto Valley Mine that include both new and reauthorized use of National Forest System lands for activities related to both pipelines and power lines, including potential construction or relocation of these linear features. Monitoring and inspection of these features is intended to identify, prevent, and detect potential issues (safety and environmental) before they pose risks, such as potential leaks, processes for containment of potential spills, and measures for preventing equipment failure or decline. Under this measure, Pinto Valley Mining Corp. will submit a plan that describes specific procedures for inspections, maintenance, reporting, incident actions, and emergency response protocols, and provide for a documented program to monitor and address potential issues at all linear facilities including power lines and pipelines on National System Forest lands owned and managed by Pinto Valley Mining Corp. This measure would ensure inspections are a part of a routine monitoring program, good housekeeping, maintenance, line and corridor construction quality assurance/quality control, and any necessary repairs. Similar activities should occur at an increased frequency during and after rainfall events.

- **Mitigation Measure MM-7: Forest Service Bond Requirements.** National Forest System surface resources (i.e. soil, vegetation) will be disturbed by the proposed operation and will require financial assurance to ensure they are reclaimed in accordance with regulation, policy, and the approved mining plan of operation. The Forest Service is authorized and will require Pinto Valley Mining Corp. to furnish a bond or other financial assurance for the mining plan of operations (36 CFR 228.13). The Forest Service has developed guidance (2004) for calculating the amount of financial assurance required for mining projects, and it must be developed or reviewed by a Certified Locatable Minerals Administrator. This guidance includes costs to remove structures, regrade and recontour the surface, replace soil, and revegetate the reclaimed land, and it accounts for costs for long-term monitoring and maintenance costs, if such were to be required to meet applicable laws and regulations.
- **Mitigation Measure MM-8: Mining Plan of Operations Expiration Date Extension.** The approved mining plan of operations will have a specified expiration date or term. If operations will need to continue beyond that date, a new or modified plan must be submitted to the Forest Service in accordance with 36 CFR part 228, subpart A.

Under Mitigation Measure MM-4, potential surface disturbance areas associated with reclamation (such as borrow and riprap sources) are described and accounted for in the estimates of surface disturbance for the alternatives in chapter 2, “Proposed Action and Alternatives,” and activities associated with reclamation (such as reclamation emissions, workforce, and noise) are described in the disclosure of environmental consequences in chapter 3, “Environmental Consequences.” In general, reclamation activities could result in surface disturbance due to extraction of borrow and riprap sources, recontouring and grading, removal of culverts and other infrastructure, and other activities. However, in most cases, reclamation-related disturbance would be occurring in areas that have already been disturbed. In general, development and application of a reclamation plan for National Forest System lands would result in beneficial impacts on surface resources by committing Pinto Valley Mining Corp. to specific reclamation activities to achieve desired reclamation objectives and post-mining land uses.

Under Mitigation Measure MM-5, potential extended post-closure maintenance and monitoring activities would result in the continuance of occasional noise, human presence, and ground disturbance as described for maintenance and monitoring activities during the 3-year maintenance period and the 30-year post-closure monitoring period under the proposed action in the Pinto Valley Mine EIS. No notable environmental effects are anticipated from the extension of these activities because they would take place within areas of authorized surface disturbance and would ensure that reclamation success criteria are being met and all post-closure systems are functioning properly.

As an active operating mine, the Pinto Valley Mine is also subject to a broad range of compliance monitoring and reporting plans under Arizona State law and agency requirements. For example, the Pinto Valley Mine Arizona Department of Environmental Quality Aquifer Protection Permit requires Pinto Valley Mining Corp. to perform operational monitoring (pond leak collection/recovery systems, tailings deposition and tailings piezometers, Best Available Demonstrated Control Technology inspections, and pit containment capture zone), groundwater monitoring (water quality/water levels in point-of compliance and alert level wells and springs, perimeter well water level monitoring), discharge monitoring (waste water treatment plant), and physical inspections (to ensure geotechnical stability of tailings, waste rock, and leach dump facilities; diversion channels free of obstructions; pump systems in good order). The results of these monitoring efforts must be reported to the Arizona Department of Environmental Quality. Furthermore, the Arizona Department of Environmental Quality Arizona Pollutant Discharge Elimination System and Multi-Sector General Permit programs require compliance water quality sampling, inspections, and preparation of a Storm Water Pollution Prevention Plan that reflects up-to-date operations and short-term construction activities. The Arizona Department of Environmental Quality Class II Synthetic Minor Air Quality Permit requires compliance reporting of excess emissions and all deviations of permit conditions. The Arizona State Mine Inspector Mined Land Reclamation Plan requires Pinto Valley Mining Corp. to prepare an annual report of new disturbance and new reclamation performed during the prior year.

The Forest Service acknowledges monitoring and mitigation requirements under these various State regulatory requirements and associated permits. However, whereas the monitoring and mitigation requirements associated with these permits are generally based on Arizona State law and State agency requirements, the mitigation measures presented in this final EIS are based on the environmental consequences identified as part of the Federal agency review under the National Environmental Policy Act. Pinto Valley Mining Corp.’s existing Arizona State permits and monitoring/reporting requirements form the basis and starting point for many of the mitigation and monitoring plans identified in this final EIS. More information regarding the State’s permits can be found in appendix H, “Environmental Protection Measures, Monitoring, and Mitigation.”

3.2 Air Quality

Expansion, operation, closure, and reclamation of Pinto Valley Mine would involve the use of equipment, vehicles, process machinery, and other sources that emit air pollutants. These emissions can include gases and particles in engine exhaust, and particles (dust) from materials handling, processing, and storage as well as dust from vehicle travel on roadways and earth surfaces. Emissions can result in impacts on air quality, visibility, and acidic deposition in the region. These potential impacts were identified as key issues during the EIS scoping process (Forest Service 2017a). The air quality assessment estimates the quantities of pollutants emitted (emissions inventories) and uses the emissions data as inputs to dispersion models to estimate potential impacts on pollutant concentrations, visibility impairment, and deposition rates. Assessment results are compared to applicable standards and guidelines to determine compliance of the project and to identify any needs for mitigation measures. Detailed calculations and modeling data are provided in appendix B, “Air Quality Technical Support Document.”

The analysis area for analyzing the near-field direct and indirect effects on air quality extends to a radius of approximately 5 kilometers (3.1 miles) surrounding Pinto Valley Mine (see figure 4 and figure 5 in appendix B, “Air Quality Technical Support Document”). This distance was selected based on modeling results to ensure that the maximum impacts on air quality were captured. There are two Class I[6] areas (Superstition Wilderness and Sierra Ancha Wilderness) and a Class II[7] area of concern (the Tonto National Monument) that are within 50 kilometers (31.1 miles) of Pinto Valley Mine, and the spatial boundaries for the visibility and deposition analysis extend to 50 kilometers (31.1 miles) to capture potential impacts at the Class I and Class II areas.

Air quality impacts can occur from construction, operations, reclamation, and closure activities. To encompass all potential impacts, the temporal boundaries for analyzing the direct and indirect effects include the duration of active mining operations, reclamation/closure, and post-closure under the

[6] Class I air quality areas, as defined by the Clean Air Act, include national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that existed or were authorized as of August 7, 1977. They receive the highest degree of air quality protection under the Clean Air Act.

[7] All other areas are Class II areas. Parks and wilderness areas other than Class I areas are considered sensitive Class II areas and are of concern due to their scenic or ecological value or the presence of other sensitive resources. Class II areas are subject to maximum limits on air quality degradation.

alternatives. The air quality analysis focuses on the year during which maximum emissions are anticipated, which is projected to be year 4 following the record of decision for alternative 1 and the proposed action and year 11 following the record of decision for the no-action alternative.

3.2.1 Relevant Laws, Regulations, and Policy

This section identifies laws, regulations, and policies associated with air quality that are relevant to the Pinto Valley Mine. As an existing and operating mine, Pinto Valley Mining Corp. has secured appropriate air quality permits to conduct existing and ongoing operations at the Pinto Valley Mine.

3.2.1.1 **Federal Authorities**

3.2.1.1.1 Clean Air Act (42 U.S. Code 7401 et seq.)

The Clean Air Act is the comprehensive Federal law that provides for regulation of air emissions from stationary and mobile sources, establishment of National Ambient Air Quality Standards to protect public health and public welfare, and protection of visibility in relatively pristine areas such as national parks and wilderness areas. The Clean Air Act prescribes the measures that the U.S. Environmental Protection Agency and other Federal agencies and State, local, and tribal governments must take in order to regulate air pollution and achieve air quality that meets the National Ambient Air Quality Standards. Arizona and the Pinto Valley Mine are located in U.S. Environmental Protection Agency Region IX.

3.2.1.1.2 National Ambient Air Quality Standards (Title 40, Part 50 of the Code of Federal Regulations)

To protect human health and welfare, the Clean Air Act requires the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards for pollutants harmful to public health or the environment. The U.S. Environmental Protection Agency has set National Ambient Air Quality Standards for the following "criteria" pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter of 10 microns in diameter and smaller (PM_{10}), particulate matter of 2.5 microns diameter and smaller ($PM_{2.5}$), and sulfur dioxide. Primary standards are set to protect human health with an adequate margin of safety. Secondary standards are set to protect public welfare and may account for air quality–related values and protection of plants, animals, and materials. Air pollutant concentrations greater than the National Ambient Air Quality Standards represent a risk to human health. If the air quality in a geographic area meets the National Ambient Air Quality Standards, the area is designated as an "attainment" area. Areas that do not meet the National Ambient Air Quality Standards are designated "nonattainment" areas and must develop comprehensive State Implementation Plans to reduce pollutant concentrations to a safe level. Former nonattainment areas that have achieved attainment are designated as "maintenance" areas. Attainment or nonattainment status is determined by the U.S. Environmental Protection Agency separately for each criteria pollutant. Table 3-4 summarizes these air quality standards and the relevant averaging periods.

Table 3-4. Summary of ambient air quality standards for criteria pollutants

Pollutant	Averaging Period	Standard Type	Units	National
Carbon monoxide	1-hour[8]	Primary	parts per million	35
			micrograms per cubic meter	40,000
	8-hour	Primary	parts per million	9

[8] Not to be exceeded more than once per year.

Pollutant	Averaging Period	Standard Type	Units	National
			micrograms per cubic meter	10,000
Lead	Rolling 3-month average	Primary and Secondary	micrograms per cubic meter	0.15
Nitrogen dioxide	1-hour[9]	Primary	parts per billion	100
			micrograms per cubic meter	188
	Annual[10]	Primary and Secondary	parts per billion	53
			micrograms per cubic meter	100
Ozone	8-hour[11]	Primary and Secondary	parts per million	0.070
			parts per billion	70
PM_{10}	24-hour[12]	Primary and Secondary	micrograms per cubic meter	150
$PM_{2.5}$	24-hour[13]	Primary and Secondary	micrograms per cubic meter	35
	Annual[14]	Primary	micrograms per cubic meter	12
		Secondary	micrograms per cubic meter	15
Sulfur dioxide	1-hour[15]	Primary	parts per billion	75
			micrograms per cubic meter	196
	3-hour[16]	Secondary	parts per million	0.5
			micrograms per cubic meter	1,300

Source: National Ambient Air Quality Standards – 40 CFR 50, Arizona – 18 Arizona Administrative Code 02.

Most of the area within the Pinto Valley Mine project boundary is in a designated nonattainment area for the 1-hour sulfur dioxide standard and nonattainment area for the 24-hour PM_{10} standard. Map 3-1 in appendix A shows the boundaries of these areas relative to the Pinto Valley Mine. A portion of the area within the project limits is also in a designated maintenance area for the 3-hour secondary sulfur dioxide standard (map 3-1 in appendix A). There is no additional regulatory requirement applicable to the 3-hour sulfur dioxide maintenance area beyond the regulatory requirements in the 1-hour sulfur dioxide nonattainment area. To the northwest of the Pinto Valley Mine is the ozone nonattainment area in Maricopa and Gila Counties. The northern portion of the area within the project limits is in a designated attainment area for all criteria pollutants.

3.2.1.1.3 Federal New Source Review and Prevention of Significant Deterioration (Title 40, Parts 51, subpart I, and 52.2(1)) of the Code of Federal Regulations

The Prevention of Significant Deterioration Program established under the Clean Air Act is designed to prevent significant deterioration in the air quality of those areas that meet the National Ambient Air Quality Standards. In general, the New Source Review and Prevention of Significant Deterioration rules define a "major source" as any source with the potential to emit 250 tons per year or more of a criteria pollutant. A lower threshold is defined for a limited number of "categorical sources," source categories for which the Prevention of Significant Deterioration applicability threshold is 100 tons per year of any criteria pollutant. Pinto Valley Mine is not a listed categorical stationary source as defined by Prevention

[9] The 3-year average of the 98th percentile of the daily maximum 1-hour average nitrogen dioxide concentration must not exceed this standard.
[10] Not to be exceeded.
[11] The 3-year average of the fourth-highest daily maximum 8-hour average ozone concentration must not exceed this standard.
[12] Not to be exceeded more than once per year on average over 3 years.
[13] The 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentration is not to exceed this standard.
[14] The 3-year average of the annual average $PM_{2.5}$ concentration is not to exceed this standard.
[15] The 3-year average of the 99th percentile of the daily maximum 1-hour average sulfur dioxide concentration must not exceed this standard.
[16] Not to be exceeded more than once per year.

of Significant Deterioration Program, does not meet the applicability threshold of 250 tons per year, and the project would not cause Pinto Valley Mine's emissions to exceed the 250 tons per year threshold. Accordingly, the Prevention of Significant Deterioration requirements do not apply to the project.

The Prevention of Significant Deterioration regulations set maximum allowable increases in pollutant concentrations due to a project, known as "Prevention of Significant Deterioration increments." Although the project is not subject to Prevention of Significant Deterioration requirements, scoping comments requested that the project impacts be evaluated with respect to the Prevention of Significant Deterioration increments.

3.2.1.1.4 New Source Performance Standards (Title 40, Part 60 of the Code of Federal Regulations)

The Federal New Source Performance Standards are technology-based emission standards applicable to new and modified stationary sources of regulated air emissions. While the National Ambient Air Quality Standards emphasize air quality in general and regulate ambient concentrations, the New Source Performance Standards focus on particular sources of pollutants and regulate emission rates. The New Source Performance Standards program sets uniform emission limitations for approximately 70 industrial source categories or subcategories of sources that are designated by size as well as by type of process.

Diesel- and gasoline-fueled engines that power generators, pumps, and other machinery at Pinto Valley Mine are subject to New Source Performance Standards. The diesel-fueled engines are subject to New Source Performance Standards subpart IIII (Stationary Compression Ignition Internal Combustion Engines) and the gasoline-fueled engines are subject to New Source Performance Standards subpart JJJJ (Stationary Spark Ignition Internal Combustion Engines). Pinto Valley Mining Corp.'s existing air quality permit contains conditions to meet these standards.

3.2.1.1.5 National Emission Standards for Hazardous Air Pollutants (Title 40, Parts 61 and 63 of the Code of Federal Regulations)

Hazardous air pollutants are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Health concerns due to hazardous air pollutants generally are considered too localized to be included under the scope of National Ambient Air Quality Standards. In general, National Emission Standards for Hazardous Air Pollutants limit emission rates and apply to affected sources that are, or are located at, major sources of hazardous air pollutant emissions, as defined in 40 CFR 63.2. A major source is defined as any stationary source that emits or has the potential to emit 10 tons per year or more of any single hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants.

Based on the provisions of its air quality permit, Pinto Valley Mine is not a major hazardous air pollutant source and the project would not cause Pinto Valley Mine to become a major hazardous air pollutant source. However, National Emission Standards for Hazardous Air Pollutants are applicable to certain individual devices at Pinto Valley Mine including diesel-fueled boilers and heaters subject to National Emission Standards for Hazardous Air Pollutants subpart JJJJJJ (National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers), diesel-fueled generator and pump engines subject to National Emission Standards for Hazardous Air Pollutants subpart ZZZZ (Stationary Reciprocating Internal Combustion Engines), and a gasoline tank subject to National Emission Standards for Hazardous Air Pollutants subpart CCCCCC (Gasoline Dispensing Facilities). Pinto Valley Mining Corp.'s existing air quality permit contains conditions to meet these standards.

3.2.1.1.6 Acid Rain Program Emission Monitoring (Title 40, Parts 72 and 75 of the Code of Federal Regulations)

The U.S. Environmental Protection Agency established a program under Title IV of the Clean Air Act to control emissions that contribute to the formation of acid rain. The overall goal of the Acid Rain Program is to achieve significant environmental and public health benefits through reductions in emissions of sulfur dioxide and nitrogen oxides, the primary causes of acid rain. The acid rain regulations are applicable to “affected units” as defined in the regulations.

Mine operations are not regulated under the Acid Rain Program, and the project would not be a major source of sulfur dioxide or nitrogen oxides emissions; therefore, these regulations are not applicable to the project.

3.2.1.1.7 Visibility Air Quality–related Values and Regional Haze Rule (Title 40, Part 51 of the Code of Federal Regulations)

Visibility, also referred to as visual range, is a subjective measure of the distance that light or an object can clearly be seen by an observer. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. It is expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10-percent change in light extinction. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each monitored day. The aerosol species include ammonium sulfate, ammonium nitrate, organic matter, elemental carbon, soil elements, and coarse mass. The daily values are then ranked from clearest to haziest and divided into three categories to indicate the mean visibility for all days (average), the 20 percent of days with the clearest visibility (20 percent clearest), and the 20 percent of days with the worst visibility (20 percent haziest). Visibility can also be defined by standard visual range measured in miles, which is the farthest distance at which an observer can see a black object viewed against the sky above the horizon; the larger the standard visual range, the clearer the air.

Visibility is important to visitors who come to enjoy the often long-range scenic beauty of public lands in the region. Having clear days for such viewing opportunities is especially important for many visitors who are in the area for only a short period. To evaluate potential impacts of a Federal action, Federal land managers[17] use a data analysis threshold of 0.5 deciview for projects that contribute to a visibility problem and a value of 1.0 deciviews for projects that cause visibility issues (Forest Service et al. 2010).

The regional haze rule promulgated by the U.S. Environmental Protection Agency in 1999 addresses visibility impairment in Class I areas as defined by the Clean Air Act. The rule requires that States establish goals (expressed in deciviews) that provide for reasonable progress toward achieving natural visibility conditions in Class I areas. Visibility within Class I areas is measured at monitors in the Interagency Monitoring of Protected Visual Environments network.

3.2.1.1.8 Compliance Assurance Monitoring Program (Title 40, Part 64 of the Code of Federal Regulations)

Federal regulations implementing compliance assurance monitoring apply to major sources that must obtain a Clean Air Act Title V operating permit pursuant to 40 CFR 70. The compliance assurance monitoring rules are aimed primarily at emission units that are individually above major source

[17] The official Federal land manager is the Secretary of the department with authority over the Federal Class I areas (or the Secretary’s designee).

thresholds and that use control devices in order to comply with an emission limitation (40 CFR 64.2). Pinto Valley Mine would not be a major source of criteria pollutants; consequently, it would not be subject to compliance assurance monitoring requirements.

3.2.1.1.9 Accidental Release Prevention Program and Risk Management Plans (Title 40, Part 68 of the Code of Federal Regulations)

The Accidental Release Prevention Program under Clean Air Act section 112(r) applies to facilities that may store quantities of toxic or flammable chemicals above listed thresholds. The requirements include process hazards analyses, implementation of work practices to prevent releases, and development of site-specific risk management plans. Pinto Valley Mine does not store onsite quantities of listed chemicals above the thresholds listed in 40 CFR 68 and would not do so with implementation of the project. Therefore, this program would not be applicable to Pinto Valley Mine.

3.2.1.1.10 Stratospheric Ozone Protection Regulations (Title 40, Part 82, subpart F of the Code of Federal Regulations)

Under Title VI of the Clean Air Act, the U.S. Environmental Protection Agency is responsible for programs that protect the stratospheric ozone layer. Processes at Pinto Valley Mine would not involve the use of chlorofluorocarbon compounds. Therefore, the project would not be subject to chlorofluorocarbon-related regulations.

3.2.1.1.11 General Conformity Analysis (Title 40, Parts 51, subpart W, and 93 of the Code of Federal Regulations)

States and local authorities have the responsibility for bringing their regions into compliance with National Ambient Air Quality Standards or more stringent standards they may adopt. State Implementation Plans are U.S. Environmental Protection Agency-approved plans that set forth the pollution control requirements applicable to the various sources addressed by each State. Section 176(c) of the Clean Air Act prohibits Federal entities from taking actions in nonattainment or maintenance areas that do not “conform” to the State Implementation Plan. The purpose of this conformity requirement is to ensure that Federal activities: (1) do not interfere with the emissions budgets in the State Implementation Plans; (2) do not cause or contribute to new violations of the National Ambient Air Quality Standards; and (3) do not impede the ability to attain or maintain the National Ambient Air Quality Standards. To implement Clean Air Act section 176(c), the U.S. Environmental Protection Agency issued the General Conformity Rule (40 CFR 93, subpart B).

The General Conformity Rule established emissions thresholds (40 CFR 93.153), known as *de minimis* levels, for use in evaluating the conformity of a project. To evaluate conformity, all changes in direct and indirect emissions (as defined in the rule) are summed. Any portion of the project that requires an air quality permit under the Arizona Department of Environmental Quality’s New Source Review or Prevention of Significant Deterioration programs is exempt from the conformity evaluation. If the net emissions increases due to the project are less than the *de minimis* thresholds, the project is presumed to conform and no further conformity evaluation is required. If the emission increases exceed any of the thresholds, a conformity determination is required. The General Conformity Rule provides several options by which a conformity determination may be accomplished. The conformity determination can entail air quality modeling studies, consultation with the U.S. Environmental Protection Agency and State air quality agencies, and commitments to revise the State Implementation Plan or to implement measures to mitigate air quality impacts. The Forest Service, as the Federal entity with jurisdiction for the proposed action, must demonstrate that the proposed action meets the requirements of the General Conformity Rule.

3.2.1.2 **Forest Service Regulations, Policies, and Guidance**

3.2.1.2.1 Protection of National Forests (16 U.S. Code 551)

National forests are managed consistent with land and resource management plans under the provisions of the National Forest Management Act. Any measures addressing air quality resource measures on National Forest System lands will be implemented through, and be consistent with, the provisions of an applicable land and resource management plan.

3.2.1.2.2 Forest Service Manual 2580

Forest Service Manual 2580 includes objectives for cooperation with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources.

3.2.1.2.3 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan includes the following provisions for protection and management of air resources (Forest Service 1985).

- "Manage for Visual Quality Objectives…ranging from Preservation to Maximum Modification as defined for each prescription and delineated in the Forest Visual Resource Inventory. Apply design guidelines found in [U.S. Department of Agriculture] Handbooks and/or National Forest Landscape Management Series" (p. 38-4).
- "Management activities will be planned so that air quality will be equal to or better than that required by applicable federal, State, and local standards or regulations" (p. 50).
- "Perform in-depth review of Prevention of Significant Deterioration….permit applications, to determine the potential effect that increased emissions from the involved major stationary source(s) would have on [air quality–related values] [in nearby] Class I areas" (p. 51). Although the Tonto National Forest Plan did not assign this provision to the portion of the Tonto National Forest in which Pinto Valley Mine is located (management area 2F, covering the majority of the Globe Ranger District), and Pinto Valley Mine will not require a Prevention of Significant Deterioration permit, the air quality analysis assesses the potential impact of the project on the nearest Class I and sensitive Class II areas including the Superstition Wilderness, Sierra Ancha Wilderness, and Tonto National Monument.

The desired condition as identified in the Tonto National Forest Plan is that air quality, including air quality–related values, will meet all applicable standards and guidelines. To support achieving the desired condition, the Pinto Valley Mine Project would not lead to air pollutant concentrations greater than the National Ambient Air Quality Standards, or impacts greater than applicable air quality–related values criteria.

The Tonto National Forest Plan also states, "All analysis areas will be at specified visual quality level or better" (Forest Service 1985). Although visual quality monitoring primarily supports aesthetic and scenic values, it is also is supported by management actions that improve visibility as an air quality–related value.

3.2.1.3 State and Local Laws, Regulations, and Policies

3.2.1.3.1 Arizona Department of Environmental Quality

The State of Arizona has the primary authority in the State for air pollution control and abatement and is responsible for administration of the Clean Air Act under U.S. Environmental Protection Agency Region IX. Arizona Revised Statutes Title 49 establishes the statutory authority for the Arizona Department of Environmental Quality. Arizona Administrative Code Title 18 codifies the Arizona Department of Environmental Quality regulations. The policies, responsibilities, and procedures of the Arizona Department of Environmental Quality, including State and county air pollution control measures, are defined in 49 Arizona Revised Statutes and 18 Arizona Administrative Code.

The Arizona Department of Environmental Quality has issued a “synthetic minor” Class II Air Quality Permit, number 65025, to Pinto Valley Mining Corp. for the current operations of the mine. Synthetic minor status, as defined in 18 Arizona Administrative Code R18-2-306.01, indicates that Pinto Valley Mining Corp. has accepted voluntary emission and operating limits to ensure that the facility’s potential to emit will be lower than the thresholds at which it would be defined as a major source. Major sources are subject to additional permitting and emission control requirements under the Clean Air Act and Arizona Administrative Code.

In accordance with Pinto Valley Mining Corp.’s air quality permit with the Arizona Department of Environmental Quality, Pinto Valley Mining Corp. applies a visual observation plan that requires Pinto Valley Mining Corp. to conduct readings, testing, and visual observations of emissions from point sources, fugitive sources, and other equipment to determine opacity levels (HSEC 2013).

3.2.1.3.2 Gila County

Gila County does not regulate construction and operation of mines with respect to air quality.

3.2.2 Resource Indicators

The air quality assessment is based on a quantitative inventory of Pinto Valley Mine–related emissions, comparison to regional emissions from all sources, and estimation of the pollutant concentrations that could result from project-related and regional emissions, as noted above. Potential changes in Pinto Valley Mine–related emissions due to the proposed action are used to assess compliance with the U.S. Environmental Protection Agency General Conformity Rule as well as the relative contribution of the project to total regional emissions. Estimated concentrations are used to assess compliance of the project with the National Ambient Air Quality Standards and effects on air quality–related values. Table 3-5 identifies the resource indicators and measures used in the air quality analysis to measure and disclose potential effects, in accordance with Forest Service Handbook 1909.15 – National Environmental Policy Act Handbook.

Table 3-5. Resource indicators and measures for assessing air quality effects

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Air quality – emissions	Air pollutant emissions	tons per year	Yes	Clean Air Act Title I, U.S. Environmental Protection Agency General Conformity Rule, Arizona Department of Environmental Quality regulations at 18 Arizona Administrative Code 02
Air quality – concentrations	Ambient pollutant concentrations	parts per billion, parts per million, or micrograms per cubic meter	Yes	National Ambient Air Quality Standards
Air quality–related value – visibility	Light extinction	deciviews	Yes	U.S. Environmental Protection Agency Regional Haze Rule
Air quality–related value – acidic deposition	Acidic deposition rates	kilograms per hectare per year	Yes	Forest Service, National Park Service, and U.S. Fish and Wildlife Service 2011

3.2.3 Affected Environment

The affected environment for existing air quality conditions can be characterized by estimated levels of emissions in the region, measured ambient pollutant concentrations, and air quality–related value levels in the region. Local meteorology provides further context for existing conditions. Table 3-6 summarizes the existing status of the resource indicators, and the existing conditions are discussed below.

Table 3-6. Resource indicators and measures for the existing condition for air quality near Pinto Valley Mine

Resource Element	Resource Indicator	Unit of Measure	Existing Condition
Air quality – emissions	Air pollutant emissions	Tons per year	Refer to “Air Quality – Emissions” section below.
Air quality – concentrations	Ambient pollutant concentrations	parts per billion, parts per million, or micrograms per cubic meter	From 2015 to 2017, levels of carbon monoxide, lead, nitrogen dioxide, PM_{10}, sulfur dioxide (1-hour average), and $PM_{2.5}$ were within National Ambient Air Quality Standards; only ozone exceeded National Ambient Air Quality Standards. Refer to table 3-8.
Air quality–related value – visibility	Light extinction	deciviews	Deciview extinction is greater than natural conditions but improving. Refer to figure **3-2**.
Air quality–related value – acidic deposition	Acidic deposition rates	kilograms per hectare per year	Greater than natural conditions but generally improving trend. Refer to figure **3-3**.

Mean temperatures in Miami, Arizona range from an average minimum of 33.8 degrees Fahrenheit and average maximum of 56.6 degrees Fahrenheit in January, to an average minimum of 65.1 degrees Fahrenheit and average maximum of 96.7 degrees Fahrenheit in July. Miami receives an average annual precipitation of approximately 18.92 inches (Western Regional Climate Center 2017a). Over the course of the year, typical wind speeds vary from 0 to 25 miles per hour, with an annual average speed of 6.9 miles per hour (Western Regional Climate Center 2017b). Figure 3-1 presents a wind rose for observations made at the Pinto Valley Mine meteorological monitoring station from the second quarter of 2016 through the first quarter of 2018. Figure 3-1 also shows that the predominant wind direction is from the south-southeast with frequent low wind-speed conditions.

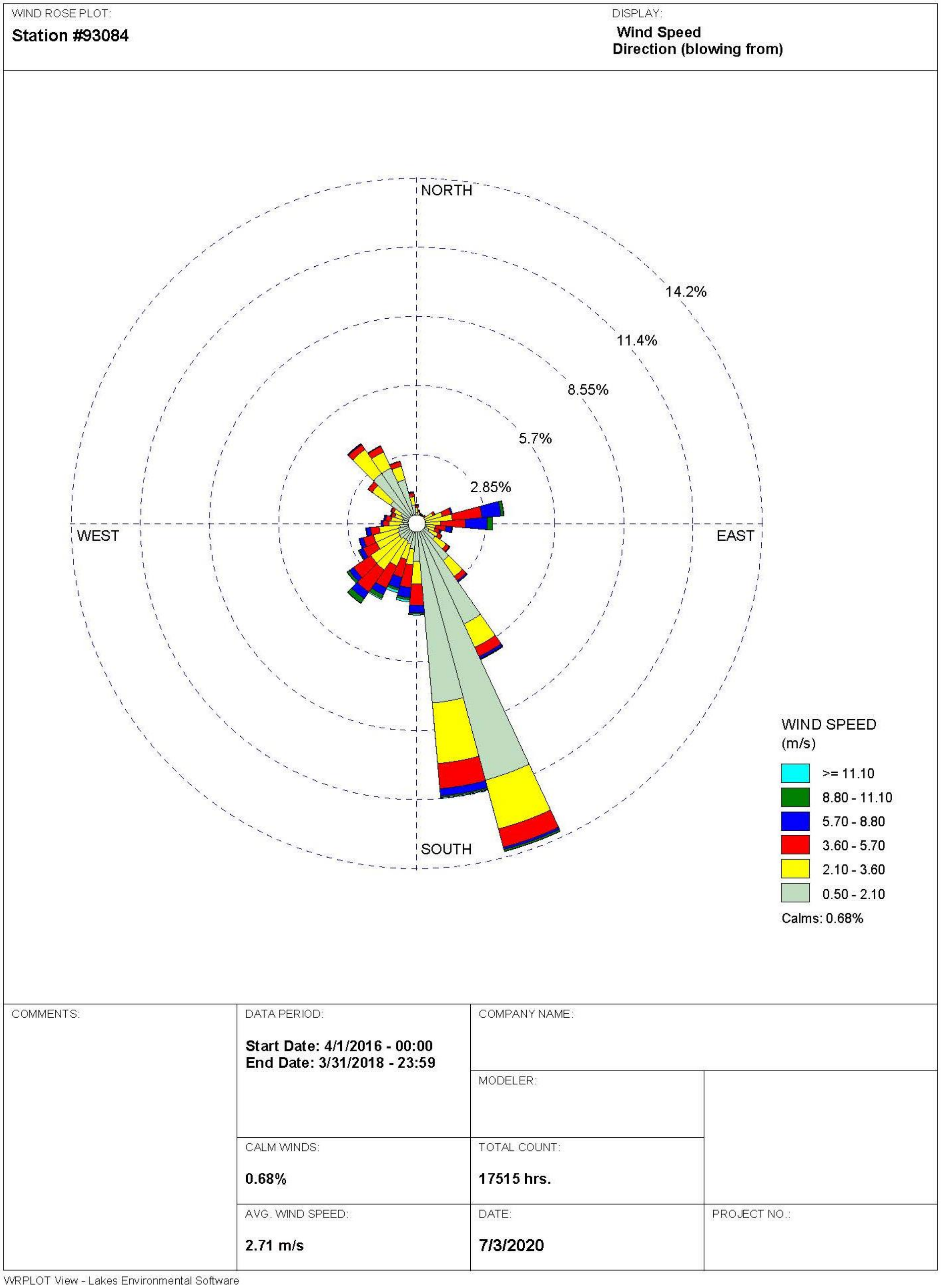

Figure 3-1. Wind rose for Pinto Valley Mine meteorological monitoring station

Source: Pinto Valley Mining Corp. 2020c

3.2.3.1 Air Quality – Emissions

The Arizona Department of Environmental Quality and U.S. Environmental Protection Agency maintain an accounting of criteria pollutant emissions from all sources in Arizona. This emissions inventory provides perspective on the contributions to existing air quality and their scale relative to the reported Pinto Valley Mine emissions. Table 3-7 summarizes the emissions inventory for 2017, which is the most recent year for which complete data are available. The inventory provides data at the county level. Because Pinto Valley Mine is located at the western edge of Gila County, data for Maricopa County and Pinal County are also shown to reflect the larger project region.

Table 3-7. Existing emissions in the region

Area	2017 Criteria Pollutant Emissions (tons per year)					
	Carbon Monoxide	*Nitrogen Oxides*	*PM_{10}*	*$PM_{2.5}$*	*Sulfur Dioxide*	*Volatile Organic Compounds*
Gila County	51,471	3,431	10,964	4,453	24,739	10,614
Maricopa County	396,970	61,612	3,519	10,435	1,621	68,689
Pinal County	51,759	9,849	24,386	4,148	112	9,932
3-county Region	500,201	74,893	70,869	19,036	26,472	89,235
Statewide	1,423,973	187,610	253,731	84,918	40,854	187,610

Source: U.S. Environmental Protection Agency 2020

3.2.3.2 Air Quality – Concentrations

Background concentrations are representative of the regional air quality in the vicinity of the Pinto Valley Mine but generally do not include permitted off-site sources considered in the cumulative analysis. The background monitored data used in this assessment followed the guidance specified in the Arizona Department of Environmental Quality guidance (Arizona Department of Environmental Quality 2015), which recommends the selection of a representative site(s) based on three key factors: (1) monitor location; (2) data quality; and (3) how current the data are. Not all pollutants of interest are measured at all air quality monitoring sites. The background air quality values and selected monitoring stations are summarized in table 3-8.[18] Three stations were identified as being most representative: Resolution Copper Mine's Mine East Plant ambient air quality monitoring station 14 kilometers (8.6 miles) to the south-southwest of Pinto Valley Mine, the Arizona Department of Environmental Quality's Miami Golf Course air quality station 12.9 kilometers (8.0 miles) to the southeast of Pinto Valley Mine, and Maricopa County's carbon monoxide background monitoring station in Buckeye 150 kilometers (95 miles) to the west of Pinto Valley Mine.

Table 3-8 indicates that from 2015 to 2017, concentrations of carbon monoxide, lead, nitrogen dioxide, PM_{10}, sulfur dioxide, and $PM_{2.5}$ were within the National Ambient Air Quality Standards, while concentrations of ozone exceeded the National Ambient Air Quality Standards.

[18] Appendix B, "Air Quality Technical Support Document," provides additional detail on the underlying rationale for the selection of the representative background monitor to use in this analysis

Table 3-8. Background pollutant concentrations and source locations

Pollutant	Monitor Location	Averaging Period, Unit, Form of Standard	National Ambient Air Quality Standards	Background Concentrations 2015–2017
Carbon Monoxide	Buckeye (Maricopa County Air Quality Department)	1-hour, not to be exceeded more than once per year	35 ppm (40,000 µg/m^3)	1.0 ppm (1,145 µg/m^3)
		8-hour, not to be exceeded more than once per year	9 ppm (10,000 µg/m^3)	0.6 ppm (687 µg/m^3)
Lead	Miami Golf Course, Miami, AZ (Arizona Department of Environmental Quality)	3-month, rolling average	0.15 µg/m^3	0.04 µg/m^3
Nitrogen dioxide	East Plant (Resolution Mine)	1-hour, 3-year average of the 98th percentile of the yearly distribution of the 1-hour daily maximum nitrogen dioxide concentrations	100 ppb (188 µg/m^3)	12.4 ppb (23.3 µg/m^3) overall, variable hourly for modeling[19]
		Annual, annual mean	53 ppb (100 µg/m^3)	7.7 ppb (14.5 µg/m^3)
Ozone	East Plant (Resolution Mine)	8-hour, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	0.070 ppm (140 µg/m^3)	0.0763 ppm (153 µg/m^3)
PM_{10}	East Plant (Resolution Mine) and secondarily West Plant	24-hour, average over the 3-year period of the second highest 24-hour average concentration	150 µg/m^3	58.0 µg/m^3
$PM_{2.5}$	East Plant (Resolution Mine) and secondarily West Plant	24-hour, average over the 3-year period of the 98th percentile of the distribution of the 24-hour average concentration	35 µg/m^3	9.4 µg/m^3
		Annual, average over the 3-year period of the annual average concentration	12 µg/m^3	4.1 µg/m^3
Sulfur dioxide	East Plant (Resolution Mine)	1-hour, 99th percentile of the 1-hour daily maximum averaged over 3-years	75 ppb (196 µg/m^3)	11.2 ppb (29.3 µg/m^3)
		3-hour, not to be exceeded more than once per year	500 ppb (1,300 µg/m^3)	8.45 ppb (22.1 µg/m^3)

Source: Arizona Department of Environmental Quality 2017a; U.S. Environmental Protection Agency 2018a
ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter

[19] Appendix B provides further information on the 1-hour nitrogen dioxide modeling.

3.2.3.3 Air Quality–Related Value – Visibility

Monitors in the nationwide Federal Interagency Monitoring of Protected Visual Environments network provide information on current visibility levels and trends in visibility. The nearest monitor to the analysis area is at the Tonto National Monument. Figure 3-2 shows visibility levels as measured at this monitor. In general, trends with a negative slope (downward from left to right) indicate declining impacts (improving atmospheric conditions). Figure 3-2 shows that visibility at the Tonto National Monument is less than natural conditions but generally has been improving over time, although most recent years have shown minimal change. In general, however, the long-term trend is improved visibility, which is expected to continue over time as the State of Arizona continues to implement the regional haze rule, which requires that states establish goals that provide for reasonable progress toward achieving natural visibility conditions in Class I areas and the application of best available retrofit technology to reduce haze-producing pollutants from major stationary sources.

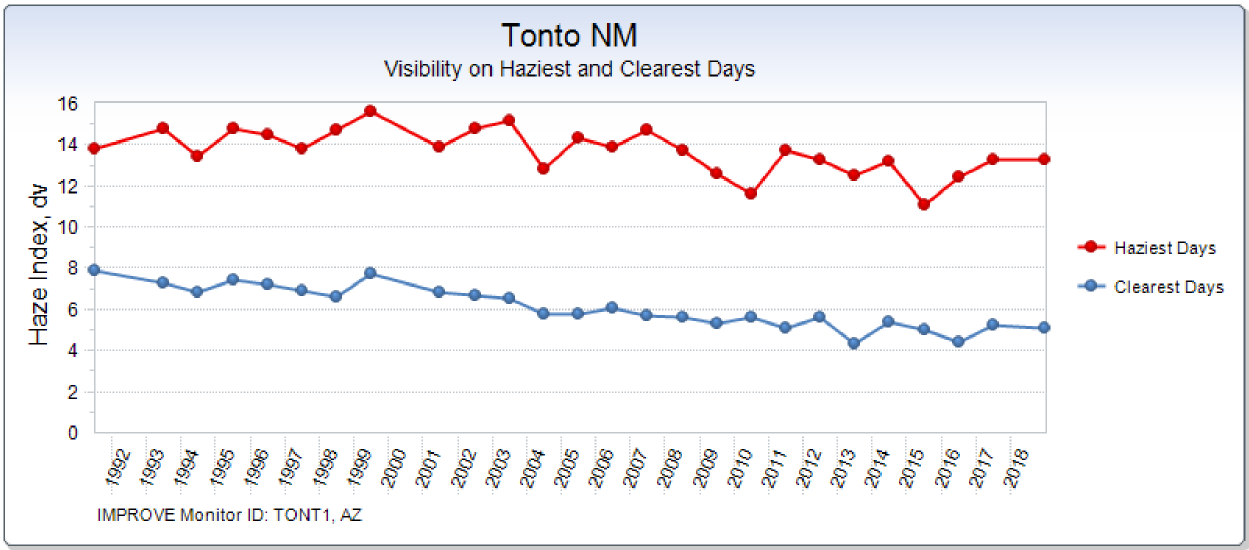

Figure 3-2. Visibility trends for Tonto National Monument

Source: Colorado State University 2020

3.2.3.4 Air Quality–Related Value – Acidic Deposition

Acidic deposition occurs when nitrates and sulfates formed in the atmosphere are deposited to soil, vegetation, and surface water. Potential effects of deposition include acidification of lakes, streams, and soils; leaching of nutrients from soils; injury to high-elevation spruce forests; changes in terrestrial and aquatic species composition and abundance; changes in nutrient cycling; unnatural fertilization of terrestrial ecosystems; and eutrophication of estuarine and some lake systems (Forest Service et al. 2010). Monitors in the interagency Clean Air Status and Trends Network provide information on current acidic deposition levels and trends in deposition. The Clean Air Status and Trends Network deposition monitor with available air quality trend data nearest to the analysis area is located in Petrified Forest National Park, approximately 130 miles northeast of Pinto Valley Mine. Figure 3-3 shows acidic deposition levels and trends as measured at this monitor. In general, trends with a negative slope indicate declining impacts (improving atmospheric conditions).

Federal land managers use a deposition data analysis threshold of 0.005 kilogram per hectare per year for nitrogen and 0.005 kilogram per hectare per year for sulfur to determine the potential significance of a project in the western U.S., as defined under the Federal Land Manager Interagency Guidance for

Nitrogen and Sulfur Deposition Analyses (Forest Service et al. 2011). The data analysis thresholds are based on estimates of naturally occurring deposition (prior to human influences) adjusted for additional deposition that could occur without raising concerns of impacts on resources (for example, the resources noted above). If predicted deposition impacts of a project are below the data analysis thresholds, the impacts are considered negligible. If the predicted impacts exceed the data analysis thresholds, the impacts would be considered potentially significant.

The National Park Service has set a cumulative significance threshold, known as a critical load, for nitrogen deposition in precipitation at Petrified Forest National Park of 3 kilograms per hectare per year based on the park's sensitive lichen and herbaceous plant species (National Park Service 2015). Existing rates of nitrogen deposition at Petrified Forest National Park, which is the nearest monitoring location to Pinto Valley Mine, exceed 3 kilograms per hectare per year. The critical load is the level of deposition that can cause harm to sensitive resources in an ecosystem. If deposition is below the critical load then significant harmful effects are not expected to occur. If deposition exceeds the critical load then additional deposition would be considered a potentially significant impact.

Acid deposition to lakes can impair water quality by reducing their acid-neutralizing capacity. Acid-neutralizing capacity, also known as buffering capacity, is the ability of a body of water to absorb (neutralize) acid deposition without increasing the acidity of the water to levels that could harm sensitive resources (such as fish, other aquatic animals, and aquatic plants). The higher the acid-neutralizing capacity, the more acid deposition a surface water body can neutralize, and the less susceptible it is to acidification and ecological impacts. Annual deposition rates of sulfur and nitrogen at sensitive lake receptors are used to estimate changes in acid neutralization capacity in accordance with Forest Service Level of Acceptable Change thresholds (Forest Service 2000; Fox et al. 1989). These thresholds consider a 10-percent change in acid-neutralizing capacity for lakes with a background acid-neutralizing capacity greater than 25 microequivalents per liter, or 1 microequivalent per liter change for lakes with a background acid-neutralizing capacity less than 25 microequivalents per liter, to be significant.[20]

[20] An equivalent is a measure of a substance's ability to combine with other substances. The equivalent is formally defined as the amount of a substance, in moles, that will react with one mole of electrons. A mole is the amount of a substance expressed in molecules, atoms, ions, or electrons. A microequivalent is one millionth of an equivalent.

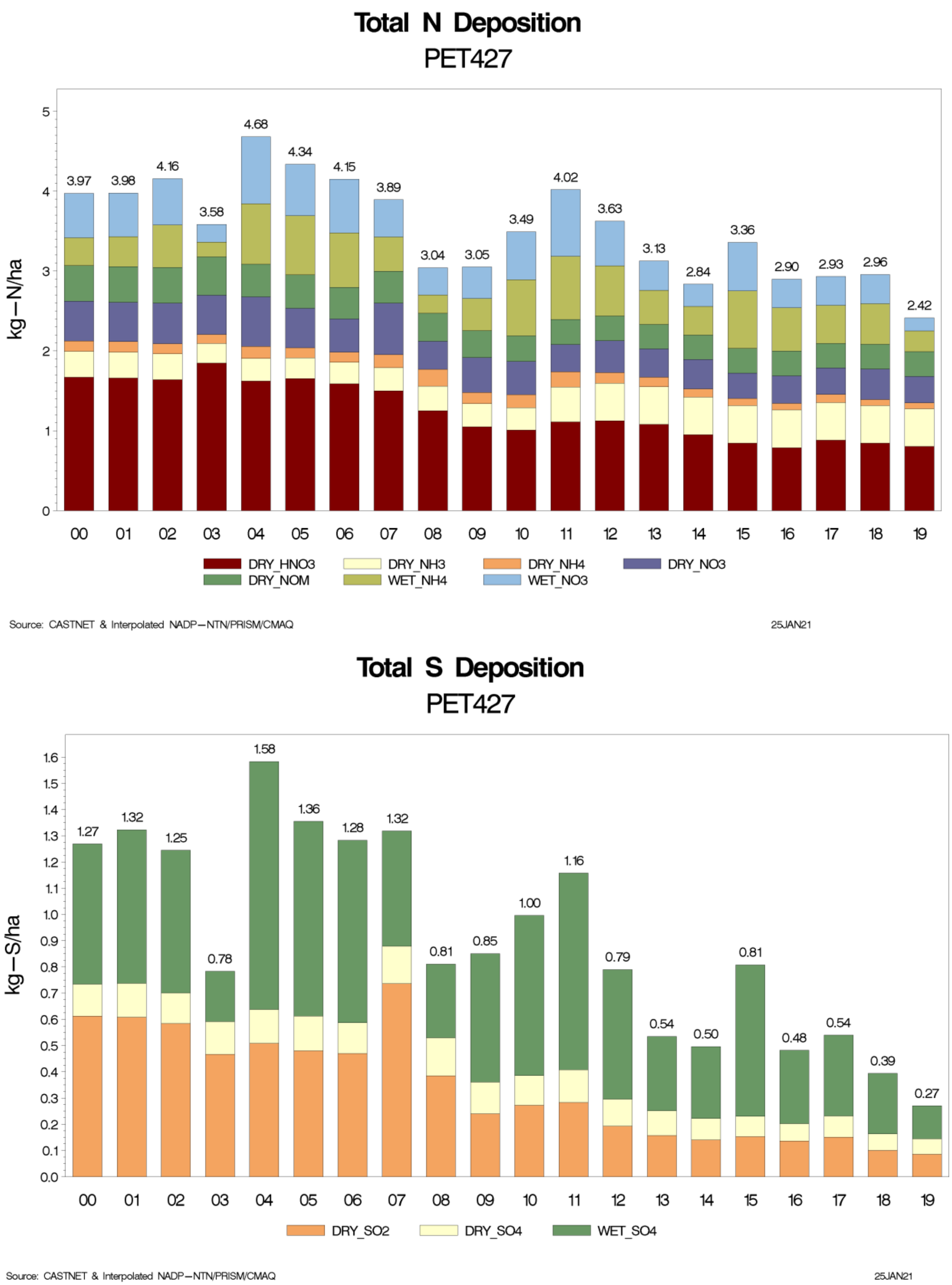

Figure 3-3. Nitrogen (N) and sulfur (S) deposition data for Petrified Forest National Park, 2000–2019

Source: U.S. Environmental Protection Agency 2021

3.2.4 Environmental Consequences

3.2.4.1 Analysis Methodology and Assumptions

The air quality analysis includes an assessment of expected future impacts of emissions from equipment, mobile sources, and activities associated with Pinto Valley Mine. The air quality analysis also includes a project-specific emission inventory and the use of air quality dispersion modeling to assess the pollutant concentration impacts of emissions from mining and processing activities on air quality in the analysis area. The impacts analysis modeling was conducted using emissions data specifically developed by Pinto Valley Mining Corp. for the construction and operation of the project. The modeling scenarios were designed to capture the maximum impacts for each pollutant for the project. Compared to the no-action alternative, an increase in haul truck activity would occur under the proposed action due to the extended life of the mine. This increased truck activity is responsible for the largest share of emissions increases associated with the proposed action. To assess the maximum impact, alternative 1 and the proposed action were modeled for the year with the highest total haul truck activity, which would occur in year 4 following the record of decision. The modeling scenario under the proposed action includes all ongoing activities at Pinto Valley Mine, plus the expansion of the Open Pit and Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 onto National Forest System land. Pinto Valley Mining Corp. does not anticipate construction of access roads or power lines in year 4. Because construction of access roads or power lines is expected to have much lower emissions than the increase in truck activity, construction of access roads or power lines in years other than year 4 would not affect the selection of year 4 as the maximum-emissions year. The no-action alternative emissions are presented for year 11 following the record of decision, which corresponds to the year with the greatest level of emissions associated with reclamation and closure activities. A cumulative modeling assessment also was conducted and includes emissions from other nearby permitted mines and smelters, using data obtained from the Arizona Department of Environmental Quality.

Air quality impacts were evaluated using the American Meteorological Society and U.S. Environmental Protection Agency Regulatory Model Improvement Committee model (AERMOD). The latest version of AERMOD (version 19191) along with the latest versions of all supporting software were used for this application. AERMOD accounts for source characteristics, locations, emission rates, locations of potential impacts (known as receptors), meteorology, land use, and topography in the analysis area.

The air quality assessment considered the project-alone and the cumulative near-field (to 50 kilometers [31.1 miles] distance from Pinto Valley Mine) air quality impacts. The modeling focused on the criteria pollutants, including carbon monoxide, nitrogen dioxide, PM_{10}, $PM_{2.5}$, and sulfur dioxide. Lead was not modeled, as there are no lead emissions. Particulate matter, including dust from mining operations, wind erosion, and traffic on unpaved roads, is a criteria pollutant of particular concern for this analysis as the project is located in a nonattainment area for the 24-hour PM_{10} National Ambient Air Quality Standard. Also of concern are sulfur dioxide emissions, as the project is in a nonattainment area for the 1-hour sulfur dioxide National Ambient Air Quality Standard. Deposition of sulfur and nitrogen compounds was evaluated by estimating deposition rates using AERMOD. A portion of the area within the project limits is also in a designated maintenance area for the 3-hour secondary sulfur dioxide 1971 standard (map 3-1 in appendix A). There is no additional regulatory requirement applicable to the 3-hour sulfur dioxide maintenance area beyond the regulatory requirements in the 1-hour sulfur dioxide nonattainment area. There are ozone non-attainment areas located north and east of the Pinto Valley Mine project boundary; however, these areas are outside of the project area (see map 3-1 in appendix A).

To more accurately represent the fugitive dust emissions associated with haul trucks, light-duty trucks, and heavy-duty trucks, Pinto Valley Mining Corp. funded a silt and moisture content study on unpaved roads at the Pinto Valley Mine in April 2020 (Trinity Consultants 2020). Silt loading and moisture content information collected at a variety of locations at the mine were applied to estimate particulate matter emission rates and locations more accurately.

To determine whether the proposed action would have a significant impact on ozone formation, a Tier 1 modeled emission rates for precursors analysis was conducted following the U.S. Environmental Protection Agency's Guidance on Development of modeled emission rates for precursors for ozone (U.S. Environmental Protection Agency 2019a). This guidance was developed to assess compliance under the U.S. Environmental Protection Agency's Prevention of Significant Deterioration Program. The guidance estimates the impacts of a single industrial source on secondary pollutants (such as ozone) using relationships between emissions and ambient air quality impacts for 70 hypothetical sources. The U.S. Environmental Protection Agency developed these relationships from photochemical modeling studies that it conducted, and which it determined are sufficiently conservative for use in evaluating a potential source's impacts. The derived modeled emission rates for precursors value indicates the emission rate of the project source that would be required to increase the ambient ozone concentration by a critical air quality threshold of 1 part per billion, based on the relationship between emissions and ambient air quality impacts found for the most relevant source modeled in the U.S. Environmental Protection Agency's photochemical studies. If the actual emission rate of the project source is less than the modeled emission rates for precursors, then the ozone impacts of the project source would be less than 1 part per billion and are considered not to be significant.

Hazardous air pollutants from the project alone and in combination with current operations have a maximum potential to emit that is below the level to be considered a "major source" (as defined by the U.S. Environmental Protection Agency) of hazardous air pollutants. Therefore, no ambient air quality modeling analysis of hazardous air pollutants was conducted.

Visibility impacts were assessed using the U.S. Environmental Protection Agency's plume visual impact screening model (VISCREEN) (U.S. Environmental Protection Agency 1992). VISCREEN was used to assess the potential for observers in nearby national monument and wilderness areas within 50 kilometers (31.1 miles) of Pinto Valley Mine to perceive visible plumes from the proposed project. VISCREEN evaluates the plume visual effects for both inside and outside the Class I or II areas for both contrast and human perceptibility against the sky background and terrain background for different sun angles

VISCREEN accounts for spatial and sun angles that affect the visibility of a plume. The model can be run at two screening levels: level-1 analysis uses worst-case meteorological conditions and a plume to observer relationship that places the plume adjacent to the observer. If level-1 screening results in exceedances of the contrast parameters, then level-2 is used. Level-2 screening requires an evaluation of both the frequency and distribution of wind speed and direction in order to determine if the plume will remain cohesive as it travels toward the observer located within the area of interest. If the plume is dispersed due to convective activity, it is unlikely that any discoloration of the atmosphere will be visible. If level-2 screening results in exceedances of the contrast parameters, then the U.S. Environmental Protection Agency Plume Visibility Model (PLUVUE) II is used to conduct a more refined (level-3) analysis.

Detailed explanation of the modeling approach as well as the calculations and modeling data are provided in appendix B, "Air Quality Technical Support Document." AERMOD, VISCREEN, and PLUVUE II, like all air quality models, are mathematical models developed from first principals, that represent the physical world, reflecting the limits of current science and input data. Consequently, the modeling results are subject to some uncertainty.

3.2.4.2 No-Action Alternative - Direct and Indirect Impacts

3.2.4.2.1 Air Quality – Emissions

Emissions from stationary sources at Pinto Valley Mine are expected to remain relatively constant during the 6-month transition period. Emissions from mobile sources at Pinto Valley Mine are expected to decrease rapidly as the mine transitions from active mining operations to reclamation and closure within 6 months of the record of decision.

Table 3-9 provides a summary of the criteria pollutant annual average emission rates for the maximum emissions year under each alternative (year 11 for the no-action alternative and year 4 for alternative 1 and the proposed action). As indicated in table 3-9, no-action alternative emissions are substantially lower than alternative 1 and the proposed action.

Information on greenhouse gas emissions under the no-action alternative is presented in section 3.4, "Greenhouse Gas and Climate Change Impacts."

Table 3-9. Summary of Pinto Valley Mine On-Site Maximum Year Emissions

Alternative and Source Type	Emissions (tons per year)					
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	VOC	CO
No-Action Alternative (Year 11)						
Road Dust Fugitive	102	11	0	0	0	0
Stationary Sources	3	0	0	0	4	0
Mobile Sources	1	1	27	1	0	40
Total	106	12	27	1	4	40
Alternative 1 (Year 4)						
Road Dust Fugitive	214	22	0	0	0	0
Stationary Sources	321	79	43	16	6	216
Mobile Sources	21	21	635	less than 0.5	less than 0.1	294
Total	556	121	678	16	6	510
Proposed Action (Year 4)						
Road Dust Fugitive	551	56	0	0	0	0
Stationary Sources	321	79	43	16	6	216
Mobile Sources	37	36	979	less than 0.5	less than 0.1	452
Total	909	171	1,023	16	6	668

Source: Pinto Valley Mining Corp. 2018a

CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulate matter 10 microns and smaller; $PM_{2.5}$ = particulate matter 2.5 microns and smaller; SO_2 = sulfur dioxide; VOC = volatile organic compounds

3.2.4.2.2 Air Quality – Ambient Pollutant Concentrations

Ambient pollutant concentrations in the vicinity of the Pinto Valley Mine are expected to decrease over time compared to the background levels shown in table 3-8, consistent with the reductions in emissions noted above.

Air quality modeling was not performed for the no-action alternative, as the emissions would be substantially lower than emissions for alternative 1 and the proposed action (table 3-9). Therefore, ambient pollutant concentrations under the no-action alternative would also be less than the proposed action and alternative 1, and would be unlikely to cause or contribute to an exceedance of the National Ambient Air Quality Standards, if modeled.

3.2.4.2.3 Air Quality–related Values – Visibility

Under the no-action alternative, Pinto Valley Mine emissions that could affect air quality-related values at nearby Class I and Class II areas would substantially decrease following the 6-month transition period as the mine transitions from active mining operations to reclamation/closure. In addition, under the no-action alternative Pinto Valley Mining Corp. does not anticipate regular blasting events that could affect visibility. As a result, the no-action alternative is not anticipated to result in visibility impacts at the Superstition Wilderness, Sierra Ancha Wilderness, or Tonto National Monument.

3.2.4.2.4 Air Quality–related Values – Acidic Deposition

Under the no-action alternative, Pinto Valley Mine emissions that could affect acidic deposition at nearby Class I and Class II areas would substantially decrease following the 6-month transition period as the mine transitions from active mining operations to reclamation/closure. As a result, the no-action alternative is not anticipated to result in acidic deposition impacts at the Superstition Wilderness, Sierra Ancha Wilderness, or Tonto National Monument.

3.2.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.2.4.3.1 Air Quality – Emissions

As shown in table 3-9, all pollutant emissions during the maximum emissions year would increase compared to the no-action alternative. The increase in emissions is mostly due to the continued operation of the mine for approximately 7 more years and associated increases in haul truck activity under alternative 1. Emissions from stationary sources at Pinto Valley Mine are expected to remain constant over time because they are limited by the terms of Pinto Valley Mining Corp.'s air quality permit. Emissions from mobile sources at Pinto Valley Mine are expected to decrease over time as older, higher-emitting trucks and equipment are retired and replaced by newer, lower-emitting units.

Refer to appendix B, "Air Quality Technical Support Document," for additional detail on emission rates for the major source types used in this analysis.

3.2.4.3.2 Air Quality – Ambient Pollutant Concentrations

Modeling results are evaluated by comparing the modeled results with the National Ambient Air Quality Standards for the applicable air quality standard (table 3-10). For each pollutant, the modeled ambient air quality impacts are added to the representative background air quality concentrations. As indicated in table 3-10, the modeling results show that under alternative 1 there are no modeled exceedances of National Ambient Air Quality Standards.

Table 3-10. Summary of ambient concentrations for the proposed action and alternative 1 at Pinto Valley Mine, maximum emissions year 2024 (micrograms per cubic meter)

Pollutant	Averaging Period	Monitored Background	Modeled without Background (μg/m³)		Total Background + Modeled (μg/m³)		National Ambient Air Quality Standards (μg/m³)
			Alternative 1	*Proposed Action*	*Alternative 1*	*Proposed Action*	
Carbon monoxide	1-Hour	1,145	722	893	1,867	2,038	40,000
	8-hour	687	204	204	891	891	10,000
Nitrogen dioxide	1-Hour	Variable hourly[21]	130.8	144.5	154.1	157.3	188
	Annual	14.5	11.5	15.4	26.0	29.9	100
Sulfur dioxide	1-Hour	29.3	26.4	26.4	55.7	55.7	196
	3-hour	22.1	17.9	14.9	40.0	37.0	1300
PM_{10}	24-Hour	58	57	88	107	135	150
$PM_{2.5}$	24-Hour	9.4	11.8	14.0	20.9	23.1	35.0
	Annual	4.1	4.6	5.3	8.7	9.4	12.0

μg/m³ = micrograms per cubic meter

3.2.4.3.3 Air Quality–related Values – Visibility

Under alternative 1, Pinto Valley Mine emissions of nitrogen oxides, sulfur dioxide, and particulate matter that could affect visibility at nearby Class I and Class II areas would increase compared to the no-action alternative due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increases in emissions under alternative 1. In addition, under alternative 1 Pinto Valley Mining Corp. would conduct daily blasting operations to excavate the ore and waste rock in the Open Pit. As indicated in appendix B, "Air Quality Technical Support Document," daily blasting could result in a visible plume at Superstition Wilderness. However, a perceptible plume would only occur when the plume is viewed against a black background, the wind direction is between 70 and 100 degrees, and the time is between the hours of 11 a.m. and 1 p.m., that is, conditions at midday with the wind from the east. However, the probability of these conditions occurring is approximately 15 percent based on the meteorological measurements, and an observer in the Superstition Wilderness would not necessarily be viewing the plume against a black background.

As a result, alternative 1 would increase potential impacts on visibility at nearby Class I and Class II areas compared to the no-action alternative. However, the probability of visibility impairment in the Class I and Class II areas would still be low.

3.2.4.3.4 Air Quality–related Values – Acidic Deposition

Under alternative 1, Pinto Valley Mine emissions of nitrogen oxides and sulfur dioxide that could affect acidic deposition at nearby Class I and Class II areas would increase compared to the no-action alternative due to the extension of active mining operations and associated increase in emissions under alternative 1. As a result, alternative 1 would increase potential impacts on acidic deposition at nearby Class I and Class II areas compared to the no-action alternative.

[21] Further information on the modeling of 1-hour nitrogen dioxide is provided in appendix B, "Air Quality Technical Support Document."

3.2.4.4 **Proposed Action – Direct and Indirect Impacts**

3.2.4.4.1 Air Quality – Emissions

As shown in table 3-9, all pollutant emissions during the maximum emissions year would increase compared to the no-action alternative and emissions of PM_{10}, $PM_{2.5}$, nitrogen oxides, and carbon monoxide would increase compared to alternative 1. Compared to alternative 1, the stationary source emissions under the proposed action would generally be the same and only the spatial pattern of these emissions would change due to the increased expansion of the Open Pit, tailings storage facilities, and other project facilities onto National Forest System lands under the proposed action. Emissions from mobile sources would increase, mostly due to increases in haul truck activity under the proposed action. In addition, emissions-generating activities would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Information on greenhouse gas emissions under the proposed action is presented in section 3.4, "Greenhouse Gas and Climate Change Impacts."

3.2.4.4.2 Air Quality – Ambient Pollutant Concentrations

As shown in table 3-10, the proposed action would increase the maximum ambient pollutant concentrations for all pollutants except for 8-hour carbon monoxide and 1-hour sulfur dioxide, which remain the same, and 3-hour sulfur dioxide, which decreases under the proposed action. As indicated in table 3-10, all ambient pollutant concentrations would remain below National Ambient Air Quality Standards.

Ozone and secondary particulate matter impacts were assessed through modeled emission rates for precursors tier 1 analysis. For each ozone or secondary $PM_{2.5}$ precursor (nitrogen oxides, sulfur dioxide, and volatile organic compounds), the emission increase under the proposed action would be less than the emission rate that would cause ozone or secondary $PM_{2.5}$ concentrations to exceed the critical air quality threshold of 1 part per billion for ozone, 1.2 micrograms per cubic meter for daily average $PM_{2.5}$, or 0.2 microgram per cubic meter for annual average $PM_{2.5}$. Therefore, the proposed action would not lead to a significant increase in ozone or secondary $PM_{2.5}$ levels.

3.2.4.4.3 Air Quality–related Values – Visibility

Under the proposed action, Pinto Valley Mine emissions of nitrogen oxides, sulfur dioxide, and particulate matter that could affect visibility at nearby Class I and Class II areas would increase compared to alternative 1 due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions under the proposed action. Similar to alternative 1, visibility impacts from active mining operations and visible plumes could occur within the nearby Superstition Wilderness into the direction of the sun against a dark terrain background. However, a more refined level-3 analysis for active operations would likely show that this impact is less than perceptible.

Potential impacts on visibility in Superstition Wilderness from daily blasting operations would be the same as alternative 1, except that daily blasting operations and resulting potential impacts on visibility would persist for 12 more years than alternative 1.

3.2.4.4.4 Air Quality–related Values – Acidic Deposition

Under the proposed action modeling scenario, acidic deposition rates at Superstition Wilderness and other Class I areas would increase due to increases in nitrogen and sulfur emissions compared to the other alternatives. The largest modeled increase in sulfur deposition in any Class I area was 0.00013 kilogram per hectare per year, well below the data analysis threshold of 0.005 kilogram per hectare per year. The largest modeled increase in nitrogen deposition in any Class I area occurred in the Superstition Wilderness area and was 0.11 kilogram per hectare per year, which exceeds the data analysis threshold of 0.005 kilogram per hectare per year. Only the Superstition Wilderness area had deposition values that would exceed the data analysis threshold. A variety of analysis techniques exist that more accurately account for the atmospheric conversion of nitrogen oxides emissions to various nitrogen species that may be deposited (Forest Service et al. 2014).

3.2.4.4.5 Air Quality – General Conformity Evaluation

As discussed in section 3.2.1, "Relevant Laws, Regulations, and Policies," the General Conformity Rule establishes emissions thresholds for use in evaluating the conformity of a project. If the net emissions increases due to the project are less than these *de minimis* thresholds, general conformity is not applicable to the project and no further conformity evaluation is required. If the emission increases exceed any of the thresholds, a Conformity Determination is required.

The Conformity Rule applies only to those pollutants for which the project area is designated nonattainment or maintenance. The Pinto Valley Mine site is within nonattainment areas for sulfur dioxide and PM_{10} (see map 3-1 in appendix A). Therefore, the changes in emissions of sulfur dioxide and PM_{10} under the proposed action were compared to the general conformity *de minimis* thresholds, which are 100 tons per year of each pollutant. As shown in table 3-9 and further described in appendix B, "Air Quality Technical Support Document," emissions of sulfur dioxide would increase by 15 tons per year under the proposed action compared to the no-action alternative, which is less than the threshold of 100 tons per year. Therefore, no further conformity evaluation is required for sulfur dioxide.

As shown in table 3-9 and described in appendix B, "Air Quality Technical Support Document," emissions of PM_{10} under the proposed action would increase by 803 tons per year compared to the no-action alternative, which is greater than the threshold of 100 tons per year. Therefore, a General Conformity Determination is required for PM_{10}. Under the General Conformity Rule, conformity may be demonstrated by showing that maximum 24-hour concentrations of PM_{10} under the proposed action would be less than the National Ambient Air Quality Standard for PM_{10}. As shown in table 3-10, the maximum PM_{10} concentration under the proposed action would be 135 micrograms per cubic meter, which is less than the National Ambient Air Quality Standard of 150 micrograms per cubic meter (table 3-5). Because the maximum PM_{10} concentration would be below the National Ambient Air Quality Standard, conformity is demonstrated and the proposed action complies with the General Conformity Rule. To document this conclusion, a General Conformity Determination was prepared and is included as appendix I, "General Conformity Determination."

3.2.4.5 **<u>Cumulative Impacts</u>**

The cumulative impacts analysis area for analyzing the near-field cumulative impacts on air quality extends to a radius of approximately 5 kilometers (3.1 miles) surrounding Pinto Valley Mine (see figure 4 and figure 5 in appendix B, "Air Quality Technical Support Document"). This distance was selected based on modeling results to ensure that the maximum impacts on air quality were captured. There are two

Class I[22] areas (Superstition Wilderness and Sierra Ancha Wilderness) and a Class II[23] area of concern (the Tonto National Monument) that are within 50 kilometers (31.1 miles) of Pinto Valley Mine, and the spatial boundaries for the visibility and deposition analysis extend to 50 kilometers (31.1 miles) to capture potential impacts at the Class I and Class II areas.

The temporal boundary for analyzing cumulative impacts on air quality includes the duration of active mining operations, reclamation and closure, and post-closure under the alternatives. The air quality analysis focuses on the year during which maximum emissions are anticipated, which is projected to be year 4 following the record of decision for alternative 1 and the proposed action and year 11 following the record of decision for the no-action alternative.

3.2.4.5.1 Air Emissions and Ambient Pollutant Concentrations

Present effects of the relevant past and present actions have resulted in the air quality conditions presented section 3.2.3, “Affected Environment.” The primary past, present, and reasonably foreseeable actions contributing to cumulative effects on air quality emissions and concentrations include other permitted mines and smelters within the analysis area, as described in table 3-11. In addition, ongoing transport of concentrate and waste off site from the Pinto Valley Mine to their respective destinations contributes to cumulative emissions in the analysis area. Potential cumulative impacts of other ongoing and reasonably foreseeable actions (table 3-2 and table 3-3) are considered to be accounted for in the monitored background concentrations presented in section 3.2.3, “Affected Environment,” or were not included in the cumulative modeling scenario for reasons noted in table 3-11. Project-related emissions and associated cumulative impacts on air quality associated with the Pinto Valley Mine and the facilities identified in table 3-11 were generally modeled in the same way as the direct and indirect impacts, as described in appendix B, “Air Quality Technical Support Document.”

As both the Hayden and the Freeport-McMoRan facilities have had additional emission controls required within the past 5 years, the Arizona Department of Environmental Quality has determined that they will not be subject to additional controls in the next regional haze state implementation plan, due in 2028.

Table 3-11. Nearby mining and smelter facilities considered for the cumulative air quality analysis

Facility	Distance from Pinto Valley Mine	Facility and Emissions Status
ASARCO Hayden Smelter	48 kilometers (29.8 miles)	Emissions are based on the smelter’s most recent Arizona Department of Environmental Quality air permit.
Carlota Mine	0.8 kilometer (0.5 mile)	The Carlota Mine currently uses surface and sub-surface leaching to extract economic copper from the leach pads. This operation is expected to continue for several years. However, most of the emissions associated with this activity are from the on-site mobile sources and use of emergency generators and storm water pumps.
Freeport-McMoRan Miami Smelter	11 kilometers (6.8 miles)	Emissions are based on the smelter’s most recent Arizona Department of Environmental Quality air permit, which includes substantial emission reductions with upgraded emission controls, particularly for sulfur dioxide, that were implemented as part of an expansion in production levels at the smelter.

[22] Class I air quality areas, as defined by the Clean Air Act, include national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that existed or were authorized as of August 7, 1977. They receive the highest degree of air quality protection under the Clean Air Act.

[23] All other areas are Class II areas. Parks and wilderness areas other than Class I areas are considered sensitive Class II areas and are of concern due to their scenic or ecological value or the presence of other sensitive resources. Class II areas are subject to maximum limits on air quality degradation.

Facility	Distance from Pinto Valley Mine	Facility and Emissions Status
Freeport-McMoRan Miami Copper Mine	8 kilometers (5.0 miles)	The Miami Mine is currently in care and maintenance mode with only limited leaching operations from stockpiles. Based on these factors, Miami Mine was not included in the cumulative modeling scenario.
Resolution Copper Mine (proposed)	6.9 kilometers (4.3 miles)	Based on review of the Resolution Mine emissions inventory and the current schedule for construction, it was determined that the facility would not be in operation during the maximum emissions modeling year used in this assessment (year 4 after the record of decision). In addition, due to the nature of the proposed underground mining for the Resolution Mine, the majority of emission impacts from future construction and operation of the Resolution Mine would occur in close proximity to the mine (in contrast to towers or stacks). Based on these factors, the Resolution Mine was not included in the cumulative modeling scenario.

Table 3-12 summarizes the emissions from other nearby mining and smelter facilities and off-site vehicle emissions associated with the Pinto Valley Mine that were included in the cumulative impact modeling scenario.

Table 3-12. Summary of regional emissions used for the cumulative analysis (tons per year)

Pollutant	ASARCO Hayden Smelter and Concentrator	Carlota Mine	Freeport-McMoRan Miami Smelter	Pinto Valley Mine Off Site
Sulfur dioxide	2,524	0.002	644	0.001
PM_{10}	2,088	0.026	310	8.8
$PM_{2.5}$	1,571	0.015	196	1.5
Carbon monoxide	163	0.15	134	0.1
Nitrogen oxides	288	0.23	265	4.6
Lead	4	less than 0.01	4	less than 0.01

Source: Refer to appendix B, “Air Quality Technical Support Document.”
Note: Pinto Valley Mine off-site emissions are from mobile sources associated with project-related vehicle emissions that occur outside of the project boundary (such as transport of concentrate from the mine to smelters).

Table 3-13 presents the results of the cumulative impact modeling scenario. The results of the cumulative impact modeling scenario were evaluated by comparing the proposed action modeled results with the National Ambient Air Quality Standards for the applicable air quality standard. For each pollutant, the modeled ambient impacts of the proposed action were added to the representative background concentration. The modeling results show that the only potential pollutant that may exceed the National Ambient Air Quality Standards is the 1-hour sulfur dioxide concentration; however, this exceedance is not attributable to the Pinto Valley Mine as further discussed below.

Table 3-13. Cumulative ambient concentrations in the analysis area, proposed action maximum emissions year

Pollutant	Period	Total Cumulative Concentration (µg/m³) without Background	Total (µg/m³), Cumulative Concentration with Background	National Ambient Air Quality Standards (µg/m³)	Monitored Background	
					Period	µg/m³
Carbon monoxide	High second high 1-hour once per year	896	2,041	40,000	1-hour	1,145
Carbon monoxide	High second high 8-hour once per year	204	891	10,000	8-hour	687
Nitrogen dioxide	High eighth high 1-hour daily max, averaged over 2 years	145.0	157.8	188	1-hour	23.3[24]
Nitrogen dioxide	Highest annual across 2 years	15.5	30.0	100	Annual	14.5
Sulfur dioxide	High fourth high 1-hour daily max averaged over 2 years	**<u>312</u>**	**<u>341</u>**	196	1-hour	29.3
Sulfur dioxide	High second high 3-hour once per year	155	177.1	1,300	3-hour	22.1
PM_{10}	High third high 24-hour over 2 years	89	136	150	24-hour	58[25]
$PM_{2.5}$	High eighth high 24-hour averaged over 2 years	14.7	24.1	35.0	24-hour	9.4[26]
$PM_{2.5}$	Annual mean, averaged over 2 years	6.0	10.1	12.0	Annual	4.1

Note: **<u>Bold underline</u>** text identifies modeled exceedances of National Ambient Air Quality Standards.
µg/m³ = micrograms per cubic meter

Table 3-13 shows that the predicted cumulative concentrations are less than the National Ambient Air Quality Standards for all pollutants except 1-hour sulfur dioxide. A number of model receptors to the north and east of Pinto Valley Mine show a potential violation of the 1-hour sulfur dioxide standard. However, in all cases the 1-hour exceedance is more than 98 percent attributable to emissions from the Freeport-McMoRan Miami Smelter. For all of the hours in the cumulative modeling that the total concentration exceeds the 1-hour sulfur dioxide National Ambient Air Quality Standard, the contribution of the Pinto Valley Mine is less than the U.S. Environmental Protection Agency's interim Prevention of Significant Deterioration significant impact level of 7.8 micrograms per cubic meter (U.S. Environmental Protection Agency 2010). When the increase due to a proposed action is less than the significant impact level, the U.S. Environmental Protection Agency considers the action not to cause or contribute to a modeled exceedance of the National Ambient Air Quality Standards. Consequently, the contribution of the Pinto Valley Mine is less than significant and can be considered not to cause or contribute to the cumulative exceedances of the 1-hour sulfur dioxide National Ambient Air Quality Standards.

[24] See figure 6 in appendix B for hourly and seasonal background nitrogen dioxide concentrations.
[25] Based on the average quarterly values of Quarter 1 – 46.5, Quarter 2 – 70.4, Quarter 3 – 49.5, and Quarter 4 – 65.7 micrograms per cubic meter.
[26] Based on the average quarterly values of Quarter 1 – 9.1, Quarter 2 – 10.0, Quarter 3 – 10.5, and Quarter 4 – 8.0 micrograms per cubic meter.

In summary, the cumulative impacts of the proposed action would not be significant because the proposed action, in combination with other past, present, and future actions, would not cause or contribute to exceedances of the National Ambient Air Quality Standards.

3.2.4.5.2 Air Quality–related Values – Visibility

Present effects of the relevant past and present actions have resulted in the visibility conditions at nearby Class I and Class II areas as presented in section 3.2.3, “Affected Environment.” The closest air quality monitor in the nationwide Federal Interagency Monitoring of Protected Visual Environments network that is within the cumulative impacts analysis area is in Tonto National Monument, approximately 20 miles northwest of the Pinto Valley Mine. Figure 3-2 shows that visibility at the Tonto National Monument is less than natural conditions but generally has been improving over time, although most recent years have shown minimal change.

Under the proposed action, Pinto Valley Mine emissions of nitrogen oxides, sulfur dioxide, and particulate matter that could affect visibility at nearby Class I and Class II areas would increase due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions under the proposed action. As a result, visibility impacts from active mining operations and visible plumes could affect viewers in the nearby Superstition Wilderness when the plume is viewed against a black background, the wind direction is between 70 and 100 degrees, and the time is between the hours of 11 a.m. and 1 p.m. However, these occurrences would be localized and minimal and the probability of these conditions occurring is approximately 15 percent based on the meteorological measurements, and an observer in the Superstition Wilderness would not necessarily be viewing the plume against a black background.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on visibility include other permitted mines, smelters, and industrial facilities in the cumulative impacts analysis area such as the Freeport-McMoRan Miami, Inc. and the ASARCO Hayden Smelter. However, similar to recent observed trends in visibility as presented on figure 3-2, visibility in the region is expected to continue improving over time as the State of Arizona continues to implement the regional haze rule, which requires that states establish goals that provide for reasonable progress toward achieving natural visibility conditions in Class I areas and the application of best available retrofit technology to reduce haze-producing pollutants from major stationary sources.

The differences in cumulative impacts on visibility among the alternatives would generally be commensurate with the differences in direct and indirect visibility impacts among the alternatives described in sections 3.2.4.2 through 3.2.4.4. The proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in the greatest potential contributions to cumulative impacts on visibility due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions compared to the other alternatives.

3.2.4.5.3 Air Quality–related Values – Acidic Deposition

Present effects of the relevant past and present actions have resulted in the acidic deposition conditions at nearby Class I and Class II areas as presented in section 3.2.3, “Affected Environment.” The closest air quality monitor in the interagency Clean Air Status and Trends Network that is within the cumulative impacts analysis area is in the Petrified Forest National Park. As indicated on figure 3-3, nitrogen and sulfur deposition measured in the Petrified Forest National Park has shown reduced deposition trends in recent years.

Under the proposed action, the largest modeled increase in sulfur deposition in any Class I area was 0.00013 kilogram per hectare per year, well below the data analysis threshold of 0.005 kilogram per hectare per year. The largest modeled increase in nitrogen deposition in any Class I area occurred in the Superstition Wilderness area and was 0.11 kilogram per hectare per year, which exceeds the data analysis threshold of 0.005 kilogram per hectare per year. Only the Superstition Wilderness area had deposition values that would exceed the data analysis threshold.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on acidic deposition include other permitted mines, smelters, and industrial facilities in the cumulative impacts analysis area such as the Freeport-McMoRan Miami, Inc. and the ASARCO Hayden Smelter. However, consistent with acidic deposition trends in the analysis area, acidic deposition from mining and industrial projects is anticipated to remain constant or decrease over time with application of best available retrofit technology that reduces emissions of nitrogen oxides.

The differences in cumulative impacts on acidic deposition among the alternatives would generally be commensurate with the differences in direct and indirect acidic deposition impacts among the alternatives described in sections 3.2.4.2 through 3.2.4.4. The proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in the greatest potential contributions to cumulative impacts on acidic deposition due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions compared to the other alternatives. As indicated in table 3-13, cumulative emissions of nitrogen oxides are modeled to remain below National Ambient Air Quality Standards, but cumulative emissions of sulfur dioxide are modeled to exceed National Ambient Air Quality Standards. However, the sulfur dioxide exceedance under the cumulative modeling scenario is 98 percent attributable to emissions from the Freeport-McMoRan Miami Smelter and impact contributions from Pinto Valley Mine were shown to be less than significant as described in appendix B, “Air Quality Technical Support Document.”

3.2.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on air quality. This section provides a summary of the monitoring and mitigation measure for air quality. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.2, “Air Quality,” for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measure AQ-1: Lower-Emitting Engines:** This measure address potential impacts on air quality (nitrogen oxides and particulate matter emissions) resulting from higher-emitting engines that are currently utilized at the Pinto Valley Mine. At the end of the lifespan of the current haul trucks, hydraulic shovels, and track dozers, the Forest Service is recommending that Pinto Valley Mining Corp. replace these vehicles or engines with lower-emitting vehicles or engines that meet U.S. Environmental Protection Agency Tier 4 emissions standards or better.

3.3 Biological Resources (Vegetation, Fish and Wildlife, and Special Status Species)

This section describes the affected environment and analyzes the impacts of the proposed action and alternatives on biological resources including vegetation, fish and wildlife, and special status species.

The analysis area for biological resources was defined as the furthest-reaching effects of the action that could alter the ecological setting and thereby affect biological resources. Activities and effects associated with this project that have the potential to alter the ecological setting include surface disturbance, traffic, artificial lighting, dust, noise, water withdrawals, and contamination of water resources. The furthest-reaching effects of the proposed action generally correspond to the area subject to a change in groundwater level of 5 feet or greater as modeled by SRK Consulting, Inc. (2019b). Areas beyond the modeled groundwater change subject to surface disturbance, mine-related noise greater than 60 A-weighted decibels as modeled by WestLand Resources, Inc. (2018a), or that are included in Pinto Valley Mining Corp.'s unpatented claims and prior authorizations are also included in the analysis area. In total, approximately 40 square miles are included within the analysis area (as shown on map 3-2 in appendix A and described in the following sections). The temporal boundary for analyzing direct and indirect impacts on biological resources from the implementation of the proposed action includes the active operation of Pinto Valley Mine and extends through closure and final reclamation, with some effects on vegetation composition and habitat continuing indefinitely into the post-closure period.

3.3.1 Relevant Laws, Regulations, and Policy

3.3.1.1 **Federal Authorities**

3.3.1.1.1 Forest Service Organic Administration Act of 1897

The Forest Service Organic Administration Act of 1897 (16 U.S. Code 551), as amended, requires the Forest Service to regulate the occupancy and use of the national forests and to preserve the forests from destruction.

3.3.1.1.2 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act of 1918 (16 U.S. Code 703–712), as amended, establishes a prohibition making it unlawful to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export" migratory birds and their parts, nests, or eggs except when specifically authorized by the U.S. Fish and Wildlife Service. In the context of the Migratory Bird Treaty Act, "take" is defined to mean to "hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill."

Per Title 50 part 10 of the Code of Federal Regulations issued by the United States Department of the Interior on January 7, 2021, incidental take of migratory birds, that is, take that results from an activity but that is not the purpose of the activity, is not prohibited under the Migratory Bird Treaty Act. This regulation defining the scope of the Migratory Bird Treaty Act went into effect on March 8, 2021. However, on the same day that the new regulations went into effect (March 8, 2021), the Department of the Interior announced that it would propose a new rule revoking the January 7, 2021 rule on incidental take. Following the regulatory review process and upon the effective date of this potential new rule, incidental take would be subject to the definitions contained within the new rule.

3.3.1.1.3 Bald and Golden Eagle Protection Act of 1940

The Bald and Golden Eagle Protection Act of 1940 (16 U.S. Code 668–668c), as amended, provides for the protection of the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*) by making it unlawful to, except when specifically authorized by the U.S. Fish and Wildlife Service, "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import" these eagles and their parts, nests, or eggs. In the context of the Bald and Golden Eagle Protection Act, "take" means to “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” “Disturb” includes actions that agitate an eagle such that they cause injury, a decrease in productivity, or nest abandonment.

3.3.1.1.4 Multiple-Use Sustained-Yield Act of 1960

The Multiple-Use and Sustained Yield Act of 1960 establishes the policy and purpose of the national forests to provide for multiple use and sustained yield of renewable surface resources and services, while stating that the act shall not “be construed so as to affect the use or administration of the mineral resources of national forest lands or to affect the use or administration of Federal lands not within national forests” (16 U.S. Code 528).

3.3.1.1.5 Endangered Species Act of 1973

The purpose of the Endangered Species Act of 1973 (16 U.S. Code 1531 et seq.), as amended, is to provide a means to conserve threatened and endangered species and the ecosystems upon which they depend. Section 7 of the Endangered Species Act requires Federal agencies that authorize, fund, or carry out actions to ensure such actions do not jeopardize the continued existence of threatened and endangered species or destroy or adversely modify their critical habitat. Federal agencies must evaluate the effects of their actions on threatened and endangered species and their critical habitat.

If listed species or their critical habitat may be affected by a proposed action, the Federal agency must consult with the U.S. Fish and Wildlife Service. Formal consultation is not required if the U.S. Fish and Wildlife Service concurs in writing that the proposed action is not likely to adversely affect the listed species or critical habitat. The final result of formal consultation is a biological opinion issued by the U.S. Fish and Wildlife Service that may include an incidental take statement. A conference opinion may be issued for species proposed to be listed under the Endangered Species Act or for critical habitat that has been proposed but not finalized.

3.3.1.1.6 Noxious Weed Act of 1974

The Noxious Weed Act of 1974, as amended (7 U.S. Code 2814), provides for the designation of a lead office and a person trained in the management of undesirable plants, establishment and funding of an undesirable plant management program, completion and implementation of cooperative agreements with State agencies, and establishment of integrated management systems to control undesirable plant species.

3.3.1.1.7 National Forest Management Act of 1976

The National Forest Management Act of 1976 is an amendment to the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S. Code 1600–1614) that establishes standards for forest resource assessments and requires the Forest Service to develop and implement national forest management plans. The amendment requires the Secretary of Agriculture “provide[s] for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” (16 U.S. Code 1604(g)(3)(B)). The amendment also requires that forest management plans provide for “multiple use and sustained yield” of forest products and services including fish and wildlife, range, recreation, timber, watershed and wilderness as provided in the Multiple-Use Sustained-Yield Act of 1960.

The National Forest Management Act requires fish and wildlife to be managed in such a way that viable populations of existing native and desired nonnative species are maintained. To this end, the National Forest Management Act establishes the concept of management indicator species, which are species whose population trends are believed to be indicative of the effects of management activities within a given planning area such as the Tonto National Forest. Management indicator species represent categories including State- and federally listed species; species with special habitat needs; species commonly hunted, fished, or trapped; nongame species of special interest; or species believed to indicate the state of biological communities or water quality, as applicable. Proposed actions must be evaluated in terms of their effect on habitat quality and quantity for management indicator species as well as their effect on management indicator species population trends.

3.3.1.1.8 Plant Protection Act of 2000

The Plant Protection Act of 2000 (7 U.S. Code 7701 et seq.), as amended by the Noxious Weed Control and Eradication Act of 2004 (Public Law 108-412), defines the term “noxious weed” as “any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment” (7 U.S. Code 7702(10)). The act gives the Secretary of Agriculture the authority to prohibit or restrict the introduction or dissemination of noxious weeds in matters of interstate commerce. A list of Federal noxious weeds is maintained by the United States Department of Agriculture, Animal and Plant Health Inspection Service.

3.3.1.1.9 Invasive Species Executive Orders

Executive Order 13112 of February 3, 1999, “Invasive Species,” directed Federal agencies to take all reasonable actions within their authority to prevent the introduction and spread of invasive species and to eradicate or control invasive species already established. Executive Order 13112 defines invasive species as “alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Executive Order 13751 of December 5, 2016, “Safeguarding the Nation from the Impacts of Invasive Species,” amended Executive Order 13112 to update and enhance Federal response to the threats posed by invasive species. Executive Order 13751 specifically directs Federal agencies to “refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.” Executive Order 13751 also incorporated climate change, technological innovation, and other emerging priorities into Federal efforts to address invasive species.

3.3.1.1.10 Responsibilities of Federal Agencies to Protect Migratory Birds, Executive Order 13186 of January 11, 2001

Executive Order 13186 directs each Federal agency taking actions that may adversely affect migratory bird populations to develop a memorandum of understanding with the U.S. Fish and Wildlife Service to promote migratory bird conservation. The Executive order also directs Federal agencies to ensure analyses required by the National Environmental Policy Act evaluate the effects of proposed actions on migratory birds, especially on migratory bird species of concern, pursuant to their memorandum of understanding.

Pursuant to Executive Order 13186, the Forest Service and the U.S. Fish and Wildlife Service entered into a memorandum of understanding in 2008. The memorandum of understanding expired on December 31, 2017; no updates have been published at this time. The memorandum of understanding calls for the Forest Service to consult the current U.S. Fish and Wildlife Service Birds of Conservation Concern, State lists, and comprehensive planning efforts for migratory birds when developing the list of species to be considered in the planning process. Planning efforts must acknowledge areas with special designations such as Important Bird Areas. Within the National Environmental Policy Act process, the Forest Service is required to focus "first on species of management concern along with their priority habitats and key risk factors."

3.3.1.1.11 Facilitation of Hunting Heritage and Wildlife Conservation, Executive Order 13443 of August 16, 2007

Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation, directs Federal agencies to facilitate enhancement and expansion of hunting opportunities and game management. This Executive order directs agencies to work collaboratively with State and tribal governments, which hold regulatory authority over animal populations not otherwise regulated under Federal law, to manage and conserve game species. Analyses of proposed actions must consider programs and recommendations of State and rangewide planning efforts for big game and upland game birds.

3.3.1.2 **Forest Service Regulations, Policies, and Guidance**

3.3.1.2.1 Title 36, Part 219 of the Code of Federal Regulations

To comply with the Multiple-Use Sustained-Yield Act of 1960 (16 U.S. Code 528 et seq.), ecological sustainability without impairment to the productivity of the land is the overall goal of management of the National Forest System. These regulations direct the Forest Service under 36 CFR section 219.19 that "the first priority for stewardship of the national forests and grasslands is to maintain or restore ecological sustainability to provide a sustainable flow of uses, values, products, and services from these lands." 36 CFR section 219.20 (a)(1)(i)(E), Focal Species, further directs the Forest Service to identify and analyze focal species "that provide insights to the larger ecological systems with which they are associated." These regulations provide the authority and basis for the Forest Service Management Indicator Species system.

3.3.1.2.2 Title 36, Part 228 of the Code of Federal Regulations

The Forest Service's regulations for the management of locatable mineral development include requirements for protecting surface resources. Section 228.8(e) requires operations to be conducted, where feasible, to minimize adverse environmental impacts on the National Forest System lands' surface resources that include fish and wildlife habitat. These regulations include reclamation requirements in 36 CFR 228.8(g), which are generally qualitative standards designed to allow the Forest Service flexibility to react to site-specific conditions of each operation.

3.3.1.2.3 United States Department of Agriculture Departmental Regulation 9500-004

United States Department of Agriculture Departmental Regulation 9500-004 directs the Forest Service to avoid actions that may cause a species to become threatened or endangered.

3.3.1.2.4 Forest Service Manuals

Forest Service policies, practices, and procedures for managing vegetation, noxious weeds, fish and wildlife, and special status species are described in various manuals and handbooks of the Forest Service Directive System. Key manuals relevant to the Pinto Valley Mine Project include:

- Forest Service Manual 2000 – National Forest Resource Management, Chapter 2070 – Vegetation Ecology

- Forest Service Manual 2100 – Environmental Management, Chapter 2150 – Pesticide – Use Management and Coordination
- Forest Service Manual 2500 – Watershed and Air Management, including Forest Service Manual 2526.03 that emphasizes the protection of soils, water, and riparian-dependent ecosystems
- Forest Service Manual 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management, including Forest Service Manual 2670.5 that requires special management and National Environmental Policy Act review of species designated by the regional forester as sensitive due to current or predicted downward trends in population size, density, or distribution
- Forest Service Manual 2840 – Reclamation
- Forest Service Manual 2900 – Invasive Species Management

3.3.1.2.5 Tonto National Forest Land and Resource Management Plan

The Tonto National Forest Plan provides standards and guidelines for the management of vegetation, fish and wildlife, and special status species (Forest Service 1985). Standards and guidelines applicable to this analysis direct managers to conduct the following actions:

- “Habitat requirements for endangered species will have precedence over threatened species. Habitat requirements for threatened, endangered, and sensitive species will take precedence over requirements for other species and habitat requirements for sensitive species will take precedence over nonsensitive species.”
- “Emphasize maintenance and restoration of healthy riparian ecosystems through conformance with Forest Plan riparian standards and guidelines. Management strategies should restore degraded riparian areas to good condition as soon as possible. Damage to riparian vegetation, stream banks, and channels should be prevented.”
- “Re-establish riparian vegetation in severely degraded but potentially productive riparian areas. Natural regeneration is anticipated to achieve this goal, but artificial regeneration may be necessary in some areas.”
- “Ensure that fish and wildlife habitats are managed to maintain viable populations of existing native vertebrate species. Improve habitat for selected species.”
- “Analyze and clear all project impacts to threatened, endangered, proposed, and candidate plant and animal species.”
- “Recognize fish and wildlife habitat elements in all resource planning and management activities to assure coordination that provides for species diversity and greater fish and wildlife populations through improvement of habitat.”
- “Maximize coordination with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, state universities, professional societies, and various conservation organizations regarding proposals and programs concerned with management of wildlife habitat.”
- “Initiate informal or formal consultation, as required by the Endangered Species Act, with the U.S. Fish and Wildlife Service on all actions that affect federally listed species.”
- “Prevent destruction or adverse modification of critical habitat for threatened and endangered species and manage Endangered Species Act-listed species with the goal achieving population levels that will meet the criteria for delisting.”
- “Emphasize maintenance and restoration of healthy riparian ecosystems through conformance with Tonto National Forest Plan standards and guidelines.”

The overall management emphasis for management area 2F (covering the majority of the approximately 500,000-acre Globe Ranger District) is to manage for a variety of renewable natural resources with a primary emphasis on wildlife habitat improvement as well as improvements to resources indirectly related to biological resources, including water quality, livestock forage, dispersed recreation, watershed values, and riparian areas.

In regard to biological resources, the desired condition specified in the forest plan is a condition where viable populations of existing native vertebrate species are maintained and where populations of Endangered Species Act–listed species are maintained or increased to the level where the criteria for delisting is met. An additional primary desired condition is that Tonto National Forest lands be managed in such a way as to comply with applicable Federal, State, and local regulations and directives. Secondary desired conditions include those listed above and address coordination with applicable governmental and nongovernmental authorities as well as specific management objectives for individual species or groups of species.

Desired conditions for vegetation are described in the management directions and prescriptions above. The Tonto National Forest Plan also identifies the following expected future conditions for riparian areas (Forest Service 1985):

1. Annual growth by volume in woody species will not be browsed more than 20 percent per year.
2. Crown cover of overstory species will be enhanced to 80 percent of potential for each vegetative type.
3. Fifty percent of cottonwood-willow and mix broadleaf acreage will be in structural Type 1 in 50 years with the objective that 25 percent will be in structural Type IV in 10 years and 50 percent in structural Type IV in 20 years.

Achievement of the above conditions will be indicated by the increased occurrence and density of management indicator species: bald eagle, Bell's vireo, summer tanager, hooded oriole, hairy woodpecker, Arizona gray squirrel, warbling vireo, western wood pewee, black hawk, and macro-invertebrates.

3.3.1.2.6 Other Forest Service Guidance

The Forest Service "Guide to Noxious Weed Prevention Practices" provides a compendium of practices to prevent the introduction and spread of noxious weeds for application in Forest Service planning and management (Forest Service 2001). The guide recommends general weed-prevention practices for site-disturbing projects, as well as several practices specific to mineral resource development.

Forest Service Handbook 1909.15 – National Environmental Policy Act Handbook provides overall Forest Service guidance on implementing the National Environmental Policy Act.

3.3.1.3 **State and Local Laws, Regulations, and Policies**

3.3.1.3.1 Arizona Native Plants

The take, transport, or possession of designated native plant species and their parts growing wild on State, public, or privately owned land is prohibited by the State of Arizona without a valid permit (Arizona Revised Statute 3-901 to 3-934). Appendix A to Arizona Administrative Code Article 11 lists species designated as Arizona Native Plants. Native plants may be removed or cleared from private land provided the landowner notifies the Arizona Department of Agriculture prior to undertaking the action and the plants are not transported from the land or offered for sale. Notification must be provided 20 days prior to removal for areas of 1 acre or less, 30 days prior to removal for areas greater than 1 acre but less than 40 acres, or 60 days prior to removal for areas of 40 acres or more. Removal must occur within 1 year of the date of destruction disclosed on the notice.

3.3.1.3.2 Arizona Noxious Weeds

The State of Arizona defines noxious weeds as plant species that are "detrimental or destructive and difficult to control or eradicate" (Arizona Revised Statute 3-201). Arizona Administrative Code R3-4-245 lists noxious weed species that are prohibited from being transported into the State or that may require control measures to prevent further infestation or contamination. The Arizona Department of Agriculture is responsible for implementing State laws located at Arizona Revised Statute 3-201 et seq. pertaining to noxious weeds, which include requirements for controlling or quarantining noxious weeds and the use, disposal, and storage of pesticides.

3.3.1.3.3 Arizona Mined Land Reclamation

Reclamation of mined areas on private lands in Arizona is regulated by the Arizona State Mine Inspector. Operators are required to prepare a mined land reclamation plan and provide financial assurance in accordance with Arizona Administrative Code R11-2-101 through R11-2-822. Revegetation and soil standards are provided in Arizona Administrative Code R11-2-701 and require the establishment of plant species that will support the approved post-mining land use. For reclamation activities on Federal lands, operators may request supersedure of State reclamation requirements if the Federal reclamation plan and financial assurance mechanism are consistent with State requirements (Arizona Administrative Code R11-2-204).

3.3.1.3.4 Arizona Revised Statute 17, Game and Fish

Under title 17 of the Arizona Revised Statutes, the Arizona Game and Fish Department, by and through the Arizona Game and Fish Commission, has jurisdictional authority and public trust responsibilities for the management of State fish and wildlife resources. It is the mission of the department "to conserve Arizona's diverse fish and wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations." The following commission policies apply directly to the management of public lands: A2.18, Multiple Use Management of Public Lands; A2.20, Access To and Upon Public and State Trust Land; A2.22, Consideration of Economic Impact; and A2.38, Travel Management and Access Upon Arizona's Public Lands For The Enjoyment Of Arizona's Wildlife Resources and Outdoor Recreation. It is the policy of the commission that public lands remain open and accessible to recreation unless there are reasons to deny access founded in sound science and affirmative analysis, and not a presumption of harm (Commission Policy A2.38).

3.3.2 Resource Indicators

Table 3-14 provides the resource indicators and measures for assessing potential effects on biological resources.

Table 3-14. Resource indicators and measures for assessing effects on biological resources

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Vegetation				
Upland vegetation communities	Area of upland vegetation communities	Acres of proposed new surface disturbance affecting existing upland vegetation communities	Yes	Mapped biotic communities (Brown 1994; The Nature Conservancy in Arizona 2004), Terrestrial Ecological Unit Inventory (Forest Service 2019b), Pinto Valley Mine vegetation surveys and observations (WestLand Resources, Inc. 2017a and others)
Riparian and wetland vegetation communities	Area of riparian and wetland vegetation communities	Acres of proposed new surface disturbance affecting existing riparian and wetland vegetation communities	Yes	Mapped riparian areas and wetlands (Triepke et al. 2014)
Plant health	Reduced streamflow and groundwater drawdown in riparian areas	Modeled drawdown contours in Pinto Creek riparian areas resulting from groundwater pumping	Yes	Arizona Game and Fish Department riparian survey, Pinto Valley Mine EIS assessment of groundwater resources; WestLand Resources, Inc. riparian vegetation study (WestLand Resources, Inc. 2020)
Plant health	Effects of water contamination on riparian vegetation communities	Water quality sampling and modeling	Yes	Pinto Valley Mine EIS assessment of surface and groundwater resources
Plant health	Effects of dust deposition on plant health	Key findings from literature	Yes	Literature review (Matsuki et al. 2016)
Invasive plants	Introduction and spread of invasive plants	Acres of proposed new surface disturbance in existing vegetation communities, miles of proposed new roads and utilities	Yes	Pinto Valley Mine vegetation surveys and observations
Fish and Wildlife, including Special Status Species				
Terrestrial habitat availability	Acres of disturbance by habitat type	Acres	Yes	Literature review, geospatial data, Pinto Valley Mine EIS resource assessments
Aquatic and riparian habitat availability	Number of features, length, volume, flow characteristics, acres of disturbance, condition of vegetation	Varies	Yes	Literature review, geospatial data, Pinto Valley Mine EIS resource assessments

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Terrestrial habitat quality	Noise, vibration, light, vehicular mortality, dust deposition, soil contamination, habitat connectivity, noxious weeds	Varies	Yes	Literature review, Pinto Valley Mine EIS resource assessments
Aquatic and riparian habitat quality	Total dissolved solids, turbidity, temperature, pH, dissolved oxygen, sedimentation, conductivity, hardness, contaminant levels (such as copper and selenium), habitat connectivity, macroinvertebrate presence and diversity, native fish abundance and distribution, aquatic herpetofauna abundance and distribution, condition of vegetation	Varies	Yes	Literature review, Pinto Valley Mine EIS resource assessments
Species presence or absence, population size, and population trend	Number of individuals or populations present, measured or projected change over time	Number, Trend	Yes	Literature review, survey data

3.3.3 Affected Environment

3.3.3.1 **Vegetation**

This section describes the affected environment and environmental consequences for vegetation, focusing on upland vegetation communities, riparian and wetland areas, and invasive plants. Impacts on vegetation from implementation of the proposed action and alternatives—which would consist primarily of vegetation removal and soil disturbance, colonization and spread of invasive plants, and changes in water availability. Plant species protected under the Endangered Species Act or considered Forest Service sensitive species are addressed in section 3.3.3.2, “Fish and Wildlife,” and section 3.3.3.3, “Special Status Species.”

Table 3-15 summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-15. Resource indicators and measures for the existing condition for vegetation

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Upland vegetation communities	Area of upland vegetation communities	Acres of proposed new surface disturbance affecting existing upland vegetation communities	Pinto Valley Mine is primarily within the interior chaparral biotic community. Vegetation absent from most active facilities.
Riparian and wetland vegetation communities	Area of riparian and wetland vegetation communities	Acres of proposed new surface disturbance affecting existing riparian and wetland vegetation communities	Riparian vegetation present along Pinto Creek and its tributaries, primarily downstream of Pinto Valley Mine. Small, isolated wetlands present, mostly mining ponds and impoundments.
Plant health	Effects of low water stress in riparian vegetation communities	Modeled drawdown contours in riparian areas resulting from groundwater pumping	High riparian tree mortality observed along segments of Pinto Creek downstream of Pinto Valley Mine (Arizona Game and Fish Department 2018a) may have been affected by groundwater pumping from the Peak Well field that occurred between 2013 and 2018 (SRK Consulting, Inc. 2019b). However, WestLand Resources, Inc. (2020) evaluated the same stream segment during the growing season (summer) and observed healthier tree conditions than noted in the aforementioned Arizona Game and Fish Department study, which was conducted during a vegetation dormancy season (winter).
Plant health	Effects of water contamination on riparian vegetation communities	Water quality sampling and modeling	Not specifically studied or monitored.
Plant health	Effects of dust deposition on plant health	Key findings from literature	Not specifically studied or monitored.
Invasive plants	Introduction and spread of invasive plants	Acres of proposed new surface disturbance in existing vegetation communities, miles of proposed new roads and utilities	13 invasive plant species observed at or near Pinto Valley Mine, primarily in disturbed areas.

3.3.3.1.1 Upland Vegetation Communities

Brown (1994) defined and delineated biotic communities of the southwestern United States based on distinctive vegetation characteristics. The biotic community encompassing the majority of the analysis area is interior chaparral (map 3-2 in appendix A). Portions of the analysis area along Pinto Creek downstream of Pinto Valley Mine consist of the Arizona Upland subdivision of the Sonoran desertscrub biotic community. A patch of Madrean Evergreen Woodland straddles U.S. Highway 60 south of Pinto Valley Mine. Table 3-16 provides the approximate acreages of each biotic community within the analysis area (The Nature Conservancy in Arizona 2004). Plant species identified through the Forest Service's geospatial ecosystem mapping project known as the Terrestrial Ecological Unit Inventory (Forest Service 2019b) were consistent with the general composition of biotic communities described below, but these data were only available for approximately 34 percent of the analysis area within the Pinto Valley Mine project boundary.

Table 3-16. Biotic communities within the analysis area

Biotic Community	Acres by Land Ownership			Total Acres
	Bureau of Land Management	***Forest Service***	***Private***	
Interior chaparral	32	18,128	6,801	24,960
Arizona upland subdivision - Sonoran desertscrub	0	842	0.0	842
Madrean evergreen woodland	0	20	0.0	20
Total	**32**	**18,990**	**6,801**	**25,822**

Source: The Nature Conservancy in Arizona 2004

Interior Chaparral

There is a total of approximately 24,960 acres of the interior chaparral biotic community in the analysis area (see table 3-16). This biotic community commonly occupies mid-elevation (3,400- to 6,600-foot elevation) foothills, mountain slopes, and canyons. Shrub cover typically averages from 60 percent to 70 percent in mature stands. Shrub live oak (*Quercus turbinella*) is widespread and often the dominant shrub species or co-dominant with manzanitas (*Arctostaphylos* sp.). Other common species are birchleaf mountain-mahogany (*Cercocarpus betuloides*), skunkbush sumac (*Rhus trilobata*), silktassels (*Garrya wrightii, G. flavescens*), and desert ceanothus (*C. greggii*).

Pinto Valley Mine is located almost entirely within the mapped interior chaparral biotic community (map 3-2). Undisturbed areas within the mine support vegetation communities characteristic of the interior chaparral biome transitioning to Sonoran desertscrub at lower elevations. Common plant species observed by Stewart (2017) within undisturbed areas of Pinto Valley Mine include shrub live oak, jojoba (*Simmondsia chinensis*), junipers (*Juniperus* sp.), crucifixion thorn (*Canotia holacantha*), sotol (*Dasylirion wheeleri*), agaves (*Agave* sp.), broom baccharis (*Baccharis sarothroides*), sugar sumac (*Rhus ovata*), beargrass (*Nolina microcarpa*), banana yucca (*Yucca baccata*), prickly pears (*Opuntia* sp.), barrel cactus (*Ferocactus* sp.), ocotillo (*Fouquieria splendens*), manzanitas, broom snakeweed (*Gutierrezia sarothrae*), catclaw mimosa (*Mimosa aculeaticarpa*), and barberries (*Berberis* sp.).

Nearly all active facilities within Pinto Valley Mine are devoid of vegetation. Decades of mining activity at the Pinto Valley Mine and other mines in the region have resulted in changes in the composition and canopy coverage of vegetation communities due to disturbance, reclamation seeding, and establishment of invasive plants. Invasive plants are common in disturbed areas within the mine, as described under "Invasive Plants," below.

Arizona Upland Subdivision - Sonoran Desertscrub

There is a total of approximately 842 acres of the Sonoran desertscrub biotic community in the analysis area (see table 3-16). Interior chaparral transitions to Sonoran desertscrub at elevations below approximately 3,300 feet along Pinto Creek downstream of Pinto Valley Mine, becoming dominant in the northern portion of the Lower Pinto Creek subwatershed. This vegetation community is typically characterized by scrubland or low woodland vegetation on sloped and broken terrain mixed with layered shrubs and perennial succulents. Shrub live oak (also known as Sonoran scrub oak), jojoba, and other desertscrub plants often dominate this subdivision and cacti such as chollas, prickly pears, saguaro cactus (*Carnegiea gigantea*), and barrel cacti are well represented.

Madrean Evergreen Woodland

There is a total of approximately 20 acres of the Madrean evergreen woodland biotic community mapped within the analysis area (see table 3-16). A patch of Madrean evergreen woodland is present at higher elevations south of Pinto Valley Mine (map 3-2). This biome is more densely vegetated than the drier interior chaparral that surrounds it. Madrean evergreen woodland vegetation communities in this region are typically dominated by evergreen oak species, such as Emory oak (*Quercus emoryi*) and Arizona white oak (*Q. arizonica*). Other common species include alligator bark juniper (*Juniperus deppeana*) and one-seed juniper (*J. monosperma*).

3.3.3.1.2 Riparian and Wetland Vegetation Communities

A collaborative effort between the Southwestern Region of the Forest Service and other organizations known as the Regional Riparian Mapping Project mapped and described riparian systems (referred to as Ecological Response Units) in Arizona and New Mexico (Triepke et al. 2014). As shown in table 3-17, Sycamore - Fremont Cottonwood is the most abundant mapped riparian system in the analysis area followed by Fremont Cottonwood/Shrub. Sycamore - Fremont Cottonwood is dominant riparian system along perennial reaches of Upper Pinto Creek and its tributaries, while Fremont Cottonwood/Shrub is dominant along intermittent segments of Pinto Creek (from several miles upstream of Blevens Wash to Roosevelt Lake) (map 3-2). Fremont cottonwood (*Populus fremontii*), velvet ash (*Fraxinus velutina*), Arizona alder (*Alnus oblongifolia*), and various willow species are common in both riparian systems, with the addition of Arizona sycamore (*Platanus wrightii*) and Arizona walnut (*Juglans major*) in the Sycamore - Fremont Cottonwood riparian system. Desert willow riparian systems are mapped along alluvial channels of Campaign Creek in the Lower Pinto Creek watershed and an unnamed tributary in the Middle Pinto Creek watershed. Desert willow (*Chilopsis linearis*), netleaf hackberry (*Celtis laevigata*), and velvet mesquite (*Prosopis velutina*) are common riparian species in this system.

The National Wetland Inventory identifies wetlands in several areas along Pinto Creek, predominantly riverine wetlands at the mouth of Pinto Creek where it meets Roosevelt Lake (map 3-2) (U.S. Fish and Wildlife Service 2017). Other potential wetlands in the analysis area not captured in the National Wetland Inventory consist of several small, man-made ponds within Pinto Valley Mine boundary, tanks and small impoundments, and emergent wetlands within the higher elevations of the Pinal Mountains.

Table 3-17. Riparian vegetation communities within the analysis area

Riparian System Type (Ecological Response Unit)	Acres by Land Ownership		Total Acres
	Forest Service	***Private***	
Sycamore - Fremont Cottonwood	539	124	663
Fremont Cottonwood/Shrub	177	0.0	177
Desert Willow	93	4	97
Total	**809**	**128**	**937**

Source: Triepke et al. 2014

3.3.3.1.3 Plant Health

Effects of Low Water Stress on Riparian Vegetation Communities

During riparian vegetation monitoring efforts associated with the Carlota Copper Project's Biological Monitoring and Mitigation Plan, observers noted mortality and health decline of Arizona alders (*Alnus oblongifolia*) along Haunted Canyon and Pinto Creek (Cedar Creek Associates, Inc. 2018). Study sites where observations were made were located along 0.8 mile of Pinto Creek extending upstream from the western analysis area boundary to the Haunted Canyon confluence and along 0.7 mile of Haunted Canyon extending upstream from the confluence; all but one of the study sites were located outside the analysis area.[27] In 1996, a severe infestation of alder flea beetle (*Macrohaltica ambiens*) was observed to have caused near-complete defoliation of Arizona alders along Haunted Canyon and Pinto Creek. Alder flea beetle infestations were observed in Haunted Canyon and, to a lesser extent, in Pinto Creek for "years afterward." In 2007, observers noted the population of alders was considerably reduced and many remaining trees showed declining health. Between 2007 and 2017, additional mortality and health decline occurred within the vegetation monitoring study sites. Alder decline was also documented by Cedar Creek Associates, Inc. in reference sites in Devil's Canyon (8 miles southwest) in 2009 and Oak Creek (33 miles northwest) in 2010–2017, and was noted elsewhere on the Tonto National Forest by Forest Service personnel. While the exact cause of the decline in alder populations could not be determined with certainty, contributing factors may have included heat, drought, the dynamic nature of southwestern riparian systems, the location of Haunted Canyon at the low end of the region's Arizona alder elevation range, and the aforementioned alder flea beetle infestation (Cedar Creek Associates, Inc. 2018). Cedar Creek Associates, Inc. (2018) suggested that the decline was not related to groundwater pumping conducted by the Carlota Copper Project beginning in 2007.

Despite the decline in Arizona alder, cover in the vegetation monitoring sites' tree stratum declined by only 3 percent between 2007 and 2017; losses of Arizona alder were offset by increases in other riparian trees such as Arizona ash (*Fraxinus velutina*) and Arizona sycamore (Cedar Creek Associates, Inc. 2018). While overall tree cover decreased slightly, cover in the shrub and herbaceous strata as well as riparian shrub and tree density increased over the timeframe of the study. Notably, riparian mortality decreased over the timeframe of the study; 0 percent morality was documented in 2015–2017. Based on these results, Cedar Creek Associates, Inc. (2018) suggests that the younger cohort of trees will eventually replace the observed losses of mature trees.

The Arizona Game and Fish Department (2018a) noted abnormally high tree mortality during a November 2017 visit to Pinto Creek between the northern Pinto Valley Mine boundary and a point 1.5 miles downstream, which decreased with distance downstream; this area is mostly located beyond the northern boundary of the analysis area. The Arizona Game and Fish Department noted that this condition appeared to be divergent from other nearby riparian systems such as Queen Creek west of Superior, Devil's Canyon, and West Fork Pinto Creek. A comparison of available aerial imagery indicated that riparian canopy along Pinto Creek appeared to be healthy in 2012, with mortality occurring between 2013 and 2015. The Arizona Game and Fish Department suggested that the observed declines may have occurred as a result of local water use by the Pinto Valley Mine and the Carlota Copper Mine as opposed to regional factors such as drought.

WestLand Resources, Inc. (2020) conducted a photographic survey of Pinto Creek in May 2020 in the same locations taken by the Arizona Game and Fish Department in November 2017. WestLand Resources, Inc. observed tree mortality along Pinto Creek between the northern Pinto Valley Mine boundary and a point approximately 0.6 mile downstream. Mortality was not observed farther than 0.6 mile downstream of the mine. Of the seven segments of the creek where WestLand Resources, Inc. observed tree mortality, mortality decreased from 2017 in three segments and did not change in two segments. Two segments where WestLand Resources, Inc. observed mortality were not photographed by the Arizona Game and Fish Department. WestLand Resources, Inc. noted that mortality primarily affected large trees and had not affected entire riparian vegetation patches. WestLand Resources, Inc. suggested that local changes in stream morphology were the primary cause of the observed mortality.

[27] Even though this is outside the analysis area, the information is included to provide additional regional context.

Effects of Groundwater Contamination on Riparian Vegetation Communities

A small portion of the seepage from the Leach Piles at Pinto Valley Mine is predicted to discharge low pH, high total dissolved solids, and metal-laden water into the groundwater system flowing toward Pinto Creek. This potential pathway may have resulted in the migration of contaminants into riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine; however, no studies of soil, vegetation, or riparian species have been conducted to determine if these contaminants are present in the riparian areas. Therefore, the existence and potential effects of such contamination have not been established.

Effects of Dust Deposition on Plant Health

Dust deposition has not been specifically studied or monitored at Pinto Valley Mine and to date, the Forest Service has not observed dust accumulation on vegetation on National Forest System lands surrounding Pinto Valley Mine. Studies conducted at other mines demonstrate that dust generated by mining activities such as blasting and vehicle use on unpaved surfaces can accumulate on vegetation, resulting in a range of potential adverse effects on plant health. The amount and location of dust deposition depends on a range of meteorological factors, particle characteristics, and surface characteristics; the greatest dust accumulations typically occur on vegetation adjacent to mining activities such as blasting. Mining dust may include criteria air pollutants $PM_{2.5}$ and PM_{10}, as well as larger dust particles. Dust deposition decreases with increasing distance from the emission source; significant decreases in dust deposition have been reported at distances ranging from 500 to 2,000 feet from the emission sources (Turner 2013; Matsuki et al. 2016). Studies evaluating the effects of dust deposition from broad a range of mining activities have found evidence of reduced photosynthesis, altered transpiration, reduced stomatal conductance, and alteration of soil chemistry in vegetation near mining facilities; however, several studies have shown neutral or beneficial effects from dust deposition (Farmer 1993). An evaluation of inert dust accumulation on plant surfaces in a semiarid environment, which resembles conditions at Pinto Valley Mine, failed to find evidence supporting adverse impacts of dust accumulation on plant health, survivorship, or composition (Matsuki et al. 2016).

3.3.3.1.4 Invasive Plants

Invasive plant species or noxious weeds, referred to collectively as “invasive plants,” are defined for this analysis as:

- Invasive plant species listed by the Tonto National Forest (Forest Service 2018a);
- Nonnative plant species considered invasive by the interagency Arizona Wildlands Invasive Plant Working Group (Arizona Wildlands Invasive Plant Working Group 2005); and
- Plant species listed as noxious weeds by the State of Arizona (Arizona Administrative Code R3-4-245).

In total, 13 invasive plant species have been observed and documented at or near Pinto Valley Mine. Table 3-18 lists these species and their observed locations. Known occurrences of invasive plants were drawn primarily from a technical memorandum prepared by WestLand Resources, Inc. (2017a) that compiled findings from vegetation surveys or incidental observations made during other biological surveys in the vicinity of Pinto Valley Mine from 2005 to 2017 and subsequently updated in the “Noxious Weed Control Plan for Pinto Valley Mine” (Capstone Mining Corp. 2020b; appendix A). Stewart (2017) observed several more invasive plants during a February 1, 2017, visit to Pinto Valley Mine. The observations on record were made along segments of Pinto Creek, Gold Gulch, Miller Gulch, and Eastwater Canyon; around Tailings Storage Facility No. 3, Cottonwood Tailings Impoundment, 19 Dump, and Peak Well 37; and in five areas where mining facilities have encroached on National Forest System lands. Forest Service biologists identified several other invasive plant species that may be present in the general vicinity, but have not been formally documented: Sahara mustard (*Brassica tournefortii*), stinknet (*Oncosiphon piluliferum*), field bindweed (*Convolvulus arvensis*), and Malta starthistle (*Centaurea melitensis*).

Table 3-18. Locations of invasive plants observed at or near Pinto Valley Mine

Plant Species		Category			Location Observed	General Distribution in Tonto National Forest
Common Name	***Scientific Name***	***Tonto National Forest*[28]**	***Arizona Wildlands Invasive Plant Working Group*[29]**	***State of Arizona*[30]**		
Bermudagrass	*Cynodon dactylon*	–	Medium	–	Cottonwood Tailings Impoundment, Gold Gulch, Tailings Storage Facility No. 3, Pinto Creek channel	Widespread below 6,000 feet elevation
Fountain grass	*Pennisetum setaceum*	Class C	High	Class C	19 Dump	Widespread, especially along roads
Lehmann lovegrass	*Eragrostis lehmanniana*	Class C	High	–	19 Dump, Cottonwood Tailings Impoundment, Tailings Storage Facility No. 3, Peak Well Site 37, road alignments and utility line corridors	Widespread at mid elevations. Extensively seeded along highways, power line corridors, and some wildfire rehabilitation areas.
Mediterranean grass	*Schismus barbatus*	Class C	Medium	–	19 Dump	Widespread in low-lying deserts
Rabbitfoot grass[31]	*Polypogon monspeliensis*	–	–	–	Gold Gulch, Pinto Creek channel	Widespread at low to mid elevations, particularly riparian areas and other suitably moist habitats
Red brome	*Bromus rubens*	Class C	High	–	Miller Gulch, Tailings Storage Facility No. 3	Widespread
Redstem filaree	*Erodium cicutarium*	–	Medium	–	Various disturbed areas at Pinto Valley Mine	Widespread up to mid elevations
Ripgut brome	*Bromus diandrus*	Class C	Medium	–	Tailings Storage Facility No. 3, road alignments, and utility line corridors	Observed in riparian areas below 5,000 feet elevation
Russian thistle	*Salsola tragus*	Class C	–	–	Tailings Storage Facility No. 3, various other disturbed areas at Pinto Valley Mine	Distribution limited primarily to recently disturbed soils

[28] Class C—Weeds have spread beyond our capability to eradicate them. The Forest Service management goal is to contain the species' spread to its present size, then decrease the population if possible (Forest Service 2018a).
[29] High—These species have severe ecological impacts on ecosystems; invasiveness attributes are conducive to moderate to high rates of dispersal and establishment; species are usually widely distributed. Medium—These species have substantial and apparent ecological impacts on ecosystems; invasiveness attributes are conducive to moderate to high rates of dispersal, often enhanced by disturbance; ecological amplitude and distribution range from limited to widespread (Arizona Wildlands Invasive Plant Working Group 2005).
[30] Class C—A species of plant that is widespread but may be recommended for active control based on risk assessment (Arizona Administrative Code R3-4-245).
[31] Nonnative invasive plant that is not officially designated as an invasive plant, but was recognized as nonnative by WestLand Resources, Inc. biologists.

Plant Species		Category			Location Observed	General Distribution in Tonto National Forest
Common Name	***Scientific Name***	***Tonto National Forest***[28]	***Arizona Wildlands Invasive Plant Working Group***[29]	***State of Arizona***[30]		
Saltcedar (Tamarisk)	*Tamarix ramosissima*	Class C	High	Class C	Cottonwood Tailings Impoundment, Gold Gulch, Miller Gulch, Tailings Storage Facility No. 3, Pinto Creek channel, road alignments and utility line corridors	Common along larger riparian zones and present in smaller systems
Tree of heaven	*Ailanthus altissima*	Class C	–	Class C	Road alignments and utility line corridors	Common adjacent to roads and buildings around larger mining communities (such as Globe). Prevalent in mining areas statewide.
Wild oats	*Avena fatua*	Class C	Medium	–	Unspecified location within Pinto Valley Mine	Widespread at low to mid elevations
Yellow sweetclover	*Melilotus officinalis*	Class C	Medium	–	Tailings Storage Facility No. 3	Common in meadows and riparian areas and along roadways in mid to upper elevations

Source: Table adapted from WestLand Resources, Inc. (2017a) and Capstone Mining Corp. (2020b; appendix A) with additional observations by Stewart (2017) and Taylor (2019).

All of the plants observed at Pinto Valley Mine listed as invasive by the Tonto National Forest (10 of the 13 species) are categorized by the Forest Service as Class C species, indicating that eradication is not feasible and management should focus on containment and reduction. Although the Tonto National Forest does not list Bermudagrass and redstem filaree as invasive species, the Arizona Wildlands Invasive Plant Working Group identifies them as invasive plants. WestLand Resources, Inc. biologists observed one additional nonnative invasive plant—rabbitfoot grass—that is not officially designated as invasive (Capstone Mining Corp. 2020b).[32] Three of the invasive plant species observed at Pinto Valley Mine—fountain grass, saltcedar, and tree of heaven—are listed as Class C noxious weeds by the State of Arizona, indicating that the species are widespread but may be recommended for active control based on risk assessment. As indicated in table 3-18, many of the invasive plants observed at Pinto Valley Mine are known to be widespread throughout the Tonto National Forest, especially along roadways and other areas where soils and vegetation have been disturbed.

3.3.3.2 **Fish and Wildlife**

Biotic communities found in the analysis area and considered in this analysis are those identified by Brown (1994). The majority of the analysis area is located within the Interior Chaparral biotic community. A small area at the northern edge of the analysis area near Pinto Creek is located within the Arizona Upland subdivision of the Sonoran Desertscrub biotic community and the southernmost extension of the analysis area along National Forest System Road 287 occurs within the Madrean Evergreen Woodland biotic community. Examples of wildlife species representative of each biotic community as listed by Brown (1994) or described by Brennan and Holycross (2006) as well as known fish and wildlife species for the analysis area are provided by vertebrate and invertebrate class groupings in the following subsections. Species with the potential to occur in the analysis area as identified by site-specific assessments are also included. Species lists provided herein are not comprehensive of every species that could occur within the analysis area; additional species are likely to be present for most class groupings. The descriptions below refer to a variety of habitats including streams, creeks, canyons, mines, vegetation communities, and other features. Refer to map 3-2 in appendix A for the location of these features in relation to the Pinto Valley Mine and the biological resources analysis area.

3.3.3.2.1 Mammals

Representative mammals of each biotic community within the analysis area listed by Brown (1994) include white-throated woodrat (*Neotoma albigula*) and cliff chipmunk (*Tamias dorsalis*) for Interior Chaparral; Harris' ground squirrel (*Ammospermophilus harrisii*), gray fox (*Urocyon cinereoargenteus*), and desert cottontail (*Sylvilagus audubonii*) for Arizona Upland subdivision of Sonoran Desertscrub; and coatimundi (*Nasua nasua*) and eastern cottontail (*Sylvilagus floridanus*) for Madrean Evergreen Woodland. Riparian and aquatic resources within each biotic community provide important resources for mammals including food, shelter, and water. Other mammal species observed during general site visits or during surveys for other taxa include mule deer, javelina, and raccoon (*Procyon lotor*) along Pinto Creek downstream of the Pinto Valley Mine (WestLand Resources, Inc. 2016a; Arizona Game and Fish Department 2018a); and raccoon, cow, and deer tracks along Pinto Creek at the National Forest System Road 287 crossing, otherwise known as the Iron Bridge (Stewart 2017).

[32] WestLand Resources, Inc. biologists also observed spearmint (*Mentha spicata*) in the Pinto Creek channel, which Forest Service biologists do not consider to be invasive or noxious within the Tonto National Forest.

Thirteen bat species have been recorded within the analysis area or in the immediate vicinity (Cedar Creek Associates, Inc. 2006; WestLand Resources, Inc. 2016b, 2017b; Arizona Game and Fish Department 2018b). These species and known locations in the analysis area are included in table 3-19.

Table 3-19. Bat species, activities, and habitat within and near the analysis area

Species, Activity, or Habitat	Location[33]
Arizona myotis, *Myotis occultus*	Within the analysis area near the Tailings Storage Facility No. 4 proposed perimeter road
Big brown bat, *Eptesicus fuscus*	In the vicinity of the analysis area
Big free-tailed bat, *Nyctinomops macrotis*	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
Brazilian [Mexican] free-tailed bat, *Tadarida brasiliensis*	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
California myotis, *Myotis californicus*	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
Fringed myotis, *Myotis thysanodes*	In the vicinity of the analysis area
Pale Townsend's big-eared bats, *Corynorhinus townsendii pallescens* (colony)	Roosting within the Arizona Pollutant Discharge Elimination System Outfall No. 005 within the analysis area
Pale Townsend's big-eared bats, *Corynorhinus townsendii pallescens* (individuals)	Pinto Creek and Powers Gulch in the vicinity of the Carlota Copper Mine
Southwestern myotis, *Myotis auriculus*	In the vicinity of the analysis area
Western red bat, *Lasiurus blossevillii* (habitat present, none observed)	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
Western small-footed myotis, *Myotis ciliolabrum*	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
Canyon bat, *Parastrellus hesperus*	Within the analysis area near the Tailings Storage Facility No. 4 perimeter road
Yuma myotis, *Myotis yumanensis*	Within the analysis area near the Arizona Pollutant Discharge Elimination System Outfall No. 005
Colonial roosting activity (none observed)	In the vicinity of the Carlota Copper Mine
Colonies (two) and one foraging area (species unspecified)	Near the analysis area at the Pinto Creek and Haunted Canyon confluence
Mine adits (several, unoccupied)	In the vicinity of the Carlota Copper Mine
Natural cavities (three, unoccupied)	Within the analysis area near the Tailings Storage Facility No. 4 perimeter road

Source: Cedar Creek Associates, Inc. 2006; WestLand Resources, Inc. 2016b, 2017b; Arizona Game and Fish Department 2018b

3.3.3.2.2 Birds

Representative bird species of each biotic community within the analysis area listed by Brown (1994) include rufous-crowned sparrow (*Aimophila ruficeps*) and canyon wren (*Catherpes mexicanus*) for Interior Chaparral; cactus wren (*Campylorhynchus brunneicapillus*), greater roadrunner (*Geococcyx californianus*), Gila woodpecker (*Melanerpes uropygialis*), and curve-billed thrasher (*Toxostoma curvirostre*) for Arizona Upland subdivision of Sonoran Desertscrub; and bridled titmouse (*Baeolophus wollweberi*), Mexican jay (*Aphelocoma wollweberi*), and acorn woodpecker (*Melanerpes formicivorus*) for Madrean Evergreen Woodland.

[33] In some circumstances, wildlife species and habitat outside of the analysis area are included to provide additional context for the biological resource conditions.

Although systematic general bird surveys have not been conducted within the analysis area, 80[34] bird species are either known to be present or have the potential to be present based on previous site-specific assessments or observations during biological site visits (Sferra 2004; Madara-Yagla 2010; WestLand Resources, Inc. 2016a; Prager and Wise 2017; Stewart 2017; Arizona Game and Fish Department 2018a, 2018b; WestLand Resources, Inc. 2018a). These 80 species are included in table 3-20. The majority of species observations have occurred within riparian vegetation along Pinto Creek; however, many of the observed species are known to use both riparian and upland vegetation. Species with the potential to be present within the Pinto Valley Mine project boundary include those that are known or have the potential to occur within Forest Service ecological response units that overlap the Pinto Valley Mine project boundary (WestLand Resources, Inc. 2018b). Additional bird species are expected to occur within the analysis area, but have not been formally documented during previous site visits and assessments. Notably, Pinto Valley Mining Corp. employs bird cannons, which create a sound that discourages birds from attempting to use on-site water impoundments that may present a risk to birds, such as process water ponds.

Table 3-20. Bird species and general location in and near the analysis area

Species	Species
Known to Occur within the Pinto Valley Mine Project Boundary	
Brewer's blackbird, *Euphagus cyanocephalus*	Red-tailed hawk, *Buteo jamaicensis*
House finch, *Haemorhous mexicanus*	-
Possible or Known to Occur within Ecological Response Units that Overlap the Pinto Valley Mine Project Boundary	
Bell's vireo, *Vireo bellii*	Lawrence's goldfinch, *Spinus lawrencei*
Black-chinned sparrow, *Spizella atrogularis*	Long-eared owl, *Asio otus*
Black-throated gray warbler, *Setophaga nigrescens*	Mountain plover, *Charadrius montanus*
Black-throated sparrow, *Amphispiza bilineata*	Northern beardless tyrannulet, *Camptostoma imberbe*
Chestnut-collared longspur, *Calcarius ornatus*	Peregrine falcon, *Falco peregrinus*
Common black-hawk, *Buteogallus anthracinus*	Pinyon jay, *Gymnorhinus cyanocephalus*
Golden eagle, *Aquila chrysaetos*	Rufous hummingbird, *Selasphorus rufus*
Gray flycatcher, *Empidonax wrightii*	Southwestern willow flycatcher, *Empidonax traillii extimus*
Gray vireo, *Vireo vicinior*	Swainson's hawk, *Buteo swainsoni*
Horned lark, *Eremophila alpestris*	Virginia's warbler, *Oreothlypis virginiae*
Juniper titmouse, *Baeolophus ridgwayi*	Yellow-billed cuckoo, *Coccyzus americanus*
Lark bunting, *Calamospiza melanocorys*	Yellow warbler, *Setophaga petechia*
Known to Occur along Pinto Creek and in the Vicinity of the Analysis Area beyond the Pinto Valley Mine Boundary[35]	
Abert's towhee, *Pipilo aberti*	Hooded oriole, *Icterus cucullatus*
American kestrel, *Falco sparverius*	House finch, *Haemorhous mexicanus*
Anna's hummingbird, *Calypte anna*	Juniper titmouse, *Baeolophus ridgwayi*
Ash-throated flycatcher, *Myiarchus cinerascens*	Ladder-backed woodpecker, *Dryobates scalaris*
Bell's vireo, *Vireo bellii*	Lazuli bunting, *Passerina amoena*
Bewick's wren, *Thryomanes bewickii*	Lesser goldfinch, *Spinus psaltria*
Black phoebe, *Sayornis nigricans*	Lucy's warbler, *Oreothlypis luciae*
Black-chinned hummingbird, *Archilochus alexandri*	Mourning dove, *Zenaida macroura*
Black-chinned sparrow, *Spizella atrogularis*	Northern beardless tyrannulet

[34] WestLand Resources, Inc. (2018b) also identified the burrowing owl (*Athene cunicularia*) as a species that could occur within the Pinto Valley Mine project boundary. No burrowing owls have been observed by Forest Service personnel during visits to the analysis area; therefore, the Forest Service does not anticipate this species to be present.

[35] In some circumstances, wildlife species and habitat outside of the analysis area are included to provide additional context for the biological resource conditions.

Species	Species
Black-headed grosbeak, *Pheucticus melanocephalus*	Northern cardinal, *Cardinalis cardinalis*
Blue-gray gnatcatcher, *Polioptila caerulea*	Peregrine falcon, *Falco peregrinus*
Black-tailed gnatcatcher, *Polioptila melanura*	Phainopepla, *Phainopepla nitens*
Black-throated sparrow, *Amphispiza bilineata*	Purple martin, *Progne subis*
Blue grosbeak, *Passerina caerulea*	Red-tailed hawk, *Buteo jamaicensis*
Bridled titmouse, *Baeolophus wollweberi*	Rufous-crowned sparrow, *Aimophila ruficeps*
Brown-crested flycatcher, *Myiarchus tyrannulus*	Scott's oriole, *Icterus parisorum*
Brown-headed cowbird, *Molothrus ater*	Song sparrow, *Melospiza melodia*
Bushtit, *Psaltriparus minimus*	Southwestern willow flycatcher, *Empidonax traillii extimus*
Cactus wren, *Campylorhynchus brunneicapillus*	Spotted towhee, *Pipilo maculatus*
Canyon wren, *Catherpes mexicanus*	Steller's jay, *Cyanocitta stelleri*
Cassin's kingbird, *Tyrannus vociferans*	Summer tanager, *Piranga rubra*
Common black-hawk, *Buteogallus anthracinus*	Swainson's thrush, *Catharus ustulatus*
Common poorwill, *Phalaenoptilus nuttallii*	Turkey vulture, *Cathartes aura*
Common raven, *Corvus corax*	Verdin, *Auriparus flaviceps*
Common yellowthroat, *Geothlypis trichas*	Vermillion flycatcher, *Pyrocephalus rubinus*
Cooper's hawk, *Accipiter cooperii*	Western wood pewee, *Contopus sordidulus*
Cordilleran flycatcher, *Empidonax occidentalis*	White-crowned sparrow, *Zonotrichia leucophrys*
Crissal thrasher, *Toxostoma crissale*	White-winged dove, *Zenaida asiatica*
Dusky-capped flycatcher, *Myiarchus tuberculifer*	Woodhouse's scrub-jay, *Aphelocoma woodhouseii*
Gambel's quail, *Callipepla gambelii*	Yellow-billed cuckoo, *Coccyzus americanus*
Gila woodpecker, *Melanerpes uropygialis*	Yellow-breasted chat, *Icteria virens*
Golden eagle, *Aquila chrysaetos*	Yellow warbler, *Setophaga petechia*
Gray vireo, *Vireo vicinior*	Zone-tailed hawk, *Buteo albonotatus*
Greater roadrunner, *Geococcyx californianus*	-

3.3.3.2.3 Reptiles and Amphibians

Reptiles and amphibians that occur within biotic communities within the analysis area include eastern collared lizard (*Crotaphytus collaris*), Arizona black rattlesnake (*Crotalus cerberus*), Sonora mud turtle (*Kinosternon sonoriense*), and Woodhouse's toad (*Anaxyrus woodhousii*) for Interior Chaparral; red-spotted toad (*Bufo punctatus*), ornate tree lizard (*Urosaurus ornatus*), and gophersnake (*Pituophis catenifer*) for Arizona Upland subdivision of Sonoran Desertscrub; and Clark's spiny lizard (*Sceloporus clarkii*) and black-necked gartersnake (*Thamnophis cyrtopsis*) for Madrean Evergreen Woodland (Brennan and Holycross 2006). Riparian and aquatic resources within each biotic community are necessary to most amphibians during reproduction and larval stages. Riparian and aquatic resources also provide important resources such food, shelter, and water for many reptile species.

Lowland leopard frogs (*Lithobates [Rana] yavapaiensis*) were located during amphibian searches conducted along Pinto Creek and Powers Gulch in 1992 and 1993 (Cedar Creek Associates, Inc. 1994). Systematic reptile and amphibian surveys have not been conducted within the analysis area since that time. Reptile and amphibian species observed along Pinto Creek during general site visits or during surveys for other taxa include lowland leopard frogs, red-spotted toad, Arizona toad (*Bufo microscaphus*), canyon treefrog (*Hyla arenicolor*), black-necked gartersnake, Woodhouse's toad, and Sonora mud turtle (Tonto National Forest and Arizona Game and Fish Department 1993; Clark and Warnecke 1997; WestLand Resources, Inc. 2016a; Arizona Game and Fish Department 2018a). Mosher (2017a, 2017b) recorded lowland leopard frogs along West Fork Pinto Creek and an unidentified frog species at Mule Springs. A single bullfrog (*Rana catesbeiana*), a nonnative competitor with and predator of native fish and other native aquatic and semiaquatic organisms, was observed in Pinto Creek upstream of Pinto Valley Mine in 1993; no bullfrogs have been noted during site visits to any of the aforementioned locations since that time.

3.3.3.2.4 Fish

Historic surveys of Pinto Creek conducted by Lewis in 1974–1976 (described in Tonto National Forest and Arizona Game and Fish Department 1993) recorded two native fish species, desert sucker (*Catostomus clarkii*) and longfin dace, and four nonnative fish species, fathead minnow (*Pimephales promelas*), mosquitofish (*Gambusia affinis*), golden shiner (*Notemigonus crysoleucas*), and red shiner (*Cyprinella lutrensis*). Fish and macroinvertebrate sampling of sites between U.S. Highway 60 and Henderson Ranch were conducted in 1992, 1993, 1995, and 1997 (Arizona Game and Fish Department 1993; Tonto National Forest and Arizona Game and Fish Department 1993; Miller Ecological Consultants, Inc. 1994; Clark and McMahon 1995; Clark and Warnecke 1997). These surveys each recorded longfin dace, desert sucker, and green sunfish (*Lepomis cyanellus*); mosquitofish were also recorded in Pinto Creek in 1993 (Miller Ecological Consultants, Inc. 1994). Green sunfish is an invasive species that preys heavily on native fish.

Beginning in 2007, Miller Ecological Consultants, Inc. has conducted annual electrofishing and habitat mapping along Pinto Creek and Haunted Canyon in the vicinity of Carlota Mine (Miller Ecological Consultants, Inc. 2008, 2010–2014, 2016–2019). Habitat types present along Pinto Creek and Haunted Canyon consisted of riffles, glides, and pools. From 2007 to 2011, pool habitat was dominant at the majority of sites (Miller Ecological Consultants, Inc. 2011). From 2012 to 2018, sites were dominated by riffles and glides (Miller Ecological Consultants, Inc. 2019). Three fish species, longfin dace, desert sucker, and green sunfish, were documented along Pinto Creek and Haunted Canyon between 2007 and 2018 (Miller Ecological Consultants, Inc. 2019). Overall, longfin dace was the dominant fish species present. Fish were consistently collected at each of these three locations during the first 3 years of the study (2007–2009). As of the September 2018 sampling period, no fish have been captured from Haunted Canyon since April 2011. Following a 3-year absence, longfin dace and green sunfish were captured from Pinto Creek, respectively, in October 2017 and March 2018.

Miller Ecological Consultants, Inc. (2019) concludes that over the timeframe of its study, low- or no-flow conditions have been the biggest concern for fish in Pinto Creek and Haunted Canyon. Lack of flow in the falls of 2009, 2011, and 2013–2016 resulted in the elimination of desert sucker from the Haunted Canyon sites.[36] The reappearance of longfin dace and, later, green sunfish in Pinto Creek demonstrates that recolonization can occur with sufficient flow. Between 2007 and 2018, Miller Ecological Consultants, Inc. (2011, 2019) noted deteriorating conditions along Pinto Creek and, particularly, Haunted Canyon as evidenced by dead trees, dry sample sites, and the replacement of pool habitat by riffles and glides.

Other recent fish observations along Pinto Creek include those of longfin dace just downstream of the Pinto Valley Mine (WestLand Resources, Inc. 2016a). Additional populations of desert sucker were recorded along Pinto Creek 4 miles downstream of Pinto Valley Mine near Bell Gulch in 2011 and along Pinto Creek just downstream of Pinto Valley Mine in 2012 (Arizona Game and Fish Department 2018b). The Arizona Game and Fish Department observed longfin dace and desert sucker during its November 2017 visit to Pinto Creek between the Pinto Valley Mine and a point 1.5 miles downstream (Arizona Game and Fish Department 2018a).

[36] Haunted Canyon is outside the analysis area and contains the furthest-reaching effects of the action that could affect biological resources, such as water withdrawals. Haunted Canyon is discussed here to provide additional context for biological resources.

There are generally limited fish data available for other water features within the analysis area. Arizona Game and Fish Department and the Forest Service conducted a site visit to Mule Springs, located just beyond the southwestern boundary of the analysis area, in May 2017. No fish were observed or collected during dip netting at this location (Mosher 2017a).

3.3.3.2.5 Aquatic Macroinvertebrates

Common macroinvertebrates collected by Miller Ecological Consultants, Inc. in 1993 consisted of mayflies (Ephemeroptera), non-biting midges (Chironomidae), and blackflies (*Simulium* sp.); species associated with rapid colonization were dominant in this study (Miller Ecological Consultants, Inc. 1994). Qualitative observations of macroinvertebrates in subsequent years consisted of a relatively abundant number of giant waterbugs (Belostomatidae), dragonfly larvae (Odonata), mayflies, blackflies, and hellgrammite larvae (Corydalidae) (Clark and McMahon 1995; Clark and Warnecke 1997).

Macroinvertebrates were sampled at three sites along Pinto Creek annually between 2002 and 2006 to quantify any toxic impacts on aquatic life in Pinto Creek from discharges from the Pinto Valley Mine. (Parkhurst 2007). Non-biting midges were the dominant taxa at all three sites. Conditions were categorized as exceptional downstream of the Pinto Valley Mine, good downstream of West Fork Pinto Creek, and fair upstream of Haunted Canyon. The author suggests that this trend may be explained by increases in baseflow that occur as Pinto Creek flows north as well as by differences in substrate composition and riparian vegetation. Parkhurst (2007) suggests that habitat quality at all three sampling sites did not change significantly during the timeframe of the study.

Beginning in 2007, Miller Ecological Consultants, Inc. has conducted annual macroinvertebrate sampling along Pinto Creek and Haunted Canyon in the vicinity of Carlota Mine to provide information regarding aquatic conditions (Miller Ecological Consultants, Inc. 2008, 2010–2014, 2016–2019). Sites were located upstream of West Fork Pinto Creek in perennial or intermittent sections of Pinto Creek and Haunted Canyon in the vicinity of the Carlota Mine. Macroinvertebrate standing crop (density and biomass) was used as an indication of macroinvertebrate productivity; Shannon-Weaver diversity and evenness index values were used to detect changes in macroinvertebrate community structure; taxa richness was used to describe differences in habitat complexity and preferences; the Ephemeroptera, Plecoptera, Trichoptera index was used to measure taxa richness among species that are considered to be sensitive to disturbance; and functional feeding groups were used to measure macroinvertebrate community function and identify various types of stress in the aquatic system (Miller Ecological Consultants, Inc. 2019).

From 2007 to 2015, few trends were observed in any of these indicators, which varied from year to year within a given site (Miller Ecological Consultants, Inc. 2016). Trends were not analyzed for data collected between 2016 and 2018; however, the taxa richness, the Ephemeroptera, Plecoptera, Trichoptera index, and the Shannon-Weaver diversity and evenness values improved markedly in 2018 from the preceding year. For all years and all sites, the Shannon-Weaver diversity index did not indicate polluted conditions (Miller Ecological Consultants, Inc. 2016, 2017, 2018, 2019). Shannon-Weaver evenness values indicated polluted conditions once at one Haunted Canyon site and once each at two Pinto Creek sites (Miller Ecological Consultants, Inc. 2016, 2017, 2018, 2019). On average, the downstream Pinto Creek site had the highest values for density, biomass, taxa richness, and Ephemeroptera, Plecoptera, Trichoptera species richness index of all the sites. Overall, the collector-gatherer functional group was dominant, as is expected for western streams (Miller Ecological Consultants, Inc. 2016), followed by the predator group and the collector-filterer group. The most abundant taxa collected were non-biting midges and biting midges (Ceratopogonidae). Mayflies, soldier flies (Hedriodiscus sp.), and predaceous diving beetles (Stictotarsus sp.) were also common at several locations. Caddisflies (Trichoptera), which were mostly absent from the other sites, were present at the downstream Pinto Creek site (Miller Ecological Consultants, Inc. 2011).

Other observations from Miller Ecological Consultants, Inc. include that high flows, which typically occur in January, reduce macroinvertebrate populations (Miller Ecological Consultants, Inc. 2019). The author indicates that populations generally recolonize sites quickly, but the extended number of zero-flow days between 2011 and 2018 likely had an adverse impact on recolonization. Between 2007 and 2018, Miller Ecological Consultants, Inc. (2011, 2019) noted deteriorating conditions along Pinto Creek and, particularly, Haunted Canyon as evidenced by dead trees, dry sample sites, and the replacement of pool habitat by riffles and glides.

Other recent macroinvertebrate observations along Pinto Creek include those of predaceous diving beetles, water boatmen (Corixidae), and diving and whirligig beetles (Coleoptera) during an Arizona Game and Fish Department visit to Pinto Creek between the Pinto Valley Mine and a point 1.5 miles downstream in November 2017 (Arizona Game and Fish Department 2018a). Macroinvertebrate communities are present at the outflow of Arizona Pollutant Discharge Elimination System Outfall No. 005 (Arizona Department of Environmental Quality 2018).

No crayfish, a nonnative competitor with and predator of native fish and other aquatic organisms, have been collected during aquatic surveys; however, crayfish have been observed along Pinto Creek by Forest Service biologists.

3.3.3.3 **Special Status Species**

Special status species are defined here as species that belong to one or more of the following groups:

- All listed, proposed, and candidate species under the Endangered Species Act of 1973 (16 U.S. Code 1531 et seq.);
- Bald and golden eagles, which are protected under the Bald and Golden Eagle Protection Act of 1940 (16 U.S. Code 668–668c);
- Species listed by the Tonto National Forest as sensitive species, management indicator species, or migratory birds of concern; and
- Species of Greatest Conservation Need and Species of Economic and Recreational Importance as identified by the Arizona Game and Fish Department.

3.3.3.3.1 Threatened and Endangered Species

Species with the potential to be affected by proposed action and alternatives are those that occur within the analysis area. To identify species listed under the Endangered Species Act with the potential to occur within the analysis area, the U.S. Fish and Wildlife Service's Information for Planning and Consultation System was accessed on April 21, 2020 (U.S. Fish and Wildlife Service 2020). The Information for Planning and Consultation System query returned a list of proposed and designated critical habitat within the analysis area as well as all listed, proposed, and candidate species under the Endangered Species Act that may occur within any U.S. Geological Survey 7.5-inch topographical quadrangles that intersect the analysis area.

Ten species were identified by the query along with proposed critical habitat for one of those species, western yellow-billed cuckoo (*Coccyzus americanus*). One additional species not returned by the Information for Planning and Consultation System query, Gila topminnow (*Poeciliopsis occidentalis*), was added to the Endangered Species Act review list because it was introduced into the West Fork of Pinto Creek by the Arizona Game and Fish Department and the Forest Service in the spring of 2017 (Mosher

2017b). The habitat requirements and distribution of each species were reviewed to identify those that are known or have the potential to occur within the analysis area currently or at a future point during the analysis timeframe. Five species, ocelot (*Leopardus pardalis*), Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*), southwestern willow flycatcher (*Empidonax traillii extimus*), the western distinct population segment of the yellow-billed cuckoo, and Gila topminnow, have the potential to meet this criterion. The sections below provide a summary of relevant information associated with these species. Refer to the Pinto Valley Mine biological assessment (Forest Service 2020b) for additional information on the life history, survey history, and habitat evaluations for these species. Justifications for excluding the remaining species from further evaluation are provided in the biological assessment (Forest Service 2020b). This analysis assumes that the proposed action and its alternatives would have no effect on species excluded from further evaluation.

Ocelot

The ocelot is a medium-sized, spotted cat that generally can be found from South America to the southern United States. In Arizona, ocelots once ranged from the Mexican border as far north as Camp Verde in Yavapai County (Hoffmeister 1986; U.S. Fish and Wildlife Service 2016a). Between 1985 and 2009, no ocelots were recorded in Arizona (U.S. Fish and Wildlife Service 2016a). Since 2009, a total of four individual ocelots have been detected within the Whetstone, Huachuca, Patagonia, and Santa Rita Mountains of southern Arizona. A fifth individual, a young male, was struck by a car near Top of the World in Pinal County in 2010 (Avila-Villegas and Lamberton-Moreno 2013; U.S. Fish and Wildlife Service 2016a). A breeding population of ocelots is not believed to occur in Arizona; all contemporary records for which the sex could be determined were males. The ocelot received protection under the Endangered Species Act in 1982 when it was listed as an endangered species without critical habitat (U.S. Fish and Wildlife Service 1983). The species is considered to be threatened throughout its range; current threats to the ocelot include habitat loss, fragmentation, and isolation due to land conversion and increasing road density; mortality caused by collisions with vehicles; and poaching in some portions of their range (Haines et al. 2005; U.S. Fish and Wildlife Service 2016a).

Ocelots are known to occupy a variety of vegetation types throughout their range and are generally associated with dense cover or vegetation (U.S. Fish and Wildlife Service 2016a). Rorabaugh et al. (2020) suggest that ocelots at their northern Sonora study site are sensitive to anthropogenic disturbance, including presence of cattle. In addition to the area included within their home range, ocelots require relatively narrow strips of contiguous vegetation for dispersal (U.S. Fish and Wildlife Service 2016a). Linear features such as drainages, shorelines, fencelines, and road margins all provide suitable travel corridors for ocelots (U.S. Fish and Wildlife Service 2016a).

Most contemporary Arizona records of ocelot have occurred within Madrean Evergreen Woodland in the rugged, isolated Sky Island mountain ranges of southeastern Arizona. Similar vegetation and terrain occurs just south of the analysis area along U.S. Highway 60. Riparian forest similar to that utilized by ocelots in northern Sonora as documented by Rorabaugh et al. (2020) occurs along portions of Pinto Creek and its major tributaries. Dense Interior Chaparral vegetation similar to that which surrounds the 2010 Top of the World record is found throughout most other undeveloped portions of the analysis area. However, these portions of the analysis area are not likely to be used by ocelots due to the existing disturbance associated with the continuing operation of the Pinto Valley Mine.

Although suitable vegetation and terrain are present within many portions of the analysis area, the paucity of records indicates that the area is not likely to support resident ocelots. Though it is possible that ocelots could disperse into the analysis area, this is unlikely to occur during the analysis timeframe due to the approximately 100-mile distance to most contemporary Arizona records and the 170-mile distance to the nearest known breeding population in Mexico. Any individuals that were to be present would likely be transient males.

Arizona Hedgehog Cactus

The Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*) is a succulent cactus with up to 50 dark-green cylindrical stems that are generally less than 20 inches tall. Flowers are red and appear in late March to mid-May. The Arizona hedgehog cactus occupies a limited geographic range within the Superstition Wilderness, Pinal Mountains, and Mescal Mountains of Pinal and Gila Counties in central Arizona (Baker 2013). The core population occurs north and south of US Highway 60, generally between Pinto Creek and upper Queen Creek (Taylor 2017). The Arizona hedgehog cactus was federally listed as endangered in 1979 without critical habitat (U.S. Fish and Wildlife Service 1979) and is listed as a highly safeguarded species by the Arizona Department of Agriculture; as such, it is protected under Arizona Native Plant Law. Threats to the species include habitat loss caused by human-caused changes in land use (such as construction and maintenance of mines, roadways, power lines, and development), illegal removal, sucking and boring insects, disease, prolonged freezing temperatures, wildfire, off-road vehicle use, herbivory, and grazing. Recent studies estimate the total Arizona hedgehog cactus population size to be approximately 40,000 individuals (Baker 2013).

Arizona hedgehog cactus habitat consists of open, rocky-sloped, and steep fractured cliffs within Interior Chaparral and Madrean Evergreen Woodland biotic communities (Baker 2013). Arizona hedgehog cacti typically occur on geological formations with volcanic parent materials (Baker 2013; Taylor 2017). Occupied elevations range from 3,300 to 5,800 feet above mean sea level (Taylor 2017). Suitable geology (Ludington et al. 2005), biotic communities (Arizona Land Resource Information System 2004), and elevations occur within portions of the analysis area.

A concentration of Arizona hedgehog cactus records occurs west of Pinto Creek from the vicinity of U.S. Highway 60 northwest to Haunted Canyon (Taylor 2017; Arizona Game and Fish Department 2018a). Approximately 1,150 individuals were located within or in the immediate vicinity of the Carlota Copper Mine footprint, adjacent to the southwestern corner of the analysis area, during surveys conducted prior to the mine’s construction (Forest Service 1997). Approximately 1,640 acres of potential habitat within the Pinto Valley Mine project boundary were surveyed by WestLand Resources, Inc. for Arizona hedgehog cactus between 2008 and 2016 (map 3-3 in appendix A; WestLand Resources, Inc. 2008, 2010, 2011, 2015a, 2016c). No Arizona hedgehog cacti were found during these surveys. No records of Arizona hedgehog cactus exist within the Pinto Valley Mine project boundary (Taylor 2017; Arizona Game and Fish Department 2018b).

No areas within the Pinto Valley Mine project boundary occur within predicted habitat identified by Baker (2013). Due to its location at the edge of the known distribution of the Arizona hedgehog cactus and because no Arizona hedgehog cacti have been located during recent surveys (including survey of inaccessible areas with binoculars), sizeable populations of Arizona hedgehog cacti are unlikely to be present. There is a possibility that individual Arizona hedgehog cactus occur within steep portions of the surveyed areas that could not be physically accessed or within unsurveyed portions of the analysis area containing suitable substrate, elevation, and geology; however, this potential is limited because no individuals have been found to date in areas north of U.S. Highway 60 and east of the species’ known distribution. In addition when flowering, this species is readily detectable, decreasing the possibility of undetected individuals in the analysis area.

Southwestern Willow Flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small, gray, neotropical migrant that breeds within the southwestern U.S. and northern Mexico (U.S. Fish and Wildlife Service 2013a). In Arizona, southwestern willow flycatchers breed locally along portions of the Gila, Salt, and Verde Rivers; Tonto Creek; the middle to lower San Pedro River; the Colorado River; the Little Colorado River headwaters; and the upper San Francisco River near Alpine (Arizona Game and Fish Department 2010). The southwestern willow flycatcher was federally listed as endangered by the U.S. Fish and Wildlife Service in 1995 and a recovery plan for the species was completed in 2002 (U.S. Fish and Wildlife Service 1995, 2002). Threats to the species include habitat loss and modification, replacement of native riparian plant species by exotic species, brood parasitism, small population size, and migration and winter range stresses (U.S. Fish and Wildlife Service 2002).

Critical habitat for southwestern willow flycatcher was designated in 2005 and revised in 2013 (U.S. Fish and Wildlife Service 2005, 2013a). The primary constituent elements of southwestern willow flycatcher critical habitat consist of (1) riparian vegetation, and (2) insect prey populations. Designated critical habitat for the southwestern willow flycatcher does not occur within the analysis area. The nearest designated critical habitat is 10 miles downstream along the Salt River east of the Pinto Creek inflow (map 3-4 in appendix A; U.S. Fish and Wildlife Service 2013b).

The southwestern willow flycatcher is an obligate riparian species, breeding in dense stands of trees and shrubs near surface water or underlying saturated soil (U.S. Fish and Wildlife Service 2013b). Southwestern willow flycatchers generally use stands of willow (*Salix* spp.) or tamarisk (*Tamarix* spp.); Russian olive (*Elaeagnus angustifolia*), boxelder (*Acer negundo*), mesquite (*Prosopis* spp.), and Fremont cottonwood (*Populus fremontii*) may also be present (Graber et al. 2007; U.S. Fish and Wildlife Service 2013a). Patches of vegetation suitable for occupancy by southwestern willow flycatchers are often ephemeral because they occur within a dynamic system where the local hydrology can vary both temporally and spatially and where maturation can render vegetation no longer suitable (U.S. Fish and Wildlife Service 2013a). Southwestern willow flycatchers also use riparian vegetation during migration; however, migrating flycatchers are often found in areas with lower density, abundance, and patch size in addition to areas suitable for breeding (U.S. Fish and Wildlife Service 2013a).

A habitat assessment of Pinto Creek conducted in 2005 found that suitably dense riparian vegetation occurred in small, isolated patches and strips (WestLand Resources, Inc. 2005). WestLand Resources, Inc. (2005) suggests that additional habitat is unlikely to develop along much of Pinto Creek due to frequent flood events that scour existing riparian vegetation and prevent accumulation of alluvium sufficient to support riparian vegetation. A geospatial model of potential southwestern willow flycatcher habitat created in 2015 identified nine patches of potential breeding habitat along a 4.2-mile stretch of Pinto Creek beginning just downstream of the analysis area; no potential habitat was predicted to occur within the analysis area (map 3-4 in appendix A; Hatten 2015).

Over the past approximately 25 years, portions of Pinto Creek and other drainages within the analysis area have been surveyed multiple times for southwestern willow flycatchers (map 3-4 in appendix A; (Cedar Creek Associates, Inc. 1994; Ellis et al. 2008; Sferra 2004, 2005; WestLand Resources, Inc. 2016d, 2017d; Sogge et al. 2010). Past southwestern willow flycatcher surveys of Pinto Creek located entirely outside the analysis area include surveys conducted by the Tonto National Forest from 2007 to 2009 (Janssen et al. 2007; Torrence et al. 2008; Torrence and Madara-Yagla 2009). No southwestern willow flycatchers have been detected within the analysis area or any other portion of Pinto Creek upstream of its confluence with the Salt River at Roosevelt Lake. Notably, a large population of southwestern willow flycatchers occurs approximately 10 miles downstream of the analysis area along a 5-mile stretch of the Salt River that includes the Pinto Creek inflow. The most recent rangewide assessment of southwestern willow flycatcher breeding sites found that as of the 2007 breeding season, territories within the Salt River drainage accounted for 3.2 percent (41 of 1,299 territories) of the rangewide total (Durst et al. 2008).

Although patches of potential willow flycatcher habitat ranging from 0.2 to 6.7 acres in size occur along Pinto Creek downstream of the analysis area (Hatten and Paradzick 2003; Hatten 2015), the numerous negative surveys conducted along portions of Pinto Creek and tributaries such as Gold Gulch and Eastwater Canyon since 1993 suggest that riparian vegetation within and immediately downstream of the analysis area is not suitable for occupancy by breeding southwestern willow flycatchers. This is likely due to a combination of small patch size, scattered placement, low vegetation density, and large distance from occupied habitat along the Salt River as described in previous habitat assessments (Forest Service 1997; WestLand Resources, Inc. 2005). Furthermore, overgrazing, past recreational use, and riparian tree mortality and declines described under “Vegetation” – “Plant Health” may have reduced the current suitability of Pinto Creek for willow flycatchers. Although breeding habitat is not present, there is some potential for southwestern willow flycatchers to use riparian vegetation found along drainages within the analysis area during migration due to their broader habitat requirements during this time (U.S. Fish and Wildlife Service 2013b). Pinto Creek may be used for this purpose as it provides a direct south-north corridor to and from known breeding sites along Roosevelt Lake and is lined by strips of riparian vegetation (U.S. Geological Survey 2004).

Western Yellow-billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus*) is a medium-sized member of the Cuculidae family that possesses brown plumage above, white plumage below, and a bi-colored bill. Yellow-billed cuckoos are neotropical migrants that spend the summer months within an area stretching from northern Mexico to southern Canada. The U.S. Fish and Wildlife Service (2014a) recognizes two distinct population segments of yellow-billed cuckoo, eastern and western. In 2014, the U.S. Fish and Wildlife Service listed the western yellow-billed cuckoo as a threatened species under the Endangered Species Act (U.S. Fish and Wildlife Service 2014a). Western yellow-billed cuckoos have experienced declines in both their rangewide and local extent over the past 100 years. These declines occurred as a result of loss, fragmentation, and degradation of their riparian woodland habitat caused by altered hydrologic flow regimes and, to a lesser extent, agricultural encroachment and livestock grazing (U.S. Fish and Wildlife Service 2014a). Within Arizona, only 12 locations remain with a western yellow-billed cuckoo population of greater than 10 pairs (U.S. Fish and Wildlife Service 2013c).

Critical habitat for western yellow-billed cuckoo was proposed in August 2014 and revised in February 2020; western yellow-billed cuckoo critical habitat has not been finalized to date (U.S. Fish and Wildlife Service 2014b, 2020). The physical and biological features of habitat essential for the conservation of the western yellow-billed cuckoo consist of (1) riparian woodlands, mesquite woodlands, and Madrean evergreen woodland drainages, (2) adequate prey base, and (3) hydrologic processes, in natural or altered systems, that provide for maintaining and regenerating breeding habitat. Two units of proposed critical habitat for western yellow-billed cuckoo occur completely or partially within the analysis area (map 3-5 in appendix A; U.S. Fish and Wildlife Service 2020). Unit 26: AZ 24 Pinto Creek South is composed of 373 contiguous acres along a 4-mile-long segment of Pinto Creek between Haunted Canyon and West Fork Pinto Creek. Unit 26 parallels the western edge of the Pinto Valley Mine project boundary; 254 acres of this unit occur within the analysis area. Unit 29: AZ 27 Pinto Creek North is composed of 427 contiguous acres along a 6-mile-long segment of Pinto Creek from the northern end of the Pinto Valley Mine project boundary to a point 1.3 miles south of Blevens Wash. Approximately 54 acres of Unit 29 along a 0.7-mile-long segment of Pinto Creek occur within the analysis area.

On the breeding grounds, western yellow-billed cuckoos typically occur in large blocks of mixed cottonwood-willow-tamarisk riparian vegetation along low-gradient surface waters at elevations below 7,000 feet above mean sea level (U.S. Fish and Wildlife Service 2014a). High structural diversity, presence of mature trees, and close proximity to water are important characteristics of western yellow-billed cuckoo habitat (Corman and Magill 2000; Johnson et al. 2008). Western yellow-billed cuckoos also use riparian vegetation during migration; however, migrating cuckoos are often found in areas with smaller patch size and lower structural diversity (U.S. Fish and Wildlife Service 2014a).

Geospatial data compiled by the U.S. Geological Survey's Southwest Regional Gap Analysis Project were used to identify riparian vegetation within the analysis area (U.S. Geological Survey 2004). Patches of riparian vegetation are present along the length of Pinto Creek and West Fork Pinto Creek within the analysis area. Riparian vegetation also occurs along Eastwater Canyon upstream of Tailings Storage Facility No. 4 and along Gold Gulch (U.S. Geological Survey 2004; WestLand Resources, Inc. 2009, 2016c, 2017e). A nearly contiguous patch of riparian vegetation is identified along Pinto Creek beginning near the northern boundary of the analysis area and extending north past Bell Gulch (U.S. Geological Survey 2004). Audubon Arizona scouted Pinto Creek for potential yellow-billed cuckoo habitat in 2017 (Prager and Wise 2017). Observers described yellow-billed cuckoo habitat along West Fork Pinto Creek and along Pinto Creek near Haunted Canyon and Eastwater Canyon as marginal; however, the surveyors noted that these areas had the potential to support yellow-billed cuckoos. The most likely habitat scouted by Audubon Arizona was located at Pinto Creek's outlet to Roosevelt Lake and along Pinto Creek downstream from the Iron Bridge. WestLand Resources, Inc. (2009) found riparian vegetation within Eastwater Canyon to be marginally suitable for western yellow-billed cuckoos due to its limited extent.

Over the past approximately 25 years, portions of Pinto Creek and other drainages within and downstream of the analysis area have been surveyed multiple times for yellow-billed cuckoos (map 3-5 in appendix A). Records of yellow-billed cuckoos occurred along Pinto Creek in 1993, 2004, 2011, and 2012 (Cedar Creek Associates, Inc. 1994; Sferra 2004; Arizona Game and Fish Department 2018a; Prager and Wise 2017). In support of the Pinto Valley Mine EIS, WestLand Resources, Inc. conducted surveys for yellow-billed cuckoos according to U.S. Fish and Wildlife Service-accepted protocol along several drainages on Pinto Valley Mine private land and on Tonto National Forest land within the analysis area in 2008, 2015, 2016, and 2017 (WestLand Resources, Inc. 2009, 2015a, 2016c, 2017b). In 2016, WestLand Resources, Inc. detected three yellow-billed cuckoos along Pinto Creek between Gold Gulch at the northern end of the survey route during the first survey. In 2017, one yellow-billed cuckoo was detected along Pinto Creek downstream of Gold Gulch. According to U.S. Fish and Wildlife Service–accepted protocol, an area is considered to be an occupied, potential breeding location if behaviors indicative of breeding are observed (such as copulation, food carries, or nest presence) or if yellow-billed cuckoos are observed on at least two separate occasions at least 10 days apart. None of the areas where yellow-billed cuckoos were detected during WestLand Resources, Inc.'s surveys qualifies as occupied, potential breeding locations. Notably, a population of western yellow-billed cuckoos is located approximately 10 miles downstream of the analysis area along a 5-mile stretch of the Salt River that includes the Pinto Creek inflow (U.S. Fish and Wildlife Service 2014a).

Although western yellow-billed cuckoos have been previously detected along Pinto Creek on multiple occasions, the lack of breeding records despite several years of surveys suggests portions of the creek within and near the analysis area do not support breeding yellow-billed cuckoos. Overgrazing, past recreational use, and riparian tree mortality and declines described under "Vegetation" – "Plant Health" along with reduced surface water availability described in appendix E, "Water Resources and Geochemistry Technical Report," and Miller Ecological Consultants, Inc. (2011, 2019) may have reduced the current suitability of Pinto Creek for yellow-billed cuckoos. Although the riparian vegetation along most of Pinto Creek does not appear to support breeding yellow-billed cuckoos, Pinto Creek provides, at minimum, a habitat corridor suitable for use during migration or between breeding seasons.

Gila Topminnow

The Gila topminnow (*Poeciliopsis occidentalis sonoriensis*) is a small, tan to olivaceous fish that was once widely distributed throughout portions of the Gila River Basin in Arizona and New Mexico below 5,000 feet above mean sea level as well as within comparable elevations throughout northwestern Sonora, Mexico. However, the Gila topminnow has been extirpated from most of its historic range within the United States since the 1950s (Arizona Game and Fish Department 2001a; Minckley and Marsh 2009). The Gila topminnow was listed as endangered without critical habitat in 1973 (Weedman 1998). The primary threats to the Gila topminnow include competition with and predation by exotic fish such as western mosquitofish and green sunfish as well as changes in hydrologic patterns (Arizona Game and Fish Department 2001a; Minckley and Marsh 2009).

As of 2008, Gila topminnows were known to occur at nine natural locations and 20 reintroduction sites within the Gila River basin and one reintroduction site within the Bill Williams watershed (U.S. Fish and Wildlife Service 2008). Reintroduction efforts have met with limited success; only 21 of 175 stockings have resulted in established populations (U.S. Fish and Wildlife Service 2008). Additional reintroduction efforts and natural dispersals have taken place since 2008. For example, Gila topminnows were stocked into the West Fork of Pinto Creek 5 miles west of the analysis area in 2017 (Mosher 2017b). Gila topminnows have naturally dispersed into previously unoccupied sections of the Santa Cruz River in recent years (U.S. Fish and Wildlife Service 2015; Pima County 2017).

Within the analysis area, drainages with the physical characteristics (elevation and hydrology) of potential Gila topminnow habitat are generally restricted to Pinto Creek. Shallow pools and streamside vegetation have been documented within Pinto Creek upstream of West Fork Pinto Creek (Miller Ecological Consultants, Inc. 2008, 2010–2014, 2016–2019) and likely occur throughout the perennial and intermittent portions of Pinto Creek within the analysis area. Between 2007 and 2018, Miller Ecological Consultants, Inc. (2011, 2019) noted deteriorating conditions along Pinto Creek and, particularly, Haunted Canyon as evidenced by dead trees and dry sample sites. Miller Ecological Consultants, Inc. (2019) concludes that over the timeframe of the study, low- or no-flow conditions have been the biggest concern for fish in Pinto Creek and Haunted Canyon. The Arizona Game and Fish Department also noted dry conditions along Pinto Creek during its 2017 survey (Arizona Game and Fish Department 2018a).

Portions of Pinto Creek and its tributaries within and near the analysis area have been sampled for fish multiple times over the past approximately 25 years (Arizona Game and Fish Department 1993; Tonto National Forest and Arizona Game and Fish Department 1993; Miller Ecological Consultants, Inc. 1994, 2008, 2010–2014, 2016–2019; Clark and McMahon 1995; Clark and Warnecke 1997). Fish species documented during surveys include longfin dace, desert sucker, and green sunfish; mosquitofish were also recorded in 1993 (Miller Ecological Consultants, Inc. 1994). Historic surveys of Pinto Creek conducted by Lewis in 1974–1976 (described in Tonto National Forest and Arizona Game and Fish Department 1993) recorded two native fish species—desert sucker and longfin dace—and four nonnative fish species—fathead minnow, western mosquitofish, golden shiner, and red shiner—in Pinto Creek. No Gila topminnows have been documented in Pinto Creek during any previous surveys or site visits.

Although potential habitat is present, the Gila topminnow is not known to occur within Pinto Creek or any of its tributaries besides West Fork Pinto Creek where it was stocked in 2017. If the 2017 stocking results in a successfully established population of Gila topminnow in West Fork Pinto Creek, the species has the potential to disperse into Pinto Creek during periods of high flow. However, a successful dispersal from West Fork Pinto Creek would require individuals to traverse approximately 4.5 miles of ephemeral streambeds that likely act as a barrier between the stocking sites and Pinto Creek (Arizona Department of Water Resources 2009). Conditions in Pinto Creek have been relatively dry in recent years, further decreasing the likelihood of successful dispersal, at least in the short term. However, the reappearance of longfin dace at one of Miller Ecological Consultants, Inc.'s sample sites in 2017 demonstrates that dispersal can occur if sufficient flow is present. In the event that individual Gila topminnows were to disperse into Pinto Creek during a high-flow event, establishment of a successful population would require individuals to overcome predation and competition by exotic green sunfish. As a result, the potential for Gila topminnows to establish populations in Pinto Creek as a result of dispersals from nearby stocking locations is speculative.

3.3.3.3.2 Bald and Golden Eagle Protection Act

Species protected under the Bald and Golden Eagle Protection Act are limited to bald and golden eagles. Golden eagles have the potential to occur within the analysis area and are discussed in detail below. Bald eagles are unlikely to be present because the nearest breeding area is approximately 10 miles north of the analysis area near the Pinto Creek confluence along the Salt River and because no records have occurred along Pinto Creek upstream of the Salt River or along any other drainages within the analysis area (McCarty et al. 2016; eBird 2018; Arizona Game and Fish Department 2018b). Furthermore, although expanses of surface water are present within Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4, these areas do not provide habitat for bald eagles because fish are not present.

Golden Eagle

The golden eagle is a widespread species, occurring throughout the northern hemisphere at variable elevations. Within Arizona, the golden eagle is a resident in a variety of vegetation types ranging from desertscrub to open conifer forests. Golden eagles require tall cliffs or canyons for nesting with adjacent open areas for foraging. Nests are often very large, as eagles will add to and reuse sites each year. Home range sizes and breeding densities are often influenced by the abundance of prey (Corman and Wise-Gervais 2005). Golden eagles typically prey upon rabbits and other medium-sized mammals but will also take birds, reptiles, and carrion (Arizona Game and Fish Department 2002a). Survey data indicate that golden eagles currently breed throughout their historic range in Arizona (Corman and Wise-Gervais 2005).

Records of this species have occurred at several locations in the vicinity of the analysis area including locations along Pinto Creek adjacent to the Pinto Valley Mine and along West Fork Pinto Creek; a probable breeding location occurs within the Pinal Mountains (Corman and Wise-Gervais 2005; Arizona Game and Fish Department 2018c; eBird 2018). Potential habitat for this species occurs throughout the analysis area according to Arizona Game and Fish Department range models (Arizona Game and Fish Department 2018b). The analysis area also contains potential nest sites due to its mountainous character. Undeveloped areas suitable for foraging golden eagles occur throughout the analysis area beyond the existing footprint of the Pinto Valley Mine and Carlota Mine.

3.3.3.3.3 Forest Service Sensitive Species

To further maintain populations of fish and wildlife species as required by the National Forest Management Act, the Forest Service implements special management of species designated by the regional forester as sensitive due to current or predicted downward trends in population size, density, or distribution (Forest Service Manual 2670.5). The effects of proposed actions on sensitive species are reviewed as part of the National Environmental Policy Act process (Forest Service Manual 2670.3).

To identify Forest Service sensitive species with the potential to occur in the analysis area during the analysis timeframe, the habitat requirements and distribution of each of the 45 species on the Tonto National Forest sensitive species list were compared to the habitat types and geographic location of the analysis area. This analysis was supplemented by species occurrence records and predicted range models stored in the Arizona Game and Fish Department’s Heritage Data Management System (Arizona Game and Fish Department 2018b, 2018c). Of the 45 Forest Service sensitive species reviewed, 11 species were identified as having the potential to occur within the analysis area. Descriptions of these species’ habitat requirements and presence within the analysis area are provided below. Refer to appendix C, “Biological Evaluation,” for additional information on the life history, survey history, and habitat evaluations for these species. Justifications for excluding the remaining species from further evaluation are provided in appendix C, “Biological Evaluation.” Operation, closure, and post-closure activities at the Pinto Valley Mine are not expected to result in effects on species excluded from further evaluation.

Allen’s Big-eared Bat

Allen’s big-eared bat (*Idionycteris phyllotis*) is found throughout the central highlands of Mexico northward into western New Mexico and west to the Colorado River Valley in Arizona. Specimens have been taken across much of Arizona, although few documented occurrences exist from the southwestern desert region. Most Allen’s big-eared bats are found between 1,500 and 7,500 feet above mean sea level. This species is found in a variety of habitats including ponderosa pine, pinyon-juniper, white fir, and riparian woodlands as well as Mohave desertscrub. Locations where bats have been observed are often associated with boulder piles and rocky outcrops. An insectivorous species, these bats often forage over streams and pools. Caves and abandoned mineshafts serve as roost sites. Disturbance of maternity roost sites often results in abandonment, but overall population trends are not known (Arizona Game and Fish Department 2001b).

According to the Arizona Game and Fish Department’s Heritage Data Management System, no records of this species have been reported within the analysis area; however, the species is predicted to occur throughout the analysis area (Arizona Game and Fish Department 2018b, 2020). Suitable vegetation and elevations occur throughout the undeveloped portions of the analysis area, which may contain roosting sites due to its mountainous character.

Pale Townsend’s Big-eared Bat

The distribution of the pale Townsend’s big-eared bat (*Corynorhinus townsendii*) ranges from the central highlands of northern Mexico and southern California through the Edwards Plateau of Texas to southwestern Canada (Arizona Game and Fish Department 2003a). The species ranges widely within Arizona, in habitats from desertscrub to coniferous forest and elevations from 550 to 8,500 feet above mean sea level. Summer day roosts are usually in caves and mines and tend to contain higher densities than winter roosts. Winter roosts typically occur in colder caves, mines, or lava tubes from the vicinity of the Grand Canyon to the southeastern portion of the State (Arizona Game and Fish Department 2003a). This species is thought to be declining due to loss of roosting habitat in caves and mines (Arizona Game and Fish Department 2003a).

Habitat for this species is predicted to occur throughout the analysis area (Arizona Game and Fish Department 2018b). Suitable vegetation and elevations occur throughout the undeveloped portions of the analysis area, which may contain roosting sites due to its mountainous character. Records of this species have occurred in the vicinity of the analysis area. A total of four confirmed or likely pale Townsend’s big-eared bats were documented in three mine adits located along Pinto Creek and Powers

Gulch within or just west of the analysis area. These bats were observed during baseline surveys associated with the Carlota Copper Project EIS in 1992 (Cedar Creek Associates, Inc. 2006). A colony of pale Townsend's big-eared bats was observed using the Arizona Pollutant Discharge Elimination System Outfall No. 005 feature as a day roost in 2016 (WestLand Resources, Inc. 2016b).

Western Red Bat

The western red bat (*Lasiurus blossevillii*) occupies an extensive range that stretches from northern Argentina north into the western United States (Arizona Game and Fish Department 2011a). The species occurs throughout central and southeastern Arizona, with additional records along the Colorado River and Grand Canyon (Arizona Game and Fish Department 2011a). Most recorded observations have occurred between late May and September at elevations ranging from 1,900 to 7,200 feet above mean sea level (Arizona Game and Fish Department 2011a). This insectivorous species roosts primarily in tree foliage, although it has also been documented using saguaro boots (Arizona Game and Fish Department 2011a). Unlike many other Arizona bats, this species does not roost in caves and mines. Most records of western red bat within Arizona have occurred in riparian forests and other mesic areas (Hoffmeister 1986). Cottonwoods are likely a preferred roosting substrate, and decline of cottonwoods within Arizona has raised some concern that western red bats have declined in recent decades (Arizona Game and Fish Department 2011a).

This species is predicted to occur throughout much of the analysis area (Arizona Game and Fish Department 2018b). Suitable elevations are present throughout the analysis area. Suitable riparian vegetation occurs along Pinto Creek and, to a lesser extent, its tributaries. Within the Pinto Valley Mine project boundary, potential roost sites may occur along Eastwater Canyon and in the vicinity of the Arizona Pollutant Discharge Elimination System Outfall No. 005 feature. According to the Arizona Game and Fish Department's Heritage Data Management System, this species has been previously recorded in Haunted Canyon just beyond the western edge of the analysis area (Arizona Game and Fish Department 2018b).

American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) nests from Alaska and northern Canada south to the highlands of central Mexico and winters from the eastern coastal and southern United States south to Chile, although some individuals are nonmigratory. In Arizona, peregrine falcons occur in a variety of vegetation associations at elevations ranging from 400 to 9,000 feet above mean sea level. Most individuals are associated with steep cliffs near woodlands, riparian areas, and other areas having an abundance of avian prey species. Peregrine falcons also occur within heavily urbanized settings where they nest and roost upon tall buildings. Peregrine falcons are aerial foragers that feed almost exclusively on birds, although bats are also taken (Arizona Game and Fish Department 2002b). This species experienced severe population declines during the 1950s and 1960s due to DDT contamination. Recent population numbers have increased, with an increased use of marginal habitat suggesting possible saturation of optimal habitat (Arizona Game and Fish Department 2002b).

In the vicinity of the analysis area, records of this species have occurred north of Haunted Canyon and along U.S. Highway 60 (eBird 2018). Corman and Wise-Gervais (2005) reported confirmed breeding within a census block partially overlapping the analysis area. According to the Arizona Game and Fish Department's range models, this species is predicted to occur throughout the analysis area (Arizona Game and Fish Department 2018b). Suitable vegetation and elevations occur throughout the undeveloped portions of the analysis area, which may contain potential nesting sites due to its mountainous character.

Bezy's Night Lizard

Bezy's night lizard (*Xantusia bezyi*) occurs within a limited range from the Mazatzal to the Galiuro Mountains in eastern Maricopa, northern Pinal, and southern Gila Counties (Bezy 2005; Brennan and Holycross 2009). The species is a crevice dweller that occurs in rock outcroppings, cliff faces, and boulder fields within Arizona Upland Sonoran Desertscrub, Interior Chaparral, and other woodland biotic communities at elevations ranging from 2,400 to 5,800 feet above mean sea level (Bezy 2005; Brennan and Holycross 2009). Prey items include insects and spiders. Bezy's night lizards mate in the spring and produce one to three young in summer (Brennan and Holycross 2009).

The analysis area is located at the eastern and northern edges of the known distribution of this species. According to the Arizona Game and Fish Department's Heritage Data Management System, no records of this species have been reported within the analysis area; however, the species is predicted to occur throughout the analysis area (Arizona Game and Fish Department 2018b). Suitable vegetation and elevations occur throughout the undeveloped portions of the analysis area, which contains suitable rock crevices due to its mountainous character.

Lowland Leopard Frog

The lowland leopard frog (*Lithobates yavapaiensis*) is found in central and southeastern Arizona below the Mogollon Rim, southwestern New Mexico, and likely northern Sonora and northwestern Chihuahua in Mexico. Historically, this species also occupied tributaries and drainages of the Lower Colorado River from Utah to the river's mouth (Stebbins 2003). Lowland leopard frogs are aquatic habitat generalists, inhabiting natural and man-made aquatic systems from desert grasslands to pinyon-juniper woodlands. Inhabited elevations range from 800 to 5,500 feet above mean sea level, but are typically below 3,300 feet above mean sea level. Adults eat invertebrates and small vertebrate prey (Brennan and Holycross 2009). Populations within southeastern Arizona have declined in recent years. Although lowland leopard frogs are still relatively secure in central Arizona, some populations within this region have undergone declines and extirpations (Brennan and Holycross 2009). Threats to this species include impacts by introduced predators (such as bullfrogs and crayfish), chytrid fungus, habitat fragmentation and degradation, and changes in hydrologic patterns.

Multiple records of this species have occurred within and in the immediate vicinity of the analysis area at locations including Pinto Creek, West Fork Pinto Creek, Horrell Creek, Powers Gulch, and in the eastern portion of the Pinto Valley Mine project site (Cedar Creek Associates, Inc. 1994; Clark and Warnecke 1997; WestLand Resources, Inc. 2016a; Mosher 2017a, 2017b; Arizona Game and Fish Department 2018a, 2018b, 2018c).

Elevations suitable for this species occur throughout the analysis area. Elevations below 3,300 feet above mean sea level, which are most likely to be occupied by lowland leopard frogs, occur along the length of Pinto Creek and portions of its tributaries downstream from Haunted Canyon. Although segments of Miller Springs Gulch, an unnamed tributary to Pinto Creek, and Pinto Creek contain the only perennial flows within the analysis area, suitable pools are present along West Fork Pinto Creek and may occur in association with small springs and cattle tanks. Several constructed ponds and reservoirs that occur within the Pinto Valley Mine project boundary may also provide habitat for this species.

Desert Sucker

Desert suckers (*Catostomus clarkii*) inhabit the Lower Colorado River Basin downstream from the Grand Canyon, generally including the Bill Williams, Salt, Gila, and San Francisco River drainages (Arizona Game and Fish Department 2002c). The species usually occurs at elevations between 400 and 8,900 feet above mean sea level. The desert sucker persists in much of its historical habitat but has disappeared from some portions of its former range and declined in others. At night, desert suckers frequent rapids, riffles, eddies, and flowing pools of rivers and creeks. During the day, adults seek shady areas near cliff faces, boulders, or large woody debris, remaining relatively sedentary on the bottom (Minckley and Marsh 2009). Adults are mostly herbivorous and feed by scraping stones using their cartilage-sheathed jaws; juveniles feed mainly on chironomid larvae (Arizona Game and Fish Department 2002c). The alteration of historic flow regimes and the construction of reservoirs have decreased available habitat for desert suckers. For instance, dams form physical barriers that fragment fish habitat while altering stream characteristics both up- and downstream. In addition, the stocking of nonnative fishes has increased competition and introduced hybridization (Arizona Game and Fish Department 2002c).

Multiple records of this species have occurred in Pinto Creek and Haunted Canyon within and in the immediate vicinity of the analysis area (Arizona Game and Fish Department 1993, 2018a, 2018b; Tonto National Forest and Arizona Game and Fish Department 1993; Miller Ecological Consultants, Inc. 1994, 2008, 2010, 2011; Clark and McMahon 1995; Clark and Warnecke 1997). With the exception of segments of Pinto Creek, perennial or intermittent drainages suitable for this species do not occur within the Pinto Valley Mine project boundary. Although segments of Miller Springs Gulch, an unnamed tributary to Pinto Creek, and Pinto Creek contain the only perennial flows within the analysis area, intermittent portions of Pinto Creek and other watercourses may be occupied by the species.

Arizona Alum Root

The Arizona alum root (*Heuchera glomerulata*) occurs in the mountains of southeastern Arizona and southwestern New Mexico at elevations between 4,000 and 9,000 feet above mean sea level. The species is found on shaded rocky slopes in humus soil and near seeps, streams, and riparian areas within vegetation associations including oak, pinyon-juniper, ponderosa pine, and mixed conifer forests (Arizona Game and Fish Department 2004).

Although no records of Arizona alum root have occurred within the analysis area, several records have occurred east and south of the analysis area in the Pinal Mountains and 10 miles west of the analysis area in the Superstition Wilderness (Arizona Game and Fish Department 2018c; SEINet 2018). One additional specimen was collected in 1994 near Sycamore Spring in Needle Canyon 0.5 mile east of the analysis area (SEINet 2018). Areas with elevations and vegetation associations suitable for occupancy by this species mainly occur within the eastern portion of the analysis area (U.S. Geological Survey 2004; Arizona Land Resource Information System 2004). Most areas along and west of Pinto Creek occur at elevations below 4,000 feet above mean sea level so are unlikely to be occupied by this species.

Mogollon Fleabane

Mogollon fleabane (*Erigeron anchana*) occurs in the mountains of central Arizona; it is locally abundant in the Sierra Ancha, which is located at the center of the species' range. The species occurs primarily in chaparral, pinyon-juniper, and pine-oak forests at elevations from 3,500 to 7,000 feet above mean sea level. Mogollon fleabane inhabits granitic rock crevices or ledges on boulders and cliff faces, usually in canyons (Arizona Game and Fish Department 2003b).

Although most records have occurred in the Sierra Ancha north of the analysis area, three populations of Mogollon fleabane were documented along West Fork Pinto Creek approximately 1 to 3 miles west of the analysis area between 1985 and 2000 (Arizona Game and Fish Department 2018b). Excluding lower elevation areas along the major drainages, undeveloped areas with a combination of suitable elevations, vegetation communities (Arizona Land Resource Information System 2004), and granitic substrates

(Ludington et al. 2005) within the analysis area primarily occur north of Tailings Storage Facility No. 4 and surrounding and south of the Open Pit.

3.3.3.3.4 Management Indicator Species

Species selected for this management indicator species assessment consist of the 29 species included on the 2016 Tonto National Forest management indicator species list. Each Tonto National Forest management indicator species is listed in table 3-21 along with its associated vegetation types, the condition the species indicates, population trends, and habitat trends. Several listed avian species show declining population trends on the Tonto National Forest, which is consistent with recent declines in North American avifauna documented in scientific studies (Rosenberg et al. 2019). Detailed descriptions of each species' life history, habitat requirements, and 1985–2005 population and habitat trends can be found in the 2005 Management Indicator Species Report (Klein et al. 2005). For this analysis, effects on associated vegetation types were used as a proxy for effects on management indicator species.

The acreage of each vegetation type associated with each management indicator species within the analysis area was calculated using geospatial data depicting all but the aquatic vegetation type (Tonto National Forest 2007). These data were prepared by the Tonto National Forest and depict vegetation types used in the 2005 Management Indicator Species Report. To monitor aquatic ecosystem health, the Tonto National Forest has established aquatic macro-invertebrate sampling stations in 12 streams on the forest; one of these, Pinto Creek, occurs within the analysis area (Klein et al. 2005). Population trends for aquatic habitat are determined using a combination of a diversity index, standing crop, and a biotic condition index. Aquatic habitat considered in this analysis consists of perennial streams within the analysis area (see appendix E, "Water Resources and Geochemistry Technical Report").[37]

Seven vegetation types associated with 21 of the 29 management indicator species are present within the analysis area: pinyon-juniper chaparral, pinyon-juniper grassland, interior chaparral, desert communities, cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic. Three vegetation types—Ponderosa pine - mild, mixed conifer with aspen, and Colorado Plateau grassland—do not occur within the analysis area. Therefore, eight management indicator species associated with these vegetation types would not be affected by the any of the alternatives and were not carried forward for further analysis.

Table 3-21. Tonto National Forest management indicator species

Species	Vegetation Type	Indicator Of	Tonto National Forest Vegetation Type Trend	Tonto National Forest Population Trend	Acres of Vegetation Type in Analysis Area (Sum Total)
Elk *Cervus elaphus*	ponderosa pine – mild, mixed conifer with aspen	General forest conditions	Static	Stable	0
Turkey *Meleagris gallopavo*	ponderosa pine – mild, mixed conifer with aspen	Vertical diversity – forest mix	Static	Stable	0
Pygmy nuthatch *Sitta pygmaea*	ponderosa pine – mild	Old growth pine	Static	Decreased	0

[37] Acreages of vegetation types and lengths of perennial streams subject to groundwater drawdown include areas that will also be affected by existing disturbances such as ongoing groundwater pumping and future infiltration into the existing Open Pit. However, the magnitude of drawdown in these areas may differ from that which would occur due to existing disturbance. See appendix E for details.

Species	Vegetation Type	Indicator Of	Tonto National Forest Vegetation Type Trend	Tonto National Forest Population Trend	Acres of Vegetation Type in Analysis Area (Sum Total)
Violet-green swallow *Tachycineta thalassina*	ponderosa pine – mild, mixed conifer with aspen	Cavity-nesting habitat	Static	Decreased	0
Western bluebird *Sialia mexicana*	ponderosa pine – mild, mixed conifer with aspen	Forest openings	Static	Stable	0
Hairy woodpecker *Picoides villosus*	ponderosa pine – mild, mixed conifer with aspen	Snags	Static	Stable	0
Northern goshawk *Accipiter gentilis*	ponderosa pine – mild, mixed conifer with aspen	Vertical diversity	Static	Decreased	0
Abert's squirrel *Sciurus aberti*	ponderosa pine – mild, mixed conifer with aspen	Successional stages of pine	Static	Decreased	0
Ash-throated flycatcher *Myiarchus tyrannulus*	pinyon-juniper chaparral, pinyon-juniper grassland	Ground cover	Static	Stable	13,178.4, 114.9 (13,293.2)
Gray vireo *Vireo vicinior*	pinyon-juniper chaparral, pinyon-juniper grassland	Tree density	Static	Decreased	13,178.4, 114.9 (13,293.2)
Townsend's solitaire *Myadestes townsendi*	pinyon-juniper chaparral, pinyon-juniper grassland	Juniper berry production	Static	Stable	13,178.4, 114.9 (13,293.2)
Juniper titmouse *Baeolophus ridgwayi*	pinyon-juniper chaparral, pinyon-juniper grassland	General woodland conditions	Static	Decreased	13,178.4, 114.9 (13,293.2)
Northern flicker *Colaptes auratus*	pinyon-juniper chaparral, pinyon-juniper grassland	Snags	Static	Stable	13,178.4, 114.9 (13,293.2)
Spotted towhee *Pipilo maculatus*	pinyon-juniper chaparral, pinyon-juniper grassland, interior chaparral	Successional stages of pinyon-juniper, shrub density	Static	Stable	13,178.4, 114.9, 771.3 (14,064.6)
Black-chinned sparrow *Spizella atrogularis*	interior chaparral	Shrub diversity	Static	Stable	771.3
Savannah sparrow Passerculus *sandwichensis*	Colorado Plateau grassland, pinyon-juniper grassland	Grass species diversity	Upward and static	Stable	0, 114.9 (114.9)
Horned lark *Eremophila alpestris*	Colorado Plateau grassland, pinyon-juniper grassland	Vegetation aspect	Upward and static	Decreased	0, 114.9 (114.9)
Black-throated sparrow *Amphispiza bilineata*	desert communities	Shrub diversity	Downward and static	Stable	79.9
Canyon towhee *Melozone fusca*	desert communities	Ground cover	Downward and static	Decreased	79.9
Bald eagle *Haliaeetus leucocephalus*	cottonwood willow riparian forest	General riparian	No change	Stable	182.2

Species	Vegetation Type	Indicator Of	Tonto National Forest Vegetation Type Trend	Tonto National Forest Population Trend	Acres of Vegetation Type in Analysis Area (Sum Total)
Bell's vireo *Vireo bellii*	cottonwood willow riparian forest	Well-developed understory	No change	Decreased	182.2
Summer tanager *Piranga rubra*	cottonwood willow riparian forest	Tall, mature trees	No change	Decreased	182.2
Hooded oriole *Icterus cucullatus*	cottonwood willow riparian forest	Medium-sized trees	No change	Stable	182.2
Hairy woodpecker *Picoides villosus*	mixed broadleaf deciduous riparian forest	Snags, cavities	No change	Stable	126.3
Arizona gray squirrel *Sciurus arizonensis*	mixed broadleaf deciduous riparian forest	General riparian	No change	Stable	126.3
Warbling vireo *Vireo gilvus*	mixed broadleaf deciduous riparian forest	Tall overstory	No change	Stable	126.3
Western wood pewee *Contopus sordidulus*	mixed broadleaf deciduous riparian forest	Medium overstory	No change	Decreased	170.0
Common black hawk *Buteogallus anthracinus*	mixed broadleaf deciduous riparian forest	Riparian streamside	No change	Decreased	170.0
Macro-invertebrates	aquatic	Water quality	All 12 sampled streams for which long-term trends were available showed impairment.	Stable	5.86 miles

Source: Klein et al. 2005; Tonto National Forest 2007; 2016 Tonto National Forest Management Indicator Species List; appendix C ,"Biological Evaluation"

3.3.3.3.5 Migratory Birds

The analysis area does not contain any areas with special bird-related designations such as Important Bird Areas or important overwintering areas (Arizona Important Bird Areas Program 2018). As detailed in appendix C, "Biological Evaluation," the Tonto National Forest has identified 40 migratory bird species of concern on its 2016 list to be addressed in National Environmental Policy Act analyses; species were grouped by vegetation types present on the Tonto National Forest. Impacts on these species of concern are considered to represent impacts on migratory birds as a whole. For this analysis, effects on associated vegetation types were used as a proxy for effects on individual species. The acreage of each vegetation type was determined for the analysis area using geospatial data compiled by the Forest Service (Tonto National Forest 2007; table 3-22).

Appendix C, "Biological Evaluation," includes a table of bird species protected under the Migratory Bird Treaty Act and recorded at eBird hotspots within the analysis area (Pinto Creek – Iron Bridge Crossing Hotspot; eBird 2020a), partially within the analysis area (National Forest System Road 287A Hotspot; eBird 2020b), and within 0.25 mile of the analysis area (Haunted Canyon Hotspot; eBird 2020c). These species are also separated by the vegetation types found at the separate hotspot locations; impacts on these species will be similar to others listed under the same vegetation types. Two species, western grebe (*Aechmophorus occidentalis*) and American coot (*Fulica americana*), listed on one checklist at the

Haunted Canyon eBird Hotspot, were likely observed nearby but recorded at the hotspot location as there is no large open water habitat at this location. Further details regarding these observations could not be obtained.

Vegetation types presented on the 2016 Tonto National Forest migratory bird species of concern list do not conform exactly to the vegetation categories included in the Forest Service's potential natural vegetation geospatial data (Tonto National Forest 2007). One vegetation type, Sonoran Riparian Scrubland (dry wash), has no applicable category in these geospatial data. As a result, the amount of each vegetation type present within the analysis area (with the exception of Sonoran Riparian Scrubland) was considered to be the maximum combined acreage of applicable vegetation categories shown in the Forest Service's potential natural vegetation geospatial data. An applicable category for the Sonoran Riparian Scrubland (dry wash) vegetation type from the U.S. Geological Survey's Gap Analysis geospatial data (U.S. Geological Survey 2004) was used for the purposes of this analysis. Five vegetation types, as identified by equivalent geospatial data vegetation categories, do not occur within the analysis area. None of the migratory bird species of concern associated with only these vegetation types, with the exception of red-naped sapsucker (*Sphyrapicus nuchalis*), has been otherwise observed in the analysis area. Red-naped sapsucker was observed wintering in habitat differing from its typical breeding habitat. As a result, these species are not anticipated to be affected by the alternatives and are not carried forward for further analysis.

Table 3-22. Tonto National Forest migratory birds of concern and associated breeding season vegetation types

Vegetation Type (Geospatial Data Vegetation Category) Species		Acres of Vegetation Type in Analysis Area
Ponderosa Pine Forest: primarily pure ponderosa pine forest (Ponderosa Pine – Mild)		
Flammulated owl (*Psiloscops flammeolus*)[38] Grace's warbler (*Setophaga graciae*) Lewis's woodpecker (*Melanerpes lewis*)	Northern goshawk (*Accipiter gentilis*) Olive-sided flycatcher (*Contopus cooperi*) Olive warbler (*Peucedramus taeniatus*)	0
Ponderosa-Gambel's Oak Forest (Madrean Pine Oak Woodland[39])		
Band-tailed pigeon (*Patagioenas fasciata*) Flammulated owl Grace's warbler Lewis's woodpecker	Mexican spotted owl (*Strix occidentalis lucida*) Northern goshawk Olive warbler	0
Mixed Conifer Forest: Douglas fir, white fir, ponderosa pine, often some aspen and Gambel's oak (Mixed Conifer with Aspen)		
Cordilleran flycatcher (*Empidonax occidentalis*) Band-tailed pigeon Flammulated owl Golden-crowned kinglet (*Regulus satrapa*) Mexican spotted owl	Northern goshawk Olive-sided flycatcher Red-faced warbler (*Cardellina rubrifrons*) Red-naped sapsucker	0
Pinyon Pine – Juniper Woodland (Pinyon-Juniper Grassland, Pinyon-Juniper Chaparral)		
Black-throated gray warbler (*S. nigrescens*) Gray flycatcher (*Empidonax wrightii*) Gray vireo (*Vireo vicinior*) Golden eagle (*Aquila chrysaetos*)	Juniper titmouse (*Baeolophus ridgwayi*) Peregrine falcon (*Falco peregrinus*) Pinyon jay (*Gymnorhinus cyanocephalus*)	13,293.2

[38] Multiple species occur in more than one vegetation type.
[39] The Madrean Pine Oak Woodland vegetation type identified by the geospatial data used for this analysis (Tonto National Forest 2007) is not synonymous with the Madrean Evergreen Woodland biotic community (Brown 1994) discussed in other sections of the biological resources analysis.

Vegetation Type (Geospatial Data Vegetation Category) Species		Acres of Vegetation Type in Analysis Area
Madrean Evergreen Woodland: Madrean evergreen oaks, juniper, and pinyon pine (Madrean Encinal Woodland)		
Black-throated gray warbler	Golden eagle	0
Interior Chaparral: shrub live oak, manzanita, mountain-mahogany, and cliffrose (Interior Chaparral[40])		
Black-chinned sparrow (*Spizella atrogularis*)		771.3
Semiarid Grassland often with scattered sotol, agaves, burroweed, snakeweed, yucca, and mesquite (Semi-Desert Grassland)		
Golden eagle	Swainson's hawk (*Buteo swainsoni*)	6,611.3
Arizona Upland Sonoran Desertscrub: paloverde, ironwood, mesquite, catclaw, acacia, saguaro, cholla, barrel cactus, prickly pear, creosote bush, jojoba, and crucifixion thorn (Desert Communities)		
Bendire's thrasher (*Toxostoma bendirei*) Canyon towhee (*Melozone fusca*) Costa's hummingbird (*Calypte costae*) Elf owl (*Micrathene whitneyi*) Gila woodpecker (*Melanerpes uropygialis*) Gilded flicker (*Colaptes chrysoides*)	Golden eagle Phainopepla (*Phainopepla nitens*) Prairie falcon (*Falco mexicanus*) Peregrine falcon Purple martin (*Progne subis*)	79.9
Montane Riparian Wetlands: cottonwood, maple, box elder, alder, willow, some Gambel's oak, ponderosa pine, Douglas fir, white fir, and aspen (Montane Willow Riparian Forest)		
Cordilleran flycatcher MacGillivray's warbler (*Geothlypis tolmiei*)	Red-faced warbler Red-naped sapsucker	0
Marshlands, Cienegas, Ponds, and Lake Edges: bulrush, sedges, pondweeds, cattail, duckweed, and saltgrass		
Yuma Ridgway's (clapper) rail (*Rallus longirostris yumanensis*)		Not applicable[41]
Interior Riparian Deciduous Forests and Woodlands: sycamore, cottonwood, willow, ash, walnut, bigtooth maple, hackberry, cypress, juniper, and oak (Mixed Broadleaf Deciduous Riparian Forest)		
Common black-hawk (*Buteogallus anthracinus*) Northern beardless-tyrannulet (*Camptostoma imberbe*)	Yellow warbler (*Setophaga petechia*)	126.3
Sonoran Riparian Deciduous Forest and Woodlands: primarily cottonwood, willow, mesquite, tamarisk (salt cedar), some ash, walnut, and hackberry (Cottonwood Willow Riparian Forest)		
Bald eagle (*Haliaeetus leucocephalus*) Bell's vireo (*Vireo bellii*) Common black hawk Northern beardless-tyrannulet	Southwestern willow flycatcher (*Empidonax traillii extimus*) Western yellow-billed cuckoo (*Coccyzus americanus*) Yellow warbler	182.2
Sonoran Riparian Scrubland (dry wash): mesquite, paloverde, ironwood, burrobush, desert broom, quailbush, and desert willow (North American Warm Desert Riparian Mesquite Bosque)		
Bell's vireo Costa's hummingbird	Lucy's warbler (*Oreothlypis luciae*) Phainopepla	27.4

3.3.3.3.6 Species of Greatest Conservation Need and Species of Economic and Recreational Importance

The Arizona Game and Fish Department has identified two categories of species used to inform management of wildlife at the State level, Species of Greatest Conservation Need and Species of Economic and Recreational Importance (Arizona Game and Fish Department 2012). The list of Species of Greatest Conservation Need consists of wildlife species under Arizona Game and Fish Department's

[40] The Interior Chaparral vegetation type identified by the geospatial data used for this analysis (Tonto National Forest 2007) is not synonymous with the Interior Chaparral biotic community (Brown 1994) discussed in other sections of the biological resources analysis.
[41] This species does not occur in the vicinity of the analysis area.

regulatory authority that the Arizona Game and Fish Department has determined to be vulnerable. Arizona's Species of Greatest Conservation Need are further grouped into three tiers. Tier 1A contains species protected by Arizona Game and Fish Department agreements and obligations, or that warrant a closed season. Tier 1B represents the remainder of the vulnerable species. Tier 1C contains species for which insufficient information is available to assess vulnerability. The list of Species of Economic and Recreational Importance is composed of game species whose distribution influences statewide wildlife-related recreation and consumer spending.

To identify Species of Greatest Conservation Need and Species of Economic and Recreational Importance with the potential to occur in vicinity of the analysis area, the Arizona Game and Fish Department's Online Environmental Review Tool was accessed on August 26, 2020 (Arizona Game and Fish Department 2020). The Online Environmental Review Tool identified all Species of Greatest Conservation Need that have been recorded within 5 miles of the analysis area and all Species of Economic and Recreational Importance predicted to occur within 5 miles of the analysis area. Eight additional Species of Greatest Conservation Need and Species of Economic and Recreational Importance not returned by the Online Environmental Review Tool are known to occur in the analysis area. Species of Greatest Conservation Need and Species of Economic and Recreational Importance with the potential to occur in the analysis area are listed in table 3-23. Of the 30 Species of Greatest Conservation Need and Species of Economic and Recreational Importance with the potential to occur in the vicinity of the analysis area, 15 are addressed in previous sections of this report. Effects on biotic community as defined by Brown (1994) are used as a proxy for effects on terrestrial species not addressed elsewhere. Effects on aquatic and riparian resources are used as a proxy for associated species. The locations where each Species of Greatest Conservation Need and Species of Economic and Recreational Importance are discussed are provided in table 3-23.

Table 3-23. Species of Greatest Conservation Need and Species of Economic and Recreational Importance with the potential to occur in the analysis area

Species	State Status	Locations Addressed in this Final EIS
American black bear (*Ursus americanus*)	SERI	Interior Chaparral and Madrean Evergreen Woodland biotic communities (Arizona Game and Fish Department 2009)
American peregrine falcon (*Falco peregrinus anatum*)	SGCN 1A	Forest Service Sensitive Species, Migratory Birds (focal species)
Arizona toad (*Anaxyrus microscaphus*)	SGCN 1B	Aquatic and Riparian Resources
Band-tailed pigeon (*Patagioenas fasciata*)	SERI, SGCN 1C	Migratory Birds (focal species)
Bezy's night lizard (*Xantusia bezyi*)	SGCN 1B	Forest Service Sensitive Species
Black-tailed jackrabbit (*Lepus californicus*)	SERI	Interior Chaparral, Arizona Upland subdivision of the Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986)
Coyote (*Canis latrans*)	SERI	Interior Chaparral, Arizona Upland subdivision of the Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986)
Desert cottontail (*Sylvilagus audubonii*)	SERI	Interior Chaparral, Arizona Upland subdivision of the Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986)
Desert sucker (*Catostomus clarkii*)	SGCN 1B	Forest Service Sensitive Species
Gambel's quail (*Callipepla gambelii*)	SERI	Arizona Upland subdivision of Sonoran Desertscrub biotic community (Corman and Wise-Gervais 2005). The Tonto National Forest manages desertscrub vegetation for Gambel's quail production (Forest Service 1985). This species has been recorded within the analysis area (Sferra 2004).

Species	State Status	Locations Addressed in this Final EIS
Gila longfin dace (*Agosia chrysogaster chrysogaster*)	SGCN 1B	Aquatic and Riparian Resources, Fish and Aquatic Macroinvertebrates (Arizona Game and Fish Department 2013)
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)	SGCN 1A	Threatened and Endangered Species
Golden eagle (*Aquila chrysaetos*)	SGCN 1B	**Bald and Golden Eagle Protection Act**, Migratory Birds (focal species)
Javelina (*Pecari tajacu*)	SERI	Interior Chaparral and Arizona Upland subdivision of Sonoran Desertscrub biotic communities (Arizona Game and Fish Department 2009). The Tonto National Forest manages desertscrub vegetation for javelina production (Forest Service 1985).
Lowland leopard frog (*Lithobates [Rana] yavapaiensis*)	SGCN 1A	Forest Service Sensitive Species
Mexican spotted owl (*Strix occidentalis lucida*)	SGCN 1A	Appendix C, "Biological Evaluation," Migratory Birds (focal species)
Mountain lion (*Puma concolor*)	SERI	Interior Chaparral, Arizona Upland subdivision of Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986)
Mourning dove (*Zenaida macroura*)	SERI	Interior Chaparral, Arizona Upland subdivision of Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Corman and Wise-Gervais 2005). This species has been recorded within the analysis area (Sferra 2004; WestLand Resources, Inc. 2016a; Prager and Wise 2017).
Mule deer (*Odocoileus hemionus*)	SERI	Interior Chaparral, Arizona Upland subdivision of Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986). The Tonto National Forest manages desertscrub vegetation for mule deer production (Forest Service 1985).
Ocelot (*Leopardus pardalis*)	SGCN 1A	Threatened and Endangered Species
Southwestern willow flycatcher (*Empidonax traillii extimus*)	SGCN 1A	Threatened and Endangered Species, Migratory Birds (focal species)
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	SGCN 1B	Forest Service Sensitive Species
Pocketed free-tailed bat (*Nyctinomops femorosaccus*)	SGCN 1B	Arizona Upland subdivision of Sonoran Desertscrub biotic community (Arizona Game and Fish Department 2011b)
Rocky mountain bighorn sheep (*Ovis canadensis canadensis*)	SERI, SGCN 1B	Interior Chaparral and Arizona Upland subdivision of Sonoran Desertscrub biotic communities (Arizona Game and Fish Department 2019)
Western red bat (*Lasiurus blossevillii*)	SGCN 1B	Forest Service Sensitive Species
Western yellow-billed cuckoo (*Coccyzus americanus*)	SGCN 1A	Threatened and Endangered Species, Migratory Birds (focal species)
White-tailed deer (*Odocoileus virginianus*)	SERI, SGCN 1B	Interior Chaparral, Arizona Upland subdivision of Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Hoffmeister 1986). The Tonto National Forest manages interior chaparral vegetation for white-tailed deer production (Forest Service 1985).
White-winged dove (*Zenaida asiatica*)	SERI	Arizona Upland subdivision of Sonoran Desertscrub biotic community (Corman and Wise-Gervais 2005). This species has been recorded within the analysis area (Sferra 2004; Prager and Wise 2017).
Yuma myotis (*Myotis yumanensis*)	SGCN 1B	Interior Chaparral, Arizona Upland subdivision of Sonoran Desertscrub, and Madrean Evergreen Woodland biotic communities (Arizona Game and Fish Department 2011c).

SGCN = Species of Greatest Conservation Need; SERI = Species of Economic and Recreational Importance

3.3.4 Environmental Consequences

3.3.4.1 Analysis Methodology and Assumptions

Direct impacts on vegetation were estimated by overlaying the footprints of proposed new disturbance areas with geospatial data characterizing existing vegetation communities, using recent aerial imagery to confirm the presence of vegetation. Potential indirect effects on vegetation from colonization and spread of invasive species and changes in water availability were described qualitatively.

The vegetation analysis incorporates the following assumptions:

- Vegetation data used for the analysis appropriately represent the types and condition of vegetation in the analysis area. Size and extent of existing vegetation communities used for baseline analysis are based on best available geospatial information, Terrestrial Ecological Unit Inventory data (Forest Service 2019b), Brown's description of biotic communities (Brown 1994), and other relevant sources.
- Periods of drought, including seasonal periods of drought, would place additional stress on vegetation communities.
- Disturbed soils would be more susceptible to invasive and noxious weed establishment.
- Reclamation and revegetation of inactive facilities on private land at Pinto Valley Mine will occur in accordance with the active Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) and the Aquifer Protection Permit Closure and Post Closure Strategy (SRK Consulting, Inc. 2019a). Reclamation and revegetation for facilities and disturbance on National Forest System lands would be conducted in accordance with the reclamation plan for National Forest System lands.
- Disturbed areas may take decades to fully revegetate after disturbance due to relatively arid conditions and altered soil properties (pH, chemistry, organics, and structure) in the Pinto Valley Mine project boundary.

Effects of the proposed action and alternatives on fish and wildlife and special status species that occur or have the potential to occur within the analysis area are assessed using the resource indicators and measures presented in table 3-14. Impacts on wildlife and special status species are analyzed for the three major phases of the project, including mine operation and construction, closure and reclamation, and post-closure.

The best available science was used to inform the analysis of impacts presented in this section. Information sources include:

- Peer-reviewed and other published literature including, but not limited to, field guides.
- U.S. Fish and Wildlife Service Endangered Species Act listing documents and recovery plans.
- Forest Service, Arizona Game and Fish Department, and other agency reports.
- Geospatial data depicting resource locations. Multiple geospatial datasets depicting vegetation communities were used in this analysis. The various datasets were created with differing goals and thus one dataset may be more applicable to the analysis of a given resource than another. As a result, vegetation communities discussed in the various sections of this analysis are not necessarily mutually exclusive.
- Species occurrence records and critical habitats obtained through the U.S. Fish and Wildlife Service' Information for Planning and Consultation System.

- Species occurrence records, critical habitats, and predicted range models obtained from geospatial data depicting spatial information stored in the Arizona Game and Fish Department's Heritage Data Management System (Arizona Game and Fish Department 2018b, 2018c) or through a query of the Arizona Game and Fish Department's Heritage Data Management System using the Arizona Game and Fish Department's Online Environmental Review Tool (Arizona Game and Fish Department 2020). The Online Environmental Review Tool uses information stored in the Heritage Data Management System to return a list of special status species with occurrence records, with critical habitats, or whose predicted range occurs within 5 miles of a user-defined area.
- Avian species occurrence data available through eBird (Sullivan et al. 2009).
- Plant species occurrence data available through SEINet (2017 and 2018).
- Species abstracts prepared by the Arizona Game and Fish Department.
- Habitat and survey information conducted in preparation for the Pinto Valley Mine EIS including other pertinent resource assessments.
- Habitat characterizations and wildlife surveys conducted in support of the Carlota Copper Project EIS including monitoring reports.

The analysis of impacts on fish and wildlife and special status species incorporates the following assumptions:

- Because comprehensive survey data are not available for many species or species groups within the analysis area, known geographic distribution, presence of suitable habitat, and occurrence near the analysis area are used as proxies for species occurrence. In some circumstances, wildlife and habitat outside of the analysis area provide additional context for biological resources analyses.
- Habitat requirements and geographic distribution of special status species were determined using the best available science, which is assumed to be accurate.
- Potential effects of various types of disturbance on analyzed resources as described by the best available science are accurate.
- Source information regarding vegetation, geology, soils, and hydrology, etc. accurately reflects the true conditions within the analysis area.
- The analysis area contains the full extent of potential effects on fish and wildlife and special status species that would occur under the proposed action and alternatives.

3.3.4.2 <u>Direct and Indirect Impacts on Vegetation</u>

3.3.4.2.1 No-action Alternative

Upland Vegetation Communities

Expansion of mining facilities onto an additional 367 acres of private lands owned by Pinto Valley Mining Corp. under the no-action alternative would result in clearing or burial of existing upland vegetation communities within the interior chaparral biotic community. The primary direct impact on vegetation communities would be vegetation removal from excavation of 357 acres of borrow and riprap sources on private land for use as cover material during reclamation and 10 acres from peripheral expansion of Tailings Storage Facility No. 4.

After interim or final grading and application of clean fill or growth medium where needed, mining facilities on private lands would be reclaimed in accordance with the active Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) and the Aquifer Protection Permit Closure and Post Closure Strategy (SRK Consulting, Inc. 2019a) and facilities on National Forest System lands would be reclaimed in accordance with the reclamation plan for National Forest System lands. For mine facilities that would remain active during the no-action alternative, final grading and subsequent reclamation activities are anticipated to begin approximately 6 months after issuance of the record of decision. The Open Pit would not be reclaimed or revegetated.

A review of the Pinto Valley Mine seed mix by GeoSystems Analysis, Inc. resulted in several changes to plant species and application rates (GeoSystems Analysis, Inc. 2015). Overall, GeoSystems Analysis, Inc. concluded that the seed mix, as modified by the Tonto National Forest, included an appropriate mix of native plant species capable of achieving moderate vegetation cover within 5 years after reclamation seeding. Compared to undisturbed vegetation communities, reclaimed areas would likely have a higher percentage of grass species and a lower percentage of forbs and shrubs for several decades from use of the currently approved seed mix.

Riparian and Wetland Vegetation Communities

No direct impacts on riparian or wetland vegetation communities are anticipated from the no-action alternative. Indirect impacts on riparian and wetland communities along perennial stream reaches are discussed in the following section.

Plant Health

Continued pumping from the Peak Well field under the no-action alternative is predicted to reduce groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 97 gallons per minute at the end of mining in 2021 (a 91-percent reduction from 2013). The predicted drawdown area[42] encompasses 5.49 miles of perennial streams, including portions of Pinto Creek (4.43 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, and may be a contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat. However, drawdown effects resulting from continued groundwater pumping during the 2 months of active mining operations after issuance of the record of decision would be minimal relative to the total drawdown that has occurred since 2013. Following the 2 months of active mining operations, sufficient water would likely be available from dewatering the Open Pit. Refer to appendix E, "Water Resources and Geochemistry Technical Report," and section 3.21, "Water Resources and Hydrogeochemistry," for additional information on modeled drawdown.

Drawdown would primarily affect the Sycamore - Fremont Cottonwood riparian system, although adverse effects from reduced stream flow could also occur in the Fremont Cottonwood/Shrub riparian system farther downstream. The simulated groundwater model predicts that baseflows would recover rapidly after pumping ceases and groundwater discharge to Pinto Creek would increase to approximately 1,057 gallons per minute in 2030 due to cessation of groundwater pumping and seepage

[42]This final EIS identifies and evaluates potential impacts on streams, springs, and seeps located within the maximum extent of the projected 5-foot groundwater drawdown contour. The 5-foot drawdown contour defines the area where the water table would be lowered by 5 feet or more at some point in time during the mining or post-mining period. Changes in groundwater levels of fewer than 5 feet often are difficult to distinguish from natural seasonal and annual fluctuations in groundwater levels. For discussion purposes, the area contained within the maximum extent of the 5-foot drawdown contour is referred to in the remainder of the analysis for surface water resources as the "drawdown area."

from Tailings Storage Facility No. 4. Groundwater baseflow to Pinto Creek is then predicted to gradually decrease to approximately 400 gallons per minute by 2225, approximately 100 gallons per minute lower than pre-mining conditions due to inflow to the Open Pit. Growth and decline of riparian vegetation in response to fluctuation in baseflow would occur over time and could change the composition of riparian vegetation. If loss of tree species such as Freemont cottonwood, Arizona sycamore, Gooding willow, and velvet ash occur, it could take several decades or more for these species to reestablish and reach maturity.

As indicated in the groundwater modeling conducted for the Pinto Valley Mine (SRK Consulting, Inc. 2019b, 2020a) and as described in appendix E, "Water Resources and Geochemistry Technical Report," the Leach Piles are predicted to drain low pH, high total dissolved solids, and metal-laden water for hundreds of years beyond the planned closure of the facility. Most of this draindown would be captured in a Pregnant Leach Solution Pond and pumped to the Open Pit lake, but a small percentage (less than 5 percent of the total draindown) is estimated to infiltrate into the granitic bedrock aquifer immediately underlying the footprint of the Leach Piles. The majority of this infiltration to groundwater (56 percent of the 5-percent draindown) would report to the Open Pit via fractures in the exposed pit wall. A lesser percentage (44 percent of the 5-percent total draindown) is expected to flow slowly over hundreds of years toward Pinto Creek in the bedrock aquifer. The flow path includes granitic and calcareous Apache Leap Tuff (dacite). Based on acid-based accounting and test work in and around the Pinto Valley Mine, Apache Leap Tuff is an inert, acid-neutralizing formation that has the potential to neutralize acidic seepage (SRK Consulting, Inc. 2021b). While Apache Leap Tuff possesses acid-neutralizing characteristics, it is generally a hard material in which water flow is typically confined to fractures. Should the seepage reach Pinto Creek at a shallow level accessed by plant root zones, the riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine may be negatively affected by accumulation of heavy metals in the soils, uptake by vegetation, and bioaccumulation in food chains.

The potential for adverse effects on plant health from deposition of dust generated by mining activities and road use is not well understood and varies based on a range of factors specific to each deposition site. Recent research conducted under conditions most similar to Pinto Valley Mine, in which inert dust accumulated on plants in a semiarid environment, failed to find evidence of adverse impacts of dust accumulation on plant health, survivorship, or composition within 150 meters of dust-generating sources (Matsuki et al. 2016). However, the currently available data and literature are insufficient to conclusively determine whether dust generated at Pinto Valley Mine would result in reduced photosynthesis, altered transpiration, reduced stomatal conductance, and alteration of soil chemistry for plant species surrounding the mine site under the no-action alternative. The Forest Service has not observed dust accumulation on vegetation on National Forest System lands surrounding Pinto Valley Mine to date and no notable changes are anticipated in the conditions and activities that contribute to dust generation.

Invasive Plants

Invasive plants are most likely to colonize and spread in disturbed areas and along roads due to removal of native vegetation, ongoing disturbances from maintenance of road corridors, and the potential for vehicles and equipment to act as dispersal vectors for invasive plants and seed sources. Expansion of mining facilities onto an additional 367 acres of previously undisturbed private lands owned by Pinto Valley Mining Corp. under the no-action alternative would increase potential for spread and establishment of invasive plants. Once established, invasive plants can spread through various mechanisms, including dispersal by wind. Potential for invasive plant spread would be reduced through application of a noxious weed control plan developed for Pinto Valley Mine that establishes general practices and procedures for invasive plant prevention, detection, control, and restoration and rehabilitation for National Forest System lands affected by mining activities (Capstone Mining Corp. 2020b). Invasive plant management practices established by the plan include the use of certified weed-free seed and hay,[43] use of a native seed mix or plantings approved by the Tonto National Forest, and development of a plan of action and best management practices for any plants classified as invasive by the Tonto National Forest prior to surface disturbance in a new location. After applying mechanical or chemical treatment methods in coordination with the Tonto National Forest, Pinto Valley Mining Corp. will monitor treated areas at least annually to determine if treatments were successful.

No new roads or utility corridors would be constructed outside of existing disturbance areas under the no-action alternative.

There is no anticipated surface disturbance within the Pinto Creek riparian corridor that would create conditions favorable to the spread and establishment of invasive plant species.

3.3.4.2.2 Alternative 1 – Authorization of Existing Uses of National Forest System Lands

Upland Vegetation Communities

Expansion of mining facilities onto an additional 909 acres of private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in clearing or burial of existing upland vegetation communities within the interior chaparral biotic community. The primary direct impact on undisturbed vegetation communities would result from construction of the West Dump and Castle Dome Marginal Dump and peripheral expansion of Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, the Inert Limestone Stockpile, and the Main Dump. This would result in approximately 542 total acres of disturbance more than the no-action alternative.

After interim or final grading and application of clean fill or growth medium where needed, mining facilities on private lands would be reclaimed in accordance with the active Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) and the Aquifer Protection Permit Closure and Post Closure Strategy (SRK Consulting, Inc. 2019a) and facilities on National Forest System lands would be reclaimed in accordance with the reclamation plan for National Forest System lands. For mine facilities used or ongoing operations under alternative 1, final grading and subsequent reclamation activities would be the same as under the no-action alternative but would occur approximately 7 years later than under the no-action alternative. Areas subject to interim reclamation prior to mine closure may include inactive tailings impoundments, waste rock dumps, and other disturbed areas no longer needed to support ongoing operations. The Open Pit would not be reclaimed or revegetated.

The same reclamation seed mix that would be approved by the Tonto National Forest would be used as described for the no-action alternative.

Riparian and Wetland Vegetation Communities

Riparian mapping by Triepke et al. (2014) shows 11 acres of Sycamore - Fremont Cottonwood riparian area in Gold Gulch on private lands owned by Pinto Valley Mining Corp. that would be cleared or buried during construction of the West Dump. Alterations to the existing surface water drainage, elevation contours, and soils in the segment of Gold Gulch that would be developed as the West Dump would likely result in permanent loss of the existing riparian vegetation. No other direct impacts on riparian vegetation are anticipated from alternative 1. This disturbance of riparian vegetation would not occur

[43] As validated by Tonto National Forest seed testing requirements (Forest Service Manual 2081.2, Prevention and Control Measures, Tonto National Forest Supplement 2000-2009-1).

under the no-action alternative. Indirect impacts on riparian and wetland communities along perennial stream reaches are discussed in the following section.

Plant Health

Continued pumping from the Peak Well field under alternative 1 is predicted to result in a reduction in groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 73 gallons per minute at the end of mining in 2026 (a 93-percent reduction from 2013 versus 91 percent under the no-action alternative). The predicted drawdown area encompasses 5.68 miles of perennial streams, including portions of Pinto Creek (4.62 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a slightly greater reduction in baseflow in Pinto Creek than the no-action alternative that would persist for approximately 7 more years. As a result, alternative 1 could be a greater contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat than the no-action alternative. Refer to appendix E, “Water Resources and Geochemistry Technical Report,” and section 3.21, “Water Resources and Hydrogeochemistry,” for additional information on modeled drawdown.

Like the no-action alternative, drawdown would primarily affect the Sycamore - Fremont Cottonwood riparian system, although adverse effects from reduced stream flow could also occur in the Fremont Cottonwood/Shrub riparian system farther downstream. The predicted magnitude of the post-closure increase in groundwater discharge to Pinto Creek and subsequent gradual decline would be highly similar to that under the no-action alternative but would occur approximately 7 years later under alternative 1. Effects on riparian vegetation from these fluctuations in baseflow would be the same as described for the no-action alternative.

The potential for discharge of low pH, high total dissolved solids, and metal-laden water from the Leach Piles after closure of Pinto Valley Mine to result in potential adverse effects on riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine from accumulation of heavy metals in the soils, uptake by vegetation, and bioaccumulation in food chains would be the same as described under the no-action alternative.

The duration during which adverse effects on plant health from deposition of dust generated by mining activities and road use could occur would be approximately 7 years longer than under the no-action alternative due to the longer operational life of the mine; however, as stated for the no-action alternative, the Forest Service has not observed dust accumulation on vegetation on National Forest System lands surrounding Pinto Valley Mine to date and no notable changes are anticipated in the conditions and activities that contribute to dust generation.

Invasive Plants

Factors contributing to the spread of invasive plants and ongoing measures taken by Pinto Valley Mine to minimize the potential for spread would be the same as described under the no-action alternative. However, alternative 1 could result in increased prevalence of invasive plants due to expansion of mining facilities onto approximately 542 more total acres than the no-action alternative and approximately 7 more years of continued road use and maintenance and other activities that may contribute to dispersal. Pinto Valley Mining Corp.’s noxious weed control plan (Capstone Mining Corp. 2020b) for National Forest System lands would be implemented in the same manner as described under the no-action alternative.

Similar to the no-action alternative, no new roads or utility corridors would be constructed outside of existing disturbance areas under alternative 1.

Similar to the no-action alternative, there is no anticipated surface disturbance within the Pinto Creek riparian corridor that would create conditions favorable to the spread and establishment of invasive plant species.

3.3.4.2.3 Proposed Action – Authorization of New and Existing Uses of National Forest System Lands

Upland Vegetation Communities

Expansion of mining facilities would have similar effects from removal of vegetation within the interior chaparral biotic community as described for the no-action alternative and alternative 1. However, the proposed action would result in 1,317 acres of new surface disturbance, including 1,087 acres on private land and 229 acres on National Forest System lands. As a result, the proposed action is expected to have a greater adverse impact on existing vegetation communities than both the no-action alternative and alternative 1 commensurate with the increased amount of surface disturbance. The proposed action would increase surface disturbance on National Forest System lands by 229 acres compared to the no-action alternative and alternative 1, resulting in increased impacts on upland vegetation on National Forest System lands. The increased surface disturbance on National Forest System lands under the proposed action would primarily be associated with expansion of the Open Pit, Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, borrow and riprap source areas, and realignment of existing access roads and water pipelines (see map 2-3 in appendix A).

The longer operating life of the mine under the proposed action would delay the start of reclamation for most facilities for approximately 19 years beyond the no-action alternative and 12 years beyond alternative 1. This would cause revegetation of reclaimed facilities to occur later in time than under the other alternatives but is not anticipated to affect the outcome of reclamation, which would be conducted in accordance with the active Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a) and the Aquifer Protection Permit Closure and Post Closure Strategy (SRK Consulting, Inc. 2019a) on private lands, and facilities on National Forest System lands would be reclaimed in accordance with the reclamation plan for National Forest System lands.

Riparian and Wetland Vegetation Communities

Based on mapping by Triepke et al. (2014), the proposed action would remove an estimated 39 acres of riparian vegetation (14 acres on private lands owned by Pinto Valley Mining Corp. and 24 acres on National Forest System lands).[44] This includes the 11 acres of Sycamore - Fremont Cottonwood riparian area on private lands owned by Pinto Valley Mining Corp. in Gold Gulch that would also be cleared or buried during construction of the West Dump under alternative 1. Upstream expansion of Tailings Storage Facility No. 4 into Eastwater Canyon and associated relocation of access roads and water pipelines under the proposed action would result in additional clearing or removal of 27 acres identified by Triepke et al. (2014) as Sycamore - Fremont Cottonwood riparian vegetation and 1 acre of Fremont Cottonwood/Shrub riparian vegetation. The composition and condition of riparian vegetation in this area of Eastwater Canyon have not been confirmed through field survey and may be more dominated by

[44] The identification of riparian vegetation relies on Triepke et al. (2014), which represents the best available data for this land cover type in the analysis area. However, riparian mapping from Triepke et al. (2014) is at a regional scale and has not been confirmed by field surveys. The acreage of impacts on riparian vegetation represents a conservative estimate and could include upland vegetation communities.

shrub species with patches of larger tree species. One existing habitat survey that included a transect at an unknown location within Eastwater Canyon characterized the vegetation along the transect as primarily xeroriparian and dominated by shrub oak and Emory oak, with a patch of mesoriparian woodland vegetation dominated by Arizona sycamore, Arizona ash, and Arizona walnut (WestLand Resources, Inc. 2016d). Indirect impacts on riparian and wetland communities along perennial stream reaches are discussed in the following section.

Plant Health

Continued pumping from the Peak Well field under the proposed action is predicted to result in a reduction in groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 162 gallons per minute at the end of mining (an 85-percent reduction from 2013 versus 90 percent under the no-action alternative and 93 percent under alternative 1). The predicted minimum baseflow under the proposed action would be approximately 73 gallons per minute in 2027, the same as for alternative 1. Baseflow would gradually increase prior to the mine closure but would still remain substantially lower than 2013 conditions. The predicted drawdown area encompasses 5.86 miles of perennial streams, including portions of Pinto Creek (4.80 miles), Miller Springs Gulch (0.82 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a reduction in baseflow in Pinto Creek of greater magnitude than the no-action alternative and similar in magnitude to alternative 1 but persisting for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. As a result, reduction in baseflow during the operational life of the mine could be a greater contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat than both the no-action alternative and alternative 1. Refer to appendix E, “Water Resources and Geochemistry Technical Report,” and section 3.21, “Water Resources and Hydrogeochemistry,” for additional information on modeled drawdown.

Like the no-action alternative and alternative 1, drawdown would primarily affect the Sycamore - Fremont Cottonwood riparian system, although adverse effects from reduced stream flow could also occur in the Fremont Cottonwood/Shrub riparian system farther downstream. The predicted magnitude of the post-closure increase in groundwater discharge to Pinto Creek and subsequent gradual decline would be highly similar to that of the no-action alternative and alternative 1 but would occur approximately 19 years later than the no-action alternative and 12 years later than alternative 1. Effects on riparian vegetation from these fluctuations in baseflow would be the same as described for the no-action alternative and alternative 1.

The potential for discharge of low pH, high total dissolved solids, and metal-laden water from the Leach Piles after closure of Pinto Valley Mine and potential adverse effects on riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine from accumulation of heavy metals in the soils, uptake by vegetation, and bioaccumulation in food chains would occur in a similar manner as under the no-action alternative and alternative 1. However, the amount of flow that could migrate toward Pinto Creek would be reduced under the proposed action, compared to the no-action alternative and alternative 1, because the residual drawdown cone that would persist around the Open Pit during the post-closure period (which is driven by groundwater flow into the Open Pit to replace water evaporated from the lake surface) will be larger and capture more of the seepage from the Leach Pile as described under the proposed action in both appendix E, “Water Resources and Geochemistry Technical Report,” and section 3.21, “Water Resources and Hydrogeochemistry.”

The duration during which adverse effects on plant health from deposition of dust generated by mining activities and road use could occur approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1 due to the longer operational life of the mine; however, as stated for the no-action alternative, the Forest Service has not observed dust accumulation on vegetation on National Forest System lands surrounding Pinto Valley Mine to date and no notable changes are anticipated in the conditions and activities that contribute to dust generation.

Invasive Plants

Factors contributing to the spread of invasive plants and ongoing measures taken by Pinto Valley Mine to minimize the potential for spread would be the same as described under the no-action alternative and alternative 1. However, the proposed action could result in increased establishment and spread of invasive plants due to expansion of mining facilities onto approximately 950 more total acres than the no-action alternative and 408 more total acres than alternative 1. Continued road use and maintenance and other activities under the proposed action that may contribute to dispersal would occur for an additional 19 or 12 years relative to the no-action alternative and alternative 1, respectively. In addition, the proposed action would increase surface disturbance on 229 acres on National Forest System lands, resulting in increased potential for the spread and establishment of invasive plants on National Forest System lands compared to the other alternatives. However, disturbances on National Forest System lands would be subject to additional requirements, such as regular noxious weed monitoring and treatment and the use of certified weed-free hay and certified weed-free sand during reclamation, which could decrease the potential for establishment and spread of invasive plants on these lands. Pinto Valley Mining Corp.’s noxious weed control plan (Capstone Mining Corp. 2020b) for National Forest System lands would be implemented in the same manner as described under the no-action alternative.

In contrast to the no-action alternative and alternative 1, the proposed action would include the construction and maintenance of new access roads around the expanded footprint of the Open Pit and Tailings Storage Facility No. 4 (see map 2-3 in appendix A). The proposed action is anticipated to result in 10 acres of new disturbance associated with access roads (3 acres on private land and 7 acres on National Forest System lands). As a result, the proposed action could increase the spread and establishment of invasive plants on these access roads compared to the other alternatives.

Similar to the no-action alternative and alternative 1, there is no anticipated surface disturbance within the Pinto Creek riparian corridor that would create conditions favorable to the spread and establishment of invasive plant species.

3.3.4.3 **Direct and Indirect Impacts on Fish and Wildlife**

3.3.4.3.1 No-action Alternative

Under the no-action alternative, disturbances associated with mining operations, reclamation, and post-closure maintenance that may affect fish, wildlife, and special status species include surface disturbance, traffic, artificial lighting, dust, noise, water withdrawals, water discharges, and water contamination. The “Fish and Wildlife” section below briefly summarizes these disturbances, then describes how they may affect fish and wildlife. These disturbances and the nature of their effects also apply to the discussions of special status species in section 3.3.4.4, “Direct and Indirect Impacts on Special Status Species.”

Surface Disturbance

There is an estimated 3,915 acres of existing disturbance at the Pinto Valley Mine, including 3,349 acres on private land and 556 acres on National Forest System lands (table 2-1). Under the no-action alternative, there would be an estimated 367 acres of new surface disturbance on private land, including 10 acres of disturbance associated with continued deposition of tailings in Tailings Storage Facility No. 4 during the first 2 months of the transition period from active mining to reclamation and 357 acres of new disturbance associated with excavation of borrow and riprap sources during reclamation and closure. There would be no new disturbance on National Forest System lands. New surface disturbance associated with the no-action alternative would occur entirely within the Interior Chaparral biotic community on private land.

New surface disturbance associated with the no-action alternative would alter the existing topography, primarily when new borrow sources are excavated during reclamation. Sloped terrain within the boundaries of borrow sources would be leveled and brought to a lower elevation as material is extracted. The depth of the Open Pit would not vary substantially from the existing depth, as blasting would not be conducted for the purpose of accessing ore deposits. No direct impacts on riparian or wetland vegetation communities are anticipated from the no-action alternative.

Upon reclamation, disturbed areas would be recontoured to reestablish natural drainage patterns. New drainages will be created where the former drainage patterns no longer function. Most mine ponds and reservoirs would be breached; seepage control ponds and storm water retention ponds may be retained as needed. Upland vegetation would be reestablished within most disturbed areas via reseeding during reclamation. Following reclamation, most disturbed areas are expected to develop natural plant and animal communities over time via the process of natural succession.

A pit lake is predicted to form in the Open Pit at the end of mining due to excavation below the potentiometric surface of groundwater, inflow from Leach Piles draindown, and cessation of pit dewatering. The pit lake will function in perpetuity as a terminal sink for inflowing groundwater, runoff, and precipitation. Modeling performed by SRK Consulting, Inc. (2020b) predicted that 95 percent of pit lake infilling would occur within 75 years post-closure.

Under the no-action alternative, wildlife that occur within the Interior Chaparral biotic community would be affected by activities that result in new surface disturbance through the resulting loss of shelter, breeding sites, and food resources for the duration of active mining operations and reclamation. Additionally, organisms unable to flee the area such as lizards or nestling birds may be crushed. Water features occupied by fish are not anticipated to be directly affected by new surface disturbance under this alternative. No known bat colonies occur within the footprint of new surface disturbance; however, unknown colonies could be present and individuals unable to flee may be subject to crushing. New surface disturbance would have minimal impacts on habitat connectivity, as it occurs adjacent to areas disturbed by the Pinto Valley Mine's existing facilities.

Upon reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. As vegetation becomes established, wildlife will begin to use the disturbed areas. However, the topography of the reclaimed mine site would be flatter than the pre-mining condition, resulting in a more homogeneous environment with fewer niches and microclimates. Therefore, the future wildlife diversity within areas affected by surface disturbance is anticipated to be lower than that present prior to disturbance. Reclamation of constructed ponds and reservoirs could adversely affect some wildlife species by permanently removing sources of drinking water, foraging areas, and aquatic habitat. Fish are not expected to be affected by reclamation of constructed ponds and reservoirs because none is known to occur within these features. However, aquatic invertebrates may occur in many of the affected features.

The suitability of the Open Pit and pit lake for use by fish and wildlife following cessation of active mining operations under the proposed action and alternative 1 was assessed as part of an ecological risk assessment prepared by SRK Consulting, Inc. (2019d); this assessment is assumed to be generally applicable to the no-action alternative. Following mine closure, the exposed pit walls are anticipated to be of minimal value to wildlife due to their steepness and anticipated lack of vegetation, resulting in a lack of food resources and cover. The pit walls may be used by winged species such as raptors and bats for nesting and roosting. Where the pit lake and pit walls meet, a limited band of riparian vegetation may develop. This vegetation is anticipated to occur in narrow, isolated bands where sediment is able to accumulate. The limited size and patchy distribution of riparian habitat along the pit lake edge is anticipated to be sufficient to support only a small number of resident organisms. Furthermore, large mammals would be restricted from accessing the pit lake by a perimeter fence that would be monitored throughout the post-closure phase. Although small terrestrial mammals, reptiles, and amphibians may pass through the perimeter fence, the distance from the pit rim to the lake would likely act as a barrier to dispersal. The distance to the pit lake would be less restrictive to birds and bats, which may use any riparian vegetation that were to develop or may use the lake as a water source. The pit lake itself is expected to be oligotrophic. Aquatic species are not expected to colonize the pit lake due to its lack of connection to other surface waters, the sterile nature of the pit walls, and the anticipated saline-acidic character of the water (see “Contamination of Water Resources” below for a discussion for the effects of pit lake contamination on wildlife). Migratory birds such as waterfowl and passerines may be attracted to the pit lake, but their prolonged usage is not anticipated due to the low productivity of the system; however, consumption of pit lake water, as discussed below under “Contamination of Water Resources,” during migration may cause reduced vigor and even mortality.

Traffic

Water features occupied by fish are not anticipated to be affected by traffic under this alternative; therefore, potential effects of this disturbance to fish are not considered in the following analysis. Under the no-action alternative, wildlife that occurs within the Interior Chaparral biotic community would continue to be affected by traffic both within the mine site and along National Forest System Road 287. Wildlife within the Madrean Evergreen Woodland biotic community would only be affected by traffic along the southern portion of National Forest System Road 287. Potential impacts include mortality or injury due to impacts with or crushing by vehicles (Kaseloo and Tyson 2004). Traffic along National Forest System Road 287 may adversely affect habitat connectivity by creating a barrier to wildlife movements (Kaseloo and Tyson 2004). Such impacts are anticipated to result in few effects on aquatic taxa because vehicular activity within surface water will generally be limited to trips to the Peak Well field, which will require vehicles to cross Pinto Creek. Traffic would also contribute to impacts on wildlife as a result of increased artificial light, noise, and dust described below.

Under the no-action alternative, traffic-related impacts on wildlife would continue at existing levels during the first 2 months of the 6-month transition period. Traffic-related impacts would decrease following the 2 months of active operations due to reduced employment at the Pinto Valley Mine and substantial reductions in overall activity at the Pinto Valley Mine.

Artificial Nighttime Lighting

Water features occupied by fish are not anticipated to be exposed to artificial nighttime lighting under this alternative; therefore, potential effects of this disturbance to fish are not considered in the following analysis. Exposure to nighttime lighting would mainly affect wildlife within the Interior Chaparral biotic community; wildlife within the Madrean Evergreen Woodland and Sonoran Desertscrub biotic communities would be exposed to artificial nighttime lighting to a lesser extent. Nighttime lighting produced by Pinto Valley Mine may be beneficial to some groups of wildlife and detrimental to others. In general, nighttime lighting has the potential to affect organisms by increasing or decreasing their ability to orient themselves within the landscape or by attracting or repelling them from the lighted area (Longcore and Rich 2004). These effects may in turn alter an organism's behavioral patterns and physiology, which can affect their ability to forage, reproduce, migrate, and communicate (Longcore and Rich 2004; Gaston et al. 2013).

Documented effects vary within and among taxonomic groups (Fenton and Morris 1976; Gaston et al. 2013). Effects of nighttime lighting documented in mammals include altered circadian rhythms and suppressed immune response in hamsters; increased tumor growth rates and increased metabolism in rats; disruption of circadian rhythm, reduced nighttime activity, increased predator avoidance, and reduced food consumption in mice; reduced feeding rates and activity, increased insect prey availability and foraging activity at point light sources, disturbed flight patterns, and commuting delay in bats; and disruption of seasonal acclimatization and thermoregulation in voles (Fenton and Morris 1976; Gaston et al. 2013). In birds, documented effects include an increased ability to locate prey in owls and higher prey intakes in shorebirds. Increased exposure to light increased prey detection in toads and reduced activity in snakes.

In general, impacts on wildlife from artificial nighttime lighting would be short term, as active mining operations would only continue for 2 months following the record of decision. During this time, wildlife using areas close to new or expanded facilities would be exposed to nighttime lighting above existing levels. Impacts of nighttime lighting would cease at mine closure when the use of nighttime lighting is discontinued.

Dust

Airborne dust is not anticipated to settle into aquatic features in sufficient quantities to increase turbidity to a degree that would affect fish and other aquatic fauna. Mine-related dust would mainly affect wildlife within the Interior Chaparral biotic community. Wildlife within the Madrean Evergreen Woodland and Sonoran Desertscrub biotic communities is not anticipated to be affected by dust because potential dust sources are located at least 2,000 feet away; National Forest System Road 287 is paved where it passes through Madrean Evergreen Woodland.

The impact of dust on fish and wildlife is not well studied. Documented impacts on wildlife include alterations to invertebrate communities including presence of additional species and reduced abundance of others (Farmer 1993). Changes in vegetation that result from dust deposition may affect animal communities by altering the competitive relationships between species and cycles of decomposition (Farmer 1993) as well as by altering characteristics of habitat components such as the availability of food and shelter. Impacts on wildlife communities resulting from dust would be greatest in the areas of highest deposition close to the source (Turner 2013). Under the no-action alternative, impacts on wildlife due to airborne dust during operations would continue for 2 months until the end of active mining operations and impacts on wildlife from airborne dust associated with reclamation activities would persist for approximately 12 years.

Noise

Mine-related noise would mainly affect wildlife within the Interior Chaparral biotic community. Animals rely on sounds for communication, navigation, danger avoidance, and successful foraging (Kaseloo and

Tyson 2004). High levels of environmental noise may mask signals, decrease hearing sensitivity, induce stress, and alter hormone levels (Dooling and Popper 2007). Although the effects of noise produced by mines are not well studied, numerous studies have been published on the effects of roadway noise on wildlife. A literature review by the Federal Highway Administration (Kaseloo and Tyson 2004) assessed the potential effects of road noise on mammals, reptiles and amphibians, fish, invertebrates, and birds. The review found that effects of road noise vary considerably within and among taxonomic groups. While large mammals may avoid roads, there is little evidence to support avoidance of roads due to traffic noise. Movements of small mammals may be impeded by the presence of roadways, with noise-related impacts being of secondary importance. The effects of noise on amphibians and reptiles are not well studied; however, estivating spadefoot toads (*Scaphiopus couchi*) have been found to arouse from their burrows in response to motorcycle noise and dune buggy noise was found to adversely affect the hearing of fringe-toed lizards (*Uma scoparia*). The effects of noise on fish and invertebrates are similarly not well studied; however, available evidence suggests that fish are unlikely to be affected by roadway noise. Unlike many of the aforementioned groups, numerous studies have assessed the impacts of road noise on birds with varying results. Adverse impacts on birds include decreased breeding activity and abundance in proximity to roadways. Other species experienced neutral effects while some bird species are found in greater abundance near roadways, presumably as a result of the presence of habitat and food sources.

WestLand Resources, Inc. (2018c) identified areas subject to mine-related noise above 60 A-weighted decibels; these areas are exposed to sound levels equal to or greater than those produced by heavy traffic at a distance of 200 feet from centerline (Dooling and Popper 2007). The 60 A-weighted decibels threshold also has biological relevancy, as it is the level at which Dooling and Popper (2007) suggest that traffic noise would begin to affect a bird's behavior. For the duration of mining operations noise above 60 A-weighted decibels will be concentrated in the vicinity of the Open Pit and Main Dump as well as along isolated portions of National Forest System Road 287; noise above 60 A-weighted decibels would shift south and west to areas surrounding active reclamation following mine closure (WestLand Resources, Inc. 2018c). A 0.3-mile stretch of Pinto Creek north of Miller Gulch would be exposed to average noise per hour above 60 A-weighted decibels during this time. Wildlife near these features may experience more adverse noise-related impacts than wildlife in other portions of the analysis area. Impacts resulting from noise would occur primarily during the first 2 months of the transition period and during the first and last 3 years of reclamation activities.

Water Withdrawals

Groundwater extraction under the no-action alternative is predicted to result in continued drawdown of the water table and reduced baseflow in Pinto Creek on private and National Forest System lands in the vicinity of the Pinto Valley Mine (SRK Consulting Inc. 2020a). From 2013 to 2018, the baseflow in Pinto Creek is modeled to have declined from an initial rate of 1,070 gallons per minute to 188 gallons per minute (SRK Consulting, Inc. 2019b). Under the no-action alternative, groundwater extraction would continue for the first 2 months of the transition period and is predicted to further decrease baseflow in Pinto Creek to 97 gallons per minute (SRK Consulting Inc. 2020a). Baseflow is predicted to recover to 2013 rates within 10 years of mine closure. By approximately 200 years after mine closure, the baseflow in Pinto Creek is predicted to decrease to 407 gallons per minute due to the combined effects of residual drawdown into the Open Pit and progressively reduced seepage from Tailings Storage Facility No. 4. Under the no-action alternative, groundwater drawdown resulting from current and future operation of the Pinto Valley Mine would affect a total of 5.49 miles of perennial stream length including portions of Pinto Creek (4.43 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Three perennial springs within the analysis area are predicted to dry due to reduced seepage from the tailings storage facilities after mine closure (SRK Consulting, Inc. 2020a). Refer to appendix E ("Water Resources and Geochemistry Technical Report") for a detailed discussion of water withdrawals and associated water resource impacts.

Water withdrawals would mainly affect fish and wildlife within the Interior Chaparral biotic community because most major water features such as Pinto Creek occur entirely within this community. Wildlife within the Sonoran Desertscrub biotic community would be affected to a lesser extent. Water resources within the Madrean Evergreen Woodland biotic community are not anticipated to be affected by water withdrawals related to the Pinto Valley Mine.

Fish and wildlife species may be affected in a variety of ways from the drawdown of groundwater. Fish and wildlife could be affected by the reduction of available surface water in areas where the groundwater is lowered enough to reduce baseflow in streams and springs. In addition, fish and wildlife could be affected by loss or degradation of riparian habitat where the water table is lowered enough to kill, reduce, or degrade riparian vegetation. Continued groundwater drawdown could contribute to riparian tree mortality and decline as described under "Vegetation" – "Plant Health" as well as reduced aquatic habitat availability described by Miller Ecological Consultants, Inc. (2011, 2019). Although flows in Pinto Creek are expected to exceed existing (2018) rates within 10 years of closure, affected vegetation may only recover to existing conditions long after pumping ceases. The effects of these losses may include reduction or elimination of aquatic habitat for aquatic and semi-aquatic organisms; loss of foraging opportunities, roost sites, and drinking water sources for terrestrial organisms; and reduced ability of both terrestrial and aquatic organisms to utilize Pinto Creek for dispersal. If springs and streams dry up, animals may have to travel farther to find water, thereby increasing energy expenditure and exposure to predation. Impacts on riparian and aquatic resources may disproportionately affect wildlife, as these resources occupy a small proportion of the landscape but are used by a relatively high number of vertebrate species (Hubbard 1977; Brinson et al. 1981; Naiman et al. 1993).

Under the no-action alternative, effects on fish and wildlife from low flows in Pinto Creek would be reduced as flows rebound after mine closure and effects associated with vegetation declines would lessen as vegetation slowly recovers during the closure and post-closure periods. Conditions may worsen as flows gradually decrease beginning approximately 10 years after closure. However, flows would remain higher than those at mine closure and those present under existing (2018) conditions.

Contamination of Water Resources

Water contamination would mainly affect wildlife within the Interior Chaparral biotic community because most major features occur entirely within this community. Wildlife within the Sonoran Desertscrub biotic community would be affected to a lesser extent. Water resources within the Madrean Evergreen Woodland biotic community are not anticipated to be contaminated by the Pinto Valley Mine. Fish and wildlife may be exposed to water contaminated from the Pinto Valley Mine through the following pathways under the no-action alternative.

Seeps and storm water retention facilities: Between 2014 and 2016, levels of selenium sampled from three seeps on the western side of the mine exceeded Arizona water quality standards on multiple occasions (Pinto Valley Mining Corp. 2015a, 2016a, 2017a). Water quality within storm water retention facilities in the vicinity of these seeps may be adversely affected by inputs of selenium exceeding Arizona water quality standards.

Fish are not anticipated to occur within the Pinto Valley Mine's storm water retention facilities and seeps, as they are not hydrologically connected to natural surface waters. Therefore, fish would not be affected by high selenium levels within these features. Under the no-action alternative, wildlife that use seeps and nearby storm water retention facilities may be exposed to selenium levels exceeding Arizona water quality standards. At high concentrations, selenium is toxic to aquatic organisms (U.S. Environmental Protection Agency 2016). Egg-laying vertebrates, such as birds that feed on aquatic organisms, are vulnerable to selenium poisoning, which is known to bioaccumulate up the aquatic food chain (U.S. Environmental Protection Agency 2016). Impacts on wildlife caused by chronic exposure to selenium include cell and egg damage, developmental deformations, and larval mortality in fish; and cell damage in birds (U.S. Environmental Protection Agency 2016). Aquatic invertebrates likely occur within these features and birds that feed upon them could be adversely affected. Effects on wildlife from contaminated seeps and storm water retention facilities would decrease upon reclamation. However, some seeps and storm water retention facilities may be retained post-closure; these features may continue to expose wildlife to contaminated water indefinitely.

Arizona Pollutant Discharge Elimination System Outfall No. 005: Arizona Pollutant Discharge Elimination System Outfall No. 005 discharges flows with high total dissolved solids and sulfate from the Cottonwood Tailings Impoundment. Under the no-action alternative, aquatic macroinvertebrates at the outlet of Arizona Pollutant Discharge Elimination System Outfall No. 005 would continue to be exposed to toxic levels of total dissolved solids. Outflow from Arizona Pollutant Discharge Elimination System Outfall No. 005 failed whole effluent toxicity tests conducted in 2009 on the water flea, *Ceriodaphnia dubia*, and the green alga, *Pseudokirchneriella subcapitata*, but passed whole effluent toxicity tests on another water flea, *Daphnia magna*, which is known to be less sensitive to total dissolved solids, and the fathead minnow (*Pimephales promelas*) (Parkhurst and Naddy 2012; Arizona Department of Environmental Quality 2018). Whole effluent toxicity refers to the aggregate toxic effect on target organisms from all pollutants in a facility's effluent. Whole effluent toxicity tests measure the effects of effluent on an organism's ability to survive, grow, and reproduce. *C. dubia* was chosen as a surrogate species for evaluating effects of the effluent on invertebrates, *P. subcapitata* was chosen as a surrogate for effects on plant life, and the fathead minnow was chosen as a surrogate for effects on vertebrates (Arizona Department of Environmental Quality 2018). All tests conducted during a subsequent toxicity identification evaluation support the hypothesis that high concentrations of total dissolved solids were responsible for the observed toxicity to *C. dubia* (Parkhurst and Naddy 2012). The cause of toxicity to *P. subcapitata* was not assessed.

Potential impacts on aquatic macroinvertebrates caused by high levels of total dissolved solids include reduced survival, growth, reproduction, and family-level community richness, especially within the sensitive insect orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (Scannell and Jacobs 2001; Timpano et al. 2010). Macroinvertebrates may also be affected through reduced availability of herbaceous food sources; whole effluent toxicity testing results for *P. subcapitata* indicated effluent from Arizona Pollutant Discharge Elimination System Outfall No. 005 was toxic to plant life. Because this facility will continue to operate through the post-closure period, discharges from Arizona Pollutant Discharge Elimination System Outfall No. 005 and the associated impacts on aquatic macroinvertebrates would continue indefinitely at their current levels.

Pinto Creek: Aquatic macroinvertebrates and fish within Pinto Creek may be exposed to high levels of total dissolved solids and sulfates originating from seepage from the tailings storage facilities, the Leach Piles, and Arizona Pollutant Discharge Elimination System Outfall No. 005, which discharges to an ephemeral wash that reports to Pinto Creek. The seepage from the tailings storage facilities may have similar water quality characteristics and potential toxicity to aquatic organisms as the effluent from Arizona Pollutant Discharge Elimination System Outfall No. 005 because they are both derived from the same ore body. However, this seepage would likely be diluted by groundwater and by surface flow in Pinto Creek.

Potential effects on macroinvertebrates caused by high levels of total dissolved solids would be as described above under “Arizona Pollutant Discharge Elimination System Outfall No. 005.” Although whole effluent toxicity testing for Arizona Pollutant Discharge Elimination System Outfall No. 005 did not indicate toxicity to fish, harmful effects of total dissolved solids at concentrations similar to those reported from monitoring wells downgradient from the tailings storage facilities and at Arizona Pollutant Discharge Elimination System Outfall No. 005 have been reported in the literature. Potential effects on fish include reduced fertilization and hatching rates, extended developmental time, and toxicity to adult fish at concentrations above 2,000 milligrams per liter (Scannell and Jacobs 2001). Effects on the macroinvertebrate and aquatic plant communities may also affect fish via reduced food availability. Under the no-action alternative, effects resulting from tailings storage facility seepage would peak 10 years after mine closure when the proportion of flow in Pinto Creek from this source is at its highest. Effects would then taper as seepage progressively decreases.

Pit Lake: SRK Consulting, Inc. (2019a) prepared an ecological risk assessment for alternative 1 and the proposed action. Pit lake characteristics under the no-action alternative are assumed to be comparable to alternative 1 for the purposes of this analysis. The water quality of the pit lake is predicted to have low pH, high sulfate concentrations, and high metal concentrations. The pit lake water is expected to be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries (SRK Consulting, Inc. 2019d).

The ecological risk assessment evaluated the potential for the 17 constituents predicted to occur at levels in excess of water quality standards or reference values within the pit lake to cause harmful effects on wildlife species. Because pH, total dissolved solids, and sulfate do not have toxicity thresholds as established by the U.S. Environmental Protection Agency, these constituents were not carried forward for quantitative analysis. Fish, reptiles, and amphibians were not anticipated to occur within or along the post-closure pit lake; therefore, individuals from these groups were not expected to be adversely affected by exposure to pit lake water. Species-specific risk characterizations were conducted for 6 terrestrial mammal, 5 bat, and 11 bird species that may occur in the vicinity of the Pinto Valley Mine. Species analyzed consisted of black bear (*Ursus americanus*), mule deer, white-tailed deer, coatimundi, javelina, raccoon, pale Townsend’s big-eared bat, big brown bat, western red bat, Brazilian [Mexican] free-tailed bat, pallid bat (*Antrozous pallidus*), golden eagle, mallard (*Anas platyrhynchos*), Mexican duck (*Anas diazi*), yellow-billed cuckoo, peregrine falcon, common black-hawk, gray flycatcher, ash-throated flycatcher, brown-crested flycatcher, gray vireo, and Abert’s towhee. Harmful effects on the 11 bird species analyzed were determined to be unlikely to occur as a result of exposure to any of the quantitatively assessed pit lake constituents. At the “No Observed Adverse Effects” level toxicity reference value established by the U.S. Environmental Protection Agency, the only constituent for which harmful effects on all mammals analyzed could not be ruled out was aluminum. At the less conservative “Lowest Observed Adverse Effects” level, aluminum within the pit lake was predicted to be unlikely to cause harmful effects on the five bat species analyzed. Harmful effects on black bear, mule deer, white-tailed deer, coatimundi, javelina, and raccoon could not be ruled out at this level.

Due to the distance from the pit rim and the presence of the Open Pit perimeter fence that will be installed upon closure of the mine, the pit lake is expected to be virtually inaccessible to terrestrial mammal species for the duration of the post-closure period. Accessibility to large mammals may increase following the post-closure period if the perimeter fence is no longer maintained. Because animals provided with a choice of water sources will begin to reject water with total dissolved solids greater than 10,000 milligrams per liter, bats and other mammals that are able to reach the pit lake may not drink the water it contains, which would likely contain total dissolved solids concentrations of in excess of 24,380 milligrams per liter (SRK Consulting, Inc. 2019c). If mammals were to drink from the pit lake, potential adverse effects that could result from exposure to aluminum include impaired production of red blood cells, increased susceptibility to infection, delays in offspring maturation, decreases in offspring body weight, and decreased neurobehavioral performance (SRK Consulting, Inc. 2019c).

Although the risk of harmful effects from exposure to pH, total dissolved solids, and sulfate in the pit lake were not quantitatively analyzed, mammals and birds that consume water from the pit lake may also be adversely affected by these constituents. High pit lake acidity in particular has caused mass waterfowl mortality events at other locations. In 2006, 3,000 to 4,000 snow geese (*Chen caerulescens*) perished after landing on the Berkeley pit lake in Montana. The U.S. Fish and Wildlife Service determined that the mortality resulted from exposure to sulfuric acid and heavy metals identified in post-mortem examinations (Dunlap 2017).

In addition, research conducted by Texas Tech University (Hooper et al. 2007) evaluated impacts on mallards in the lab resulting from consumption of synthetic acid metalliferous water designed to simulate the water in mine tailing ponds. Mallards were chosen for the study because previous studies indicated that passerines and waterfowl are the species most at risk to injury from drinking acid mine tailings. The results of the study indicated that ingestion of synthetic acid metalliferous water was highly toxic to dehydrated mallards (simulating migration stress) with a large percentage of birds dying within the first 98 minutes following exposure. Signs of toxicity prior to death included lateral head shaking, nasal discharge, signs of throat irritation, ataxia, signs of central nervous system depression, and increased breathing rate with shallow breaths. Mortality was mainly consistent with extreme copper toxicity. Additional results showed that no mortality occurred in mallards when lime was added to neutralize the acidity of the acid metalliferous water and reduce dissolved metal content; nearly all mallards consuming typically sublethal doses of synthetic acid metalliferous water were able to survive exposure if allowed access to clean water and food; and synthetic acid metalliferous water diluted 10-fold was still highly toxic to mallards while synthetic acid metalliferous water diluted 100-fold was not lethal to mallards but did cause minor signs of toxicity. See appendix C, “Biological Evaluation,” for a more detailed discussion of this research.

Arizona contains part of the Pacific Flyway for waterfowl with the majority of migration occurring through the Colorado River corridor, with the next major flyway corridor along the Rio Grande River in New Mexico (Birdlife International 2021). Waterfowl such as cormorants will disperse away from these flyways along major rivers, but in much smaller numbers. Water in the pit lake is likely to be unpalatable to waterfowl due to its high mineral content and the lake will be mostly devoid of vegetation and fish; therefore, it will be unsuitable for long-term occupancy by waterfowl. However, small numbers of waterfowl, especially during a highly stressful physiological period such as in-migration, may drink the pit lake water, resulting in mortality or decreased vigor.

Migrating passerines, including the Tonto National Forest migratory birds of concern, with habitat in the analysis area and those species listed in table 3-22, could also be susceptible to adverse impacts including mortality from drinking pit lake water. Water in the pit lake is likely to be unpalatable to passerines due to its high mineral content and the lake edges will be mostly devoid of vegetation limiting cover; therefore, it will be unsuitable for long-term occupancy by songbirds. In addition, relatively clean water will be available to migrating passerines in nearby drainages. However, small numbers of passerines, especially during a highly stressful physiological period such as in-migration, may drink the pit lake water resulting in mortality or decreased vigor.

3.3.4.3.2 Alternative 1 – Authorization of Existing Uses of National Forest System Lands

Surface Disturbance

Impacts on fish and wildlife from surface disturbance under alternative 1 would be similar to those described for the no-action alternative, except an additional 542 acres would be affected and the timeframe associated with this disturbance would be approximately 7 years longer. Although a comparatively small area of riparian and aquatic resources would be affected by surface disturbance, impacts on these resources may disproportionately affect wildlife, as they occupy a small proportion of the landscape but are used by a relatively high number of vertebrate species (Hubbard 1977; Brinson et al. 1981; Naiman et al. 1993). Compared to the no-action alternative, adverse impacts due to loss of constructed reservoirs and ponds would be delayed for approximately 7 years under alternative 1, and riparian habitat along Eastwater Canyon and Gold Gulch would also be affected. Less than 0.1 acre of riparian vegetation and associated habitat could develop along the edges of the pit lake under alternative 1.

Traffic

Impacts on fish and wildlife that would occur as a result of mine-related traffic are anticipated to be similar to those described for the no-action alternative, except that impacts experienced during active mining operations would continue for approximately 7 more years. Impacts resulting from traffic during reclamation and post-closure would be as described under the no-action alternative except that they would occur approximately 7 years later.

Artificial Nighttime Lighting

Impacts on fish and wildlife from artificial nighttime lighting would be similar for alternative 1 and the no-action alternative, except that impacts may occur within new areas as light sources shift to accommodate facility expansions. Impacts would continue for approximately 7 more years compared to the no-action alternative.

Dust

Impacts on fish and wildlife from dust would generally be similar to those described for the no-action alternative, except the impacts from dust deposition would affect individuals within a larger area and would continue for approximately 7 more years under alternative 1.

Noise

Impacts on wildlife from project-related noise would generally be similar to those described for the no-action alternative. However, during active mine operations, impacts on wildlife as a result of mine-related noise would continue for approximately 7 more years. Noise above 60 A-weighted decibels associated with blasting events is experienced within the Open Pit (WestLand Resources, Inc. 2018c), and is not anticipated to adversely affect nearby wildlife. Impacts from mine-related noise during reclamation and post-closure would be as described under the no-action alternative except that they would occur approximately 7 years later.

Water Withdrawals

The nature of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for the no-action alternative. However, potential impacts would occur along an additional 0.18 mile of Pinto Creek under alternative 1. Impacts may also be more pronounced under alternative 1 because baseflow in Pinto Creek is predicted to decrease to 73 gallons per minute by the end of active mining, 24 gallons per minute less than the 97 gallons per minute predicted under the no-action alternative. Furthermore, impacts from low baseflow during active mining would continue for approximately 7 more years, during which time aquatic and riparian resources would continue to deteriorate. Aquatic and riparian resources would not begin to recover until approximately 7 years later under alternative 1 compared to the no-action alternative.

Contamination of Water Resources

The nature of impacts on fish and wildlife resulting from water contamination would generally be the same as described for the no-action alternative, but exposure from some pathways would differ in length, start date, and magnitude of exposure. Impacts due to exposure to selenium within storm water facilities would occur for up to 7 more years under alternative 1. Impacts resulting from exposure to contaminated water from Arizona Pollutant Discharge Elimination System Outfall No. 005, the Leach Piles, and the pit lake would be as described under the no-action alternative. Impacts from seepage from Tailings Storage Facility No. 4 would be greater due to the larger volume of seepage that would enter Pinto Creek and would begin approximately 7 years later than under the no-action alternative.

3.3.4.3.3 Proposed Action – Authorization of New and Existing Uses of National Forest System Lands

Surface Disturbance

Under the proposed action, 408 additional acres would be subjected to new surface disturbance compared with alternative 1, including 229 acres on National Forest System lands. Approximately 950 more acres would be subjected to new surface disturbance compared with the no-action alternative. The final footprint of the Pinto Valley Mine under the proposed action would total 5,232 acres including 795 acres on National Forest System lands. Surface disturbance to areas not affected by alternative 1 would primarily occur around the upstream edges of Tailings Storage Facility No. 4, the western boundary of Tailings Storage Facility No. 3, and at the eastern end of the Open Pit under the proposed action. Similar to the no-action alternative and alternative 1, new surface disturbance associated with the proposed action would occur entirely within the Interior Chaparral biotic community.

New surface disturbance associated with the proposed action would directly affect 2.2 miles of ephemeral drainages, including 0.9 mile not affected by alternative 1 (Arizona Land Resource Information System 1993). Notable among these is 0.4 additional mile of Eastwater Canyon and associated riparian vegetation that would be subsumed by the upstream expansion of Tailings Storage Facility No. 4 onto National Forest System land. Impacts on riparian vegetation would be as described under alternative 1. Some constructed reservoirs and ponds may be subsumed into other mine features before mine closure occurs.

Impacts on fish and wildlife that would occur as a result of surface disturbance would be similar to those described for the no-action alternative and alternative 1, but to a greater degree due to the larger footprint and duration of active mining operations. The timeframe associated with impacts from surface disturbance would extend for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative. The longer timeframe associated with active mining operations under the proposed action would delay reclamation of disturbed areas within the Pinto Valley Mine site for approximately 12 years as compared to alternative 1 and 19 years as compared to the no-action alternative. Approximately 0.12 acre of riparian vegetation and associated habitat is predicted to develop along the edges of the pit lake under the proposed action, 0.024 acre more than under alternative 1.

Traffic

Impacts on fish and wildlife that would occur as a result of mine-related traffic are anticipated to be similar to those described for alternative 1 and the no-action alternative, except that impacts experienced during active mining operations would extend for approximately 12 more years and 19 more years, respectively. Impacts resulting from traffic during reclamation and post-closure would be as described for alternative 1 and the no-action alternative except that they would occur approximately 12 years later and 19 years later, respectively.

Artificial Nighttime Lighting

Impacts on fish and wildlife from artificial nighttime lighting would be similar for all three alternatives, except impacts under the proposed action would continue for approximately 12 more years than under alternative 1 and 19 more years more than under the no-action alternative. Because the location of some impacts would shift as facilities expand outward, the greatest change in location of impacts would occur under the proposed action.

Dust

Impacts on fish and wildlife from dust would generally be similar to those described for alternative 1 and the no-action alternative, except the impacts from dust deposition would affect individuals within a larger area and would continue for approximately 12 more years and 19 more years, respectively.

Noise

Impacts on wildlife from project-related noise would generally be similar to those described for alternative 1 and the no-action alternative. However, during active mine operations, impacts on wildlife as a result of mine-related noise under the proposed action would affect individuals within a broader area and would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative. Impacts from blasting events would affect wildlife in areas east of the pit that would not be affected under the other alternatives. Impacts from mine-related noise during reclamation and post-closure would occur approximately 12 years later than under alternative 1 and 19 years later than under the no-action alternative.

Water Withdrawals

The nature of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for alternative 1 and the no-action alternative. Impacts would be experienced along an additional 0.18 mile of perennial streams than under alternative 1 and an additional 0.37 mile of perennial streams than under the no-action alternative. Impacts would be the most pronounced under the proposed action because reduced baseflow in Pinto Creek occurs over the longest timeframe under this alternative. Similar to alternative 1, baseflow under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Impacts from low baseflow during active mining would continue for approximately 12 more years than alternative 1 and 19 more years than the no-action alternative, during which time aquatic and riparian resources would continue to deteriorate. Aquatic and riparian resources would not begin to recover until approximately 12 years later than under alternative 1 and 19 years later than under the no-action alternative.

Contamination of Water Resources

The nature of impacts on fish and wildlife resulting from water contamination would generally be the same as described for the no-action alternative and alternative 1, but exposure from some pathways would differ in length, start date, and magnitude. Impacts due to exposure to selenium within storm water facilities would occur for up to 12 more years than under alternative 1 and 19 more years than under the no-action alternative. Impacts resulting from exposure to contaminated water from Arizona Pollutant Discharge Elimination System Outfall No. 005 would be as described under alternative 1 and the no-action alternative.

Fish and wildlife within Pinto Creek would be exposed to greater quantities of seepage with high total dissolved solids and sulfate from the tailings storage facilities for 20 additional years. Potential effects of this exposure would be as described under the other alternatives, except effects may be more pronounced and would occur approximately 12 years later than under alternative 1 and 19 years later than under the no-action alternative.

The pit lake would be largest under the proposed action; this larger volume would dilute contaminants contained within it. The nature of potential harmful effects on wildlife associated with constituents present within the pit lake would be as described under the no-action alternative. Wildlife may be more likely to consume water from the pit lake under the proposed action due to the lower predicted levels of total dissolved solids; however, the levels still exceed the threshold beyond which water is palatable. The accessibility of the larger pit lake to wildlife would be roughly the same as under the other alternatives.

3.3.4.4 **Direct and Indirect Impacts on Special Status Species**

The sections below present a summary of potential impacts on special status species with potential to occur in the analysis area. Refer to the Pinto Valley Mine biological assessment (Forest Service 2020b) and appendix C, "Biological Evaluation," for additional information.

3.3.4.4.1 No-action Alternative Impacts on Threatened and Endangered Species

Ocelot

Although dispersing ocelots may be affected under the no-action alternative, it is unlikely that an ocelot would occur within the analysis area during the analysis timeframe due to the distance to most contemporary records and the nearest known breeding population in Mexico. As a result, the potential for the no-action alternative to affect the ocelot is considered to be discountable. Therefore, the no-action alternative may affect, but is not likely to adversely affect, the ocelot.

The no-action alternative would result in up to 367 acres of new surface disturbance on private land that would generally be unsuitable for ocelots under existing conditions because of vibration, noise, artificial lighting, and human presence associated with the existing mine. New surface disturbance also would decrease the suitability of previously unaffected adjacent areas by increasing noise and human presence. Conditions associated with new surface disturbance would continue for the duration of active mining and the active phases of reclamation. Effects of existing light levels would cease when the use of artificial night lighting is discontinued at the end of the 2 months of active mining. Any potentially dispersing ocelots would likely avoid areas subject to increased noise and human presence through the end of reclamation.

Impacts on any potentially dispersing ocelots may also occur as a result of collisions with mine-related traffic along National Forest System Road 287. These potential impacts are anticipated to continue at existing levels throughout the 2 months of active operation of the Pinto Valley Mine, and decrease along with traffic loads on National Forest System Road 287 during the remainder of the transition period and reclamation.

Reductions in vegetation and surface water availability on private and National Forest System lands that may result from the 2 months of continued groundwater pumping during the transition period may adversely affect the suitability of Pinto Creek as a potential ocelot dispersal corridor by decreasing cover, prey availability, and drinking water sources. Baseflow is predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases; however, affected riparian vegetation would only recover to existing conditions long after flows are restored and if other contributing factors do not limit the ability for riparian vegetation to recover. Possible leaching of contaminants from the Leach Piles and tailings storage facilities may further degrade resources along Pinto Creek.

Following the post-closure phase, ocelots that may disperse to or through the project area may be harmed by consumption of water from the pit lake if the perimeter fence that restricts access to the Open Pit is no longer maintained. SRK Consulting, Inc. (2019c) found that harmful effects on other medium- to large-sized terrestrial mammals may occur as a result of predicted levels of aluminum, pH, total dissolved solids, and sulfate in the lake. Although there is a potential for these effects to occur, any dispersing ocelots are unlikely to use the pit lake as a source of drinking water due to the large distance from the pit rim to the lake, the presence of more accessible water sources along Pinto Creek, and the predicted levels of total dissolved solids within the lake, which may cause the water to be unpalatable.

Arizona Hedgehog Cactus

Although Arizona hedgehog cacti may be affected under the no-action alternative, individuals are unlikely to occur within portions of the analysis area subject to relevant disturbances. As a result, the potential for the no-action alternative to affect the Arizona hedgehog cactus is considered to be discountable. Therefore, the no-action alternative may affect, but is not likely to adversely affect, the Arizona hedgehog cactus.

Potential impacts on Arizona hedgehog cacti may result from 367 acres of new surface disturbance on private land. There is a limited possibility that individual Arizona hedgehog cacti could occur within steep portions of the surveyed areas that could not be physically accessed or within unsurveyed portions of the new surface disturbance footprint containing suitable substrate, elevation, and geology. In the unlikely event that Arizona hedgehog cactus occurs within the footprint of new surface disturbance, they could be crushed during construction of new facilities.

Similarly, in the unlikely event that individuals were to occur within areas subject to high levels of dust deposition, individuals could be negatively affected (Farmer 1993). Physiological impacts on plants were observed by Turner (2013) within 1,969 feet from the source of mining dust. However, Matsuki et al. (2016) found that in their semiarid study region, high dust loads did not increase the probability of plants experiencing a decline in health. Matsuki et al. (2016) observed high dust loads within 492 feet of an open pit, with the highest loads within 66 feet of the pit (Matsuki et al. 2016). Therefore, it is anticipated that any Arizona hedgehog cactus occurring within approximately 500 feet of dust sources would be subject to the greatest risk of impacts due to dust, while impacts could occur as far away as approximately 2,000 feet. As the known population of Arizona hedgehog cactus in the southwestern corner of the analysis area is approximately 1.3 miles from the nearest source of dust, no impacts on this population resulting from dust deposition are anticipated.

Southwestern Willow Flycatcher

Although migrating southwestern willow flycatchers may be affected, impacts resulting from the no-action alternative are anticipated to be minimal because they would be limited to a decline in the suitability of potential migratory stop-over sites in the vicinity of the Pinto Valley Mine. Therefore, the no-action alternative may affect, but is not likely to adversely affect, the southwestern willow flycatcher.

As described in section 3.3.3.3, "Special Status Species," previous habitat assessments and surveys suggest that habitat for breeding southwestern willow flycatchers does not occur within the analysis area. However, southwestern willow flycatchers may use riparian vegetation along Pinto Creek both within and downstream of the analysis area as stop-over habitat during migration. No potential habitat for southwestern willow flycatchers along Pinto Creek would be directly affected by new surface disturbance under the no-action alternative.

Mine-related disturbances with the potential to affect migrating southwestern willow flycatchers include increased noise. The nature of effects on southwestern willow flycatchers may be similar to those described for birds above. Southwestern willow flycatchers migrating along Pinto Creek are not predicted to be exposed to average noise per hour above 60 A-weighted decibels for the duration of active operations under the no-action alternative. During active reclamation, a 0.3-mile stretch of Pinto Creek near Tailings Storage Facility No. 1/2 would be exposed to average noise per hour above 60 A-weighted decibels; however, this area does not contain riparian vegetation (U.S. Geological Survey 2004) and is unlikely to be used by willow flycatchers as a stop-over site.

Other impacts on migrating southwestern willow flycatchers that may occur under the no-action alternative include loss or degradation of potential stop-over sites along Pinto Creek on private and National Forest System lands as a result of 2 months of continued groundwater pumping at the start of the 6-month transition period following the record of decision. The resulting groundwater drawdown and associated baseflow reductions may contribute to the deterioration of riparian vegetation along Pinto Creek, which has experienced recent mortality and decline (Miller Ecological Consultants, Inc. 2011, 2019; also see section 3.3.3.1.3, "Plant Health"). Baseflow is predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases; however, affected riparian vegetation may only recover to existing conditions long after flows are restored and if other contributing factors do not limit the ability for riparian vegetation to recover. Possible seepage of contaminants from the Leach Piles and tailings storage facilities may also degrade riparian stop-over habitat within the analysis area.

Western Yellow-billed Cuckoo

Although the western yellow-billed cuckoo and its proposed critical habitat may experience negative effects under the no-action alternative, most effects resulting from the no-action alternative would be limited to those associated with 2 months of groundwater withdrawals at the beginning of the transition period. Due to the short-term duration of continued pumping, impacts of the no-action alternative on the western yellow-billed cuckoo and its critical habitat are anticipated to be minimal. Therefore, the no-action alternative may affect, but is not likely to adversely affect, the western yellow-billed cuckoo or its proposed critical habitat.

As described in section 3.3.3.3, "Special Status Species," although previous habitat assessments and surveys suggest that habitat for breeding western yellow-billed cuckoos does not occur within the analysis area, riparian vegetation along Pinto Creek provides short-term habitat for cuckoos during the breeding season and may be used as a movement corridor. No potential habitat for western yellow-billed cuckoos along Pinto Creek would be directly affected by new surface disturbance under the no-action alternative.

Mine-related disturbances with the potential to affect nonbreeding western yellow-billed cuckoos include increased noise. Potential effects on western yellow-billed cuckoos may be similar to those described for birds under “Fish and Wildlife – Noise.” Western yellow-billed cuckoos that occur along Pinto Creek are not predicted to be exposed to average noise per hour above 60 A-weighted decibels for the duration of active operations under the no-action alternative. During active reclamation, a 0.3-mile stretch of Pinto Creek north of Miller Gulch would be exposed to average noise per hour above 60 A-weighted decibels; however, this area does not contain riparian vegetation (U.S. Geological Survey 2004) and is unlikely to be used by yellow-billed cuckoos.

Other impacts on western yellow-billed cuckoos that may occur under the no-action alternative include loss or degradation of nonbreeding habitat along Pinto Creek on private and National Forest System lands as a result of 2 months of continued groundwater pumping at the start of the transition period. The resulting groundwater drawdown and associated baseflow reductions may contribute to the deterioration of riparian vegetation along Pinto Creek, which has experienced recent mortality and decline (Miller Ecological Consultants, Inc. 2011, 2019; also see section 3.3.3.1.3, “Plant Health”). Riparian vegetation declines beyond those that will result from existing groundwater withdrawals would be limited to those associated with 2 additional months of pumping at the beginning of the transition period. Potential seepage of contaminants from the Leach Piles and tailings storage facilities may also degrade western yellow-billed cuckoo habitat within the analysis area.

No surface disturbance would occur in critical habitat for western yellow-billed cuckoo. Approximately 244 acres and 31 acres of proposed critical habitat within units 26 and 29, respectively, would be affected by groundwater drawdown along Pinto Creek under the no-action alternative. Such deterioration could negatively affect two of the three physical or biological features of proposed critical habitat for western yellow-billed cuckoo: riparian woodlands and adequate prey base. The third physical or biological feature, hydrologic processes, could also be affected due to changes in the hydrologic regime that would lower the water table, reduce baseflow, and potentially reduce the extent of perennial reaches. However, hydrologic processes would likely recover to existing levels upon cessation of active mining, as post-mining flows are predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases. Effects on riparian woodlands and their dependent adequate prey base beyond those that will result from existing groundwater withdrawals would be limited to those associated with 2 months of pumping at the beginning of the transition period.

Gila Topminnow

Activities conducted under the no-action alternative would have no effect on the Gila topminnow or its habitat. The Gila topminnow does not currently occur within the analysis area and the likelihood of this species establishing new populations within analysis area drainages via natural dispersal during the analysis timeframe is speculative. At this time, there are no plans to introduce this species to the analysis area.

3.3.4.4.2 No-action Alternative Impacts on Bald and Golden Eagles

Golden Eagle

Although activities conducted under the no-action alternative may affect foraging golden eagles, the impacts are anticipated to be minimal because alternate foraging habitat occurs throughout the surrounding areas. The no-action alternative would not result in take of golden eagles as defined by the Bald and Golden Eagle Protection Act.

Under the no-action alternative, new surface disturbance would directly affect up to 367 acres of potential foraging habitat for golden eagles on private land. Areas affected by new surface disturbance would be rendered unsuitable for use by foraging eagles. Golden eagles may also be adversely affected by existing mine-related noise and traffic, which could cause them to avoid affected areas, a possibility suggested by studies of other avian species (Kaseloo and Tyson 2004). Project activities that reduce the abundance of mammalian prey species due to increased exposure to light and noise may adversely affect foraging opportunities within affected portions of the analysis area. Golden eagle nesting sites would not be affected, as none occur within portions of the analysis area subject to the aforementioned disturbances. Impacts on golden eagles from light, noise, and traffic would be generally be short term, occurring primarily during the first 2 months of the 6-month transition period, and, in the case of noise and traffic, during the active phases of reclamation. During reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. As vegetation becomes established, golden eagles and their prey may begin to use the disturbed areas.

Although not analyzed quantitatively, there is a possibility that golden eagles could be harmed by consumption of pit lake water due to its predicted pH, total dissolved solids, and sulfate. The potential for eagles to consume pit lake water in quantities that would result in harmful effects may be reduced by the predicted levels of total dissolved solids within the lake, which may cause the water to be unpalatable.

3.3.4.4.3 No-Action Alternative Impacts on Forest Service Sensitive Species

Allen’s Big-eared Bat, Pale Townsend’s Big-eared Bat, and Western Red Bat

Potential foraging areas and roost sites for big-eared bats occur throughout the analysis area and those affected by the no-action alternative represent a limited portion of that which is available. Potential foraging areas for western red bat are also abundant within the analysis area, while riparian vegetation suitable for roosting is less common. However, impacts on riparian vegetation that would occur as a result of the no-action alternative would only affect a small proportion of that which is available in the vicinity of the analysis area. Therefore, the no-action alternative may affect individual Allen’s big-eared bat, pale Townsend’s big-eared bat, and western red bats, but is not likely to result in a downward trend toward Federal listing or loss of viability.

The no-action alternative would result in up to 367 acres of new surface disturbance within potential foraging or roosting habitat for these three species of bats on private land. No known roost sites for either species of big-eared bat would be affected; however, sites not currently known may occur within mountainous areas that would be disturbed by the construction of new borrow sources. Any big-eared bats occupying roost sites scheduled for disturbance would need to evacuate the roost or be crushed by equipment or vehicles. The colony of pale Townsend’s big-eared bats that occurs within Arizona Pollutant Discharge Elimination System Outfall No. 005 would not be affected because this feature will remain in place throughout the analysis timeframe. Following mine closure, the walls of the Open Pit may provide additional roost sites for big-eared bats. Upon reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. As vegetation becomes established and the prey base increases (insects), Forest Service sensitive bats may begin to use the disturbed areas with greater frequency. However, any roost sites that may have been affected by new surface disturbance would not be restored. Riparian vegetation suitable for roosting western red bats may develop naturally over time if sufficient quantities of water are present along new or reconstructed drainages.

Reclamation of ponds and reservoirs may result in the loss of foraging areas and drinking sources used by Forest Service sensitive bats. Although bats are not among the wildlife groups considered to be most vulnerable to selenium poisoning (U.S. Environmental Protection Agency 2016), bats foraging at constructed ponds and reservoirs may be adversely affected by high selenium levels in insect prey. If bats were affected in this way, reclamation of these features would benefit bats by reducing their exposure to selenium-contaminated prey.

An ecological risk assessment prepared by SRK Consulting, Inc. (2019d) analyzed the potential for Allen's big-eared bats and western red bats to be harmed by constituents in the pit lake water following closure of the mine under alternative 1 and the proposed action. Although effects on pale Townsend's big-eared bat were not analyzed, this species is likely to experience similar effects to those experienced by Allen's big-eared bats. Pit lake characteristics under the no-action alternative are assumed to be comparable to alternative 1 for the purposes of this analysis. At the "No Observed Adverse Effects" level toxicity reference value, the only constituent for which harmful effects on bats could not be ruled out was aluminum. At the less conservative "Lowest Observed Adverse Effects" level, aluminum within the pit lake was predicted to be unlikely to cause harmful effects on bats. Potential harmful effects on bats that could result from drinking the pit lake water include impaired production of red blood cells, increased susceptibility to infection, delays in offspring maturation, decreases in offspring body weight, and decreased neurobehavioral performance as observed in other mammals (SRK Consulting, Inc. 2019c). Harmful effects may also result from consumption of pit lake water due to its predicted pH, total dissolved solids, and sulfate (SRK Consulting, Inc. 2019d). The potential for Forest Service sensitive bats to consume pit lake water in quantities that would result in harmful effects may be reduced by the predicted levels of total dissolved solids within the lake, which may cause the water to be unpalatable.

The operation of existing facilities may have some benefit to Forest Service sensitive bats, as artificial lighting has been shown to concentrate prey species for foraging bats (Fenton and Morris 1976). However, adverse impacts on bats as a result of nighttime lighting may include reduced feeding rates and activity, disturbed flight patterns, and commuting delay (Gaston et al. 2013). Both beneficial and adverse impacts on Forest Service sensitive bats due to artificial lighting would occur through the first 2 months of the transition period under the no-action alternative.

Forest Service sensitive bats may be adversely affected by the degradation of foraging or roosting sites along streams and springs on private and National Forest System lands as a result of 2 months of continued groundwater pumping at the start of the transition period. The resulting groundwater drawdown and associated baseflow reductions may reduce the availability of surface water and contribute to the deterioration of riparian vegetation along Pinto Creek, which has experienced recent mortality and decline (Miller Ecological Consultants, Inc. 2011, 2019; also see "Vegetation" – "Plant Health"). Baseflows would likely recover to existing levels upon cessation of active mining, as post-mining flows are predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases. Effects on riparian vegetation beyond those that will result from existing groundwater withdrawals are expected to be minor because they would be limited to the effects associated with 2 months of pumping at the beginning of the transition period. Potential seepage of contaminants from the Leach Piles and tailings storage facilities may also degrade foraging habitat for bats along Pinto Creek due to potential impacts on macroinvertebrate prey communities, which are described in the literature (Scannell and Jacobs 2001; Timpano et al. 2010; Parkhurst and Naddy 2012).

American Peregrine Falcon

Although activities conducted under the no-action alternative may affect foraging and nesting habitat for American peregrine falcons, alternate foraging and nesting habitat occurs throughout the surrounding areas. Therefore, the no-action alternative may affect individual American peregrine falcons, but is not likely to result in a downward trend toward Federal listing or loss of viability.

The no-action alternative would result in up to 367 acres of new surface disturbance within potential foraging habitat for peregrine falcon on private land. No known peregrine falcon nesting sites occur within the disturbance footprint; however, suitable cliffs and outcrops may be disturbed by excavation of new borrow sources, which constitutes approximately 357 acres of the estimated new disturbance on private land. During reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. As vegetation becomes established, peregrine falcons and their prey may begin to use the disturbed areas. However, any potential nesting sites that may have been affected by new surface disturbance would not be restored. Following mine closure, the walls of the Open Pit may provide roosting and nesting sites for falcons.

Peregrine falcons may also be adversely affected by continued mine-related noise, which could cause them to avoid affected areas as described for birds under “Fish and Wildlife – Noise.” Noise impacts would continue throughout the active phases of reclamation. Exposure to artificial nighttime lighting during the first 2 months of the of the 6-month transition period may adversely affect peregrine falcons via altered behavioral patterns or physiology as described for birds under “Fish and Wildlife – Artificial Nighttime Lighting.” Alternatively, peregrine falcons occurring in the vicinity of the mine may possess some tolerance to additional mine-related noise and lighting due to their current exposure to these disturbances and the species’ demonstrated ability to tolerate high levels of noise and light in urban settings. Project activities that reduce the abundance of avian and bat prey species due to increased exposure to light and noise would adversely affect foraging opportunities for peregrine falcons within affected portions of the analysis area. Artificial nighttime lighting may result in some benefit to peregrine falcons via increased abundance of bats, which may benefit from foraging opportunities at point light sources.

Peregrine falcons may be adversely affected by the degradation of foraging sites along Pinto Creek on private and National Forest System lands as a result of 2 months of continued groundwater pumping at the start of the 6-month transition period under the no-action alternative. The resulting groundwater drawdown and associated baseflow reductions may reduce the availability of surface water and contribute to the deterioration of riparian vegetation along Pinto Creek, which has experienced recent mortality and decline (Miller Ecological Consultants, Inc. 2011, 2019; also see “Vegetation” – “Plant Health”). This in turn may affect the availability of bat and avian prey along the creek. Baseflows are predicted to recover to existing levels upon cessation of active mining, as post-mining flows are predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases. Effects on riparian vegetation beyond those that will result from existing groundwater withdrawals are expected to be minor because they would be limited to the effects associated with 2 months of pumping at the beginning of the transition period. Potential seepage of contaminants from the Leach Piles and tailings storage facilities may also degrade peregrine falcon foraging habitat along Pinto Creek.

An ecological risk assessment prepared by SRK Consulting, Inc. (2019d) analyzed the potential for peregrine falcons to be harmed by constituents in the pit lake water following closure of the mine. Although not analyzed quantitatively, there is a possibility that peregrine falcons could be harmed by consumption of pit lake water due to its predicted pH, total dissolved solids, and sulfate. The potential for peregrine falcons to consume pit lake water in quantities that would result in harmful effects may be reduced by the predicted levels of total dissolved solids within the lake, which may cause the water to be unpalatable.

Bezy's Night Lizard

Rock crevice habitat within biotic communities and at elevations suitable for occupancy by Bezy's night lizard is common within the analysis area and throughout the species' range. Potential habitat affected by the no-action alternative represents a limited portion of that which is available. Therefore, the no-action alternative may affect individual Bezy's night lizards, but is not likely to result in a downward trend toward Federal listing or loss of viability.

The no-action alternative would result in up to 367 acres of new surface disturbance on private land within potential Bezy's night lizard habitat on private land. Areas affected by new surface disturbance would be rendered unsuitable for use by night lizards and any night lizards present when initial ground disturbance occurs would be at risk of being crushed by equipment or vehicles. During reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. However, the pre-mining topography, including rock outcropping, cliff faces, and boulder fields suitable for occupancy by Bezy's night lizard, would not be restored.

Night lizards occupying other portions of the mine site could be injured or killed by vehicles while crossing existing roadways. The risk of crushing by vehicles or equipment would be greatest during activities associated with new ground disturbance; however, vehicles that continue to operate within the mine site could injure or kill lizards through the end of the post-closure period.

Although the impacts of artificial night lighting on reptiles are not well studied, potential impacts on Bezy's night lizard that have been documented with other reptiles include altered behavioral patterns or physiology (Gaston et al. 2013). Under the no-action alternative, project-related impacts on Bezy's night lizard caused by artificial nighttime lighting would cease at the end of the 2 months of continued active operations.

Deposition of mine-derived dust may also affect this species by altering invertebrate prey communities (Farmer 1993). Effects of mine-derived dust are anticipated to be greatest on individuals closest to the source (Turner 2013). The impacts of elevated noise on reptiles are not well studied, but have the potential to alter behavioral patterns and hearing ability (Kaseloo and Tyson 2004). Deposition of mine-derived dust and noise impacts would continue throughout 2 months of active operations and the active phases of reclamation.

Lowland Leopard Frog

Although lowland leopard frogs may experience negative effects under the no-action alternative, most effects beyond those that will result from existing disturbances would be limited to those associated with 2 months of groundwater withdrawals at the beginning of the transition period. Due to the short-term duration of continued pumping, impacts of the no-action alternative on the lowland leopard frog are anticipated to be minimal. Therefore, the no-action alternative may affect individual lowland leopard frogs, but is not likely to result in a downward trend toward Federal listing or loss of viability.

Lowland leopard frogs that occur along the perennial streams or springs on private and National Forest System lands affected by groundwater drawdown would be adversely affected by 2 months of continued operation of the Peak Well field under the no-action alternative. The resulting groundwater drawdown and associated baseflow reductions may contribute to the reduced availability of surface water and the deterioration of riparian and aquatic habitat along Pinto Creek, which has experienced recent mortality and decline (Miller Ecological Consultants, Inc. 2011, 2019; also see "Vegetation" – "Plant Health"). Continued drying of Pinto Creek could result in indirect effects including additional loss of breeding pools, tadpole habitat, and foraging sites for lowland leopard frogs. Baseflows would likely recover to existing levels upon cessation of active mining, as post-mining flows are predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases. Therefore, impacts on lowland leopard frog habitat are anticipated to last for the 2 months of active mine operations, at which time aquatic habitat along the creek would begin to recover. Three perennial springs within the analysis area are predicted to dry due to reduced seepage from the tailings storage facilities after mine closure (SRK Consulting, Inc. 2020a), which could adversely affect lowland leopard frogs. Possible leaching of contaminants from the Leach Piles and tailings storage facilities may also further degrade aquatic and riparian habitat within the analysis area. Effects on riparian and aquatic habitat beyond those that will result from existing groundwater withdrawals are expected to be minor because they would be limited to the effects associated with 2 months of pumping at the beginning of the transition period. Known populations of lowland leopard frogs along Pinto Creek are not expected to be affected by mine-related noise or light, as these disturbances would generally not extend to the creek.

Existing constructed ponds and reservoirs within the mine site may also provide habitat for lowland leopard frogs, as evidenced by the two records of lowland leopard frogs from the vicinity of the Mine Reservoir. These features would be lost when they are subsumed by other mine facilities or removed during reclamation. However, although amphibians are not among the wildlife groups considered to be most vulnerable to selenium poisoning (U.S. Environmental Protection Agency 2016), lowland leopard frogs inhabiting constructed ponds and reservoirs may currently be adversely affected by high selenium levels. If leopard frogs were affected in this way, reclamation of these features may benefit them by removing potential sources of exposure. Frogs crossing roadways in the vicinity of the Mine Reservoir during dispersal or other activities would be at risk of being crushed by mine-related traffic along Bohme Ranch Road, which provides access to the Burch pipeline. If lowland leopard frogs were to occur in other constructed ponds and reservoirs within the Pinto Valley Mine project boundary, they would be subject to similar risks. Lowland leopard frogs occupying constructed ponds and reservoirs would also be subjected to mine-related noise and nighttime lighting. Impacts of noise and nighttime lighting on amphibians are not well studied, but exposure to both types of disturbance could result in altered behavioral patterns and physiology (Gaston et al. 2013; Kaseloo and Tyson 2004).

Desert Sucker

Within the analysis area, aquatic resources suitable for occupancy by desert sucker primarily occur along Pinto Creek. Although desert suckers may experience negative effects under the no-action alternative, most effects beyond those that will result from existing disturbances would be limited to those associated with 2 months of groundwater withdrawals at the beginning of the transition period. Due to the short-term duration of continued pumping, impacts of the no-action alternative on the desert sucker are anticipated to be minimal. Therefore, the no-action alternative may affect individual desert suckers, but is not likely to result in a downward trend toward Federal listing or loss of viability.

Desert suckers that occur within perennial streams or springs on private and National Forest System lands affected by groundwater drawdown could be adversely affected by 2 months of continued operation of the Peak Well field under the no-action alternative. The resulting groundwater drawdown and associated baseflow reductions may contribute to the reduced availability of surface water and the deterioration of riparian and aquatic habitat along Pinto Creek, which has experienced recent decline (Miller Ecological Consultants, Inc. 2011, 2019; also see “Vegetation” – “Plant Health”). Continued drying of the creek could result in loss of the perennial flows required by this species. Loss of perennial flows within portions of Pinto Creek would also create barriers to movement between areas of remaining habitat. Baseflows would likely recover to existing levels upon cessation of active mining, as post-mining flows are predicted to recover to 2013 levels during the first 10 years after groundwater pumping ceases. Therefore, associated impacts on desert suckers are anticipated to last for the 2 months of active mine operations under the no-action alternative, at which time aquatic habitat along the creek would begin to recover.

After the end of active mining, desert suckers within Pinto Creek may be exposed to high levels of total dissolved solids and sulfates originating from seepage from the tailings storage facilities and, to a lesser extent, from the Leach Piles and Arizona Pollutant Discharge Elimination System Outfall No. 005. Potential effects of exposure to high total dissolved solids reported in fish include reduced fertilization and hatching rates, extended developmental time, and toxicity to adult fish at concentrations above 2,000 milligrams per liter (Scannell and Jacobs 2001). Effects on the macroinvertebrate and aquatic plant communities may also affect fish via reduced food availability. Under the no-action alternative, effects resulting from tailings storage facility seepage would peak approximately 10 years after mine closure when the proportion of flow in Pinto Creek from this source is at its highest. Effects would then taper as seepage progressively decreases (appendix E, “Water Resources and Geochemistry Technical Report”).

Arizona Alum Root

Adverse impacts on Arizona alum root resulting from activities conducted under the no-action alternative are anticipated to be minimal because disturbance would be limited to dust deposition and short-term water withdrawals within small areas of potential habitat. Therefore, the no-action alternative may affect individual Arizona alum roots, but is not likely to result in a downward trend toward Federal listing or loss of viability.

No drainages, seeps, or riparian areas at elevations suitable for occupancy by Arizona alum root would be directly affected by surface disturbance from the no-action alternative. Potential Arizona alum root habitat occurs along several drainages that could be subject to groundwater drawdown and associated impacts on riparian habitat during the 2 months of active mining at the start of the transition period. Effects on potential Arizona alum root habitat beyond those that will result from existing groundwater withdrawals are expected to be minor because they would be limited to the effects associated with 2 months of pumping at the beginning of the transition period. Portions of these drainages are also close to facilities that would produce dust during either active operations or reclamation. Plants occurring along drainages within approximately 2,000 feet of dust-producing facilities could be adversely affected (Farmer 1993; Turner 2013) for the duration of active mine operations and active phases of reclamation. Because Tailings Storage Facility No. 4 is not anticipated to be a major source of dust during the active operation of the mine, most potential impacts on Arizona alum root habitat along Eastwater Canyon and an unnamed drainage north of Eastwater Canyon would occur during the 3 years of active reclamation of this tailings storage facility.

Mogollon Fleabane

Adverse impacts on Mogollon fleabane resulting from the no-action alternative are anticipated to be minimal, as impacts would be limited to those resulting from potential deposition of dust. Therefore, the no-action alternative may affect individual Mogollon fleabanes, but is not likely to result in a downward trend toward Federal listing or loss of viability.

Under the no-action alternative, no new surface disturbance would occur within areas suitable for Mogollon fleabane. Potential habitat for Mogollon fleabane occurs in the vicinity of the Open Pit and Castle Dome Marginal Dump, which are facilities that would produce dust during active operation or reclamation. Plants occurring within approximately 2,000 feet of dust-producing facilities could be adversely affected (Farmer 1993; Turner 2013) for the 2-month duration of active mine operations and active phases for reclamation.

3.3.4.4.4 No-action Alternative Impacts on Management Indicator Species

Of the seven vegetation types that occur within the analysis area, two vegetation types, pinyon-juniper grassland and desert communities, would not be affected by new surface disturbance or groundwater drawdown under the no-action alternative. Therefore, the no-action alternative is not anticipated to cause or contribute to declines in the four management indicator species associated with these vegetation types. Two of the vegetation types within the analysis area, pinyon-juniper chaparral and interior chaparral, and their seven associated management indicator species would be directly affected by surface disturbance on private land under the no-action alternative. The remaining three vegetation types within the analysis area, cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic, and their 10 associated management indicator species may be indirectly affected under the no-action alternative due to predicted groundwater drawdown and baseflow reductions, which may contribute to the reduced availability of surface water and the deterioration of riparian vegetation along Pinto Creek and other affected watercourses. Groundwater drawdown and baseflow reductions would affect both private and National Forest System lands.

Pinyon-Juniper Chaparral

New surface disturbance on private land under the no-action alternative would affect less of this vegetation type than would be affected under alternative 1. Because alternative 1 would affect only a small fraction of the pinyon-juniper chaparral vegetation available in the Globe Ranger District, the comparatively smaller impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Interior Chaparral

New surface disturbance on private land under the no-action alternative would affect less of this vegetation type than would be affected under alternative 1. Because alternative 1 would affect only a small fraction of the interior chaparral vegetation available in the Globe Ranger District, the comparatively smaller impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Cottonwood Willow Riparian Forest

An estimated 166.7 acres of cottonwood willow riparian forest on private and National Forest System lands may be indirectly affected by groundwater drawdown under the no-action alternative, which is approximately 12.4 fewer acres than under alternative 1. Groundwater drawdown under the no-action alternative may affect 2.3 percent of the 7,124.4 acres of cottonwood-willow riparian forest vegetation available in the Globe Ranger District. Because only a small fraction of this vegetation type may be affected, impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Mixed Broadleaf Deciduous Riparian Forest

Within the mixed broadleaf deciduous riparian forest vegetation type, 123.7 acres on private and National Forest System lands may be indirectly affected by groundwater drawdown under the no-action alternative, which is approximately 1.7 fewer acres than under alternative 1. Groundwater drawdown under the no-action alternative may affect 12.5 percent of the 988.3 acres of mixed-broadleaf deciduous riparian forest vegetation available in the Globe Ranger District. Because a relatively large fraction of this vegetation type may be affected, impacts that would occur under the no-action alternative may cause or contribute to declines in associated management indicator species.

Aquatic

Within the aquatic vegetation type, 5.49 miles of perennial streams on private and National Forest System lands would be indirectly affected by groundwater drawdown under the no-action alternative, which is approximately 0.18 mile less than under alternative 1. Groundwater drawdown under the no-action alternative would affect 10.79 percent of the 50.88 miles of the aquatic vegetation type (perennial streams) available in the Globe Ranger District. Because a relatively large fraction of this vegetation type would be affected, impacts that would occur under the no-action alternative may cause or contribute to declines in associated management indicator species.

3.3.4.4.5 No-action Alternative Impacts on Migratory Birds

As identified by equivalent geospatial data vegetation categories, two vegetation types that occur within the analysis area, Arizona upland Sonoran desertscrub and Sonoran riparian scrubland (dry wash), would not be affected by new surface disturbance or groundwater drawdown under the no-action alternative. Therefore, no impacts on these vegetation types would occur that might cause or contribute to declines in the associated migratory birds of concern. Three of the vegetation types within the analysis area, pinyon pine – juniper woodland, interior chaparral, and semiarid grassland, and their associated migratory birds would be directly affected by surface disturbance on private land under the no-action alternative. The remaining two vegetation types within the analysis area, mixed broadleaf deciduous riparian forest and cottonwood willow riparian forest, and their associated migratory birds may be indirectly affected under the no-action alternative due to predicted groundwater drawdown and baseflow reductions associated with the continued operation of the Peak Well field, which may contribute to the reduced availability of surface water and the deterioration of riparian vegetation along Pinto Creek and other affected watercourses. Groundwater drawdown and baseflow reductions would affect both private and National Forest System lands. In addition, small numbers of migrating waterfowl and other birds that use surface water features may be susceptible to adverse impacts including mortality from drinking water from the pit lake during periods of high physiological stress, such as migration.

Pinyon Pine – Juniper Woodland (Pinyon-Juniper Grassland, Pinyon-Juniper Chaparral)

New surface disturbance on private land under the no-action alternative would affect less of this vegetation type than would be affected under alternative 1. Because alternative 1 would affect only a small fraction of the pinyon pine – juniper woodland vegetation available in the Globe Ranger District, the comparatively smaller impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Chaparral: Shrub Live Oak, Manzanita, Mountain-mahogany, and Cliffrose (Interior Chaparral)

New surface disturbance on private land under the no-action alternative would affect less of this vegetation type than would be affected under alternative 1. Because alternative 1 would affect only a small fraction of the interior chaparral vegetation available in the Globe Ranger District, the comparatively smaller impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Semiarid Grassland Often with Scattered Sotol, Agaves, Burroweed, Snakeweed, Yucca, and Mesquite (Semi-Desert Grassland)

New surface disturbance on private land under the no-action alternative would affect less of this vegetation type than would be affected under alternative 1. Because alternative 1 would affect only a small fraction of the semiarid grassland vegetation available in the Globe Ranger District, the comparatively smaller impacts that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Riparian Deciduous Forests and Woodlands: Paloverde, Ironwood, Mesquite, Catclaw, Acacia, Saguaro, Cholla, Barrel Cactus, Prickly Pear, Creosote Bush, Jojoba, and Crucifixion Thorn (Mixed Broadleaf Deciduous Riparian Forest)

Within the interior riparian deciduous forests and woodlands vegetation type, 123.7 acres on private and National Forest System lands would be indirectly affected by groundwater drawdown under the no-action alternative, approximately 1.7 fewer acres than under alternative 1. Groundwater drawdown would affect 12.5 percent of the 988.3 acres of mixed-broadleaf deciduous riparian forest vegetation available in the Globe Ranger District. Because a relatively large fraction of this vegetation type would be affected, impacts that would occur under the no-action alternative may cause or contribute to declines in associated migratory birds of concern within the Globe Ranger District.

Sonoran Riparian Deciduous Forest and Woodlands: Primarily Cottonwood, Willow, Mesquite, Tamarisk (Salt Cedar), Some Ash, Walnut, and Hackberry (Cottonwood Willow Riparian Forest)

Within the Sonoran riparian deciduous forest and woodlands vegetation type, 166.7 acres on private and National Forest System lands would be indirectly affected by groundwater drawdown under the no-action alternative, approximately 12.4 fewer acres than under alternative 1. Groundwater drawdown under the no-action alternative would affect 2.3 percent of the 7,124.4 acres of cottonwood-willow riparian forest vegetation available in the Globe Ranger District. Because only a small fraction of this vegetation type would be affected, impacts on that would occur under the no-action alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

3.3.4.4.6 Alternative 1 Impacts on Threatened and Endangered Species

Ocelot

Similar to the no-action alternative, dispersing ocelots may be affected under alternative 1; however, effects are discountable because it is unlikely individuals would occur within the analysis area during the analysis timeframe. Therefore, alternative 1 may affect, but is not likely to adversely affect, the ocelot.

Effects on ocelots resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance on private land, an increase of 542 acres compared to the no-action alternative. This additional acreage of surface disturbance could further reduce the suitability of the analysis area for potentially dispersing ocelots, compared to the no-action alternative. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise, light, and human presence under the no-action alternative would be exposed to these disturbances under alternative 1.

The suitability of Pinto Creek as a potential dispersal corridor for ocelots would continue to diminish over the operational life of the mine from continued operation of the Peak Well field, which would reduce the likelihood of ocelots dispersing into the analysis area. Compared to the no-action alternative, operation of the Peak Well field during active mining operations would continue for approximately 7 years under alternative 1, potentially resulting in 7 additional years of contributions to vegetation declines and further delaying vegetation recovery.

Arizona Hedgehog Cactus

Similar to the no-action alternative, Arizona hedgehog cacti may be affected under alternative 1; however, effects are discountable because individuals are unlikely to occur within portions of the analysis area subject to relevant disturbances. Therefore, alternative 1 may affect, but is not likely to adversely affect, the Arizona hedgehog cactus.

Effects on the Arizona hedgehog cactus resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance on private land, an increase of 542 acres compared to the no-action alternative. With this larger area, additional potential Arizona hedgehog cactus habitat would be affected by surface disturbance within portions of the expansion footprints of Tailings Storage Facility No. 4, the Main Dump, and the Inert Limestone Stockpile. There is a limited possibility that surface-disturbing activities could crush individual Arizona hedgehog cacti within portions of the surveyed areas that could not be physically accessed or within approximately 184 acres of unsurveyed portions of the new surface disturbance footprint that contain suitable substrate, elevation, and geology.

Additionally, because the footprint of the mine would be 542 acres larger under alternative 1, some areas would be exposed to dust that would not be exposed under the no-action alternative. Impacts on the known population of Arizona hedgehog cactus in the southwestern corner of the analysis area would be as described under the no-action alternative; neither alternative is anticipated to affect this population.

Southwestern Willow Flycatcher

Similar to the no-action alternative, impacts on southwestern willow flycatcher under alternative 1 are anticipated to be minimal because they would be limited to a decline in the suitability of potential migratory stop-over sites in the vicinity of the Pinto Valley Mine. Therefore, alternative 1 may affect, but is not likely to adversely affect, the southwestern willow flycatcher.

Effects on southwestern willow flycatchers resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below. As under the no-action alternative, no southwestern willow flycatcher stop-over habitat would be affected by new surface disturbance. The nature of effects from noise would be minimal as described under the no-action alternative.

Six additional years of Peak Well field operation would result in additional impacts on southwestern willow flycatcher stop-over sites on private and National Forest System lands beyond those experienced under the no-action alternative. Impacts on riparian vegetation may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, “Water Resources and Geochemistry Technical Report”). Baseflows within an additional 0.19 mile of Pinto Creek would be affected as compared to the no-action alternative. Degradation of stop-over sites may be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Western Yellow-billed Cuckoo

The effects of alternative 1 on western yellow-billed cuckoos and their proposed critical habitat are anticipated to be greater than those that would occur under the no-action alternative, primarily due to potential effects of extended mine operation on riparian vegetation and baseflow. Alternative 1 may affect and is likely to adversely affect the western yellow-billed cuckoo. Alternative 1 is not likely to result in the destruction or adverse modification of proposed critical habitat for the western yellow-billed cuckoo.

Effects on western yellow-billed cuckoos and their proposed critical habitat on private and National Forest System lands resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below. As under the no-action alternative, no western yellow-billed cuckoo nonbreeding habitat or proposed critical habitat would be affected by new surface disturbance. The nature of effects from noise would be minimal as described under the no-action alternative.

Six additional years of Peak Well field operation would result in additional impacts on western yellow-billed cuckoo nonbreeding habitat and proposed critical habitat beyond those experienced under the no-action alternative. Impacts on riparian vegetation may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, "Water Resources and Geochemistry Technical Report"). Baseflows within an additional 0.18 mile of Pinto Creek would be affected as compared to the no-action alternative. Under alternative 1, 250 acres of proposed critical habitat within unit 26 and 50 acres within unit 29 would be affected by groundwater drawdown. The acreage affected within unit 26 and unit 29 would be, respectively, 6 acres and 19 acres greater compared to the no-action alternative. Degradation of nonbreeding habitat and proposed critical habitat may be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Gila Topminnow

As under the no-action alternative, activities conducted under alternative 1 would have no effect on the Gila topminnow or its habitat. The Gila topminnow does not currently occur within the analysis area and the likelihood of this species establishing new populations within analysis area drainages via natural dispersal during the analysis timeframe is speculative. At this time, there are no plans to introduce this species to the analysis area.

3.3.4.4.7 Alternative 1 Impacts on Bald and Golden Eagles

Golden Eagle

Due to the greater acreage of golden eagle foraging habitat that would be affected, effects of alternative 1 are anticipated to be greater than those that would occur under the no-action alternative. However, adverse impacts on golden eagles are anticipated to be minimal because alternate foraging habitat occurs throughout the surrounding areas. Similar to the no-action alternative, the proposed action would not result in take of golden eagles as defined by the Bald and Golden Eagle Protection Act.

Effects on golden eagles resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance to potential golden eagle foraging and nesting habitat on private land, an increase of 542 acres compared to the no-action alternative. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise and light under the no-action alternative would be exposed to these disturbances under alternative 1. Golden eagle nesting sites would not be affected, as none occur within portions of the analysis area subject to the aforementioned disturbances.

3.3.4.4.8 Alternative 1 Impacts on Forest Service Sensitive Species

Allen's Big-eared Bat, Pale Townsend's Big-eared Bat, and Western Red Bat

Although the effects of alternative 1 on Forest Service sensitive bats are anticipated to be greater than those that would occur under the no-action alternative, potential foraging areas and roost sites for big-eared bats occur throughout the analysis area and those affected by alternative 1 represent a limited portion of that which is available. Therefore, as under the no-action alternative, alternative 1 may affect individual Allen's and pale Townsend's big-eared bats but is not likely to result in a trend toward Federal listing or loss of viability. Potential foraging areas for western red bat are also abundant within the analysis area, while riparian vegetation suitable for roosting is less common. However, adverse impacts on riparian vegetation that would occur as a result of alternative 1 would only affect a small proportion of that which is available in the vicinity of the analysis area. Therefore, as under the no-action alternative, alternative 1 may affect western red bats but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on Forest Service Sensitive bats resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance to potential foraging or roosting habitat for bats on private land, an increase of 542 acres compared to the no-action alternative. Additional potential habitat for roosting western red bats would be removed along 0.5 mile of Gold Gulch and along 0.2 mile of Eastwater Canyon. Beneficial and adverse impacts on bats from nighttime lighting would affect additional areas as lighting shifts to accommodate facility expansions.

Loss or degradation of potential foraging habitat for all three Forest Service sensitive bats and potential roost sites for western red bat along Pinto Creek may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, "Water Resources and Geochemistry Technical Report"). Baseflows within an additional 0.19 mile of Pinto Creek would be affected as compared to the no-action alternative. Degradation of foraging habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

American Peregrine Falcon

Although the effects of alternative 1 on American peregrine falcons are anticipated to be greater than those that would occur under the no-action alternative, potential foraging areas and potential nest sites occur throughout the analysis area and those affected by alternative 1 represent a limited portion of that which is available. Therefore, as under the no-action alternative, alternative 1 may affect individual American peregrine falcons but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on American peregrine falcons resulting from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance to potential peregrine falcon foraging and nesting habitat on private land, an increase of 542 acres compared to the no-action alternative. No known peregrine falcon nesting sites occur within the footprint of additional disturbance associated with alternative 1; however, suitable cliffs and outcrops would be disturbed by construction of new facilities. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise and light under the no-action alternative would be exposed to these disturbances under alternative 1.

Loss or degradation of foraging habitat along Pinto Creek may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, “Water Resources and Geochemistry Technical Report”). Baseflows within an additional 0.18 mile of Pinto Creek would be affected as compared to the no-action alternative. Degradation of foraging habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Bezy’s Night Lizard

The effects of alternative 1 on Bezy’s night lizards are anticipated to be greater than those that would occur under the no-action alternative, because rock crevice habitat within biotic communities and at elevations suitable for occupancy by Bezy’s night lizard is common within the analysis area and throughout the species’ range. Potential habitat affected by alternative 1 represents a limited portion of that which is available. Therefore, alternative 1 may affect individual Bezy’s night lizards but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on Bezy’s night lizards resulting from alternative 1 would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Alternative 1 would result in 909 acres of new surface disturbance to potential Bezy’s night lizard habitat on private land, an increase of 542 acres compared to the no-action alternative. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise and light under the no-action alternative would be exposed to these disturbances under alternative 1.

Lowland Leopard Frog

The effects of alternative 1 on lowland leopard frogs are anticipated to be greater than those that would occur under the no-action alternative. Although lowland leopard frogs are known to occupy other aquatic features within the analysis area, Pinto Creek provides the majority of aquatic resources suitable for occupancy by lowland leopard frogs as evidenced by the fact that most analysis area records of lowland leopard frogs have occurred along this creek. However, impacts on Pinto Creek that would occur as a result of alternative 1 would only affect a small proportion of the available lowland leopard frog habitat in the vicinity of the analysis area. Therefore, as under the no-action alternative, alternative

1 may affect individual lowland leopard frogs but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on lowland leopard frogs from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Loss or degradation of lowland leopard frog habitat along Pinto Creek may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, “Water Resources and Geochemistry Technical Report”). Baseflows within an additional 0.18 mile of Pinto Creek would be affected as compared to the no-action alternative. Degradation of habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise and light under the no-action alternative would be exposed to these disturbances under alternative 1.

Desert Sucker

The effects of alternative 1 on desert suckers are anticipated to be greater than those that would occur under the no-action alternative. Within the analysis area, aquatic resources suitable for occupancy by desert sucker primarily occur within Pinto Creek. However, adverse impacts on Pinto Creek that would occur as a result of alternative 1 would only affect a small proportion of the available desert sucker habitat in the vicinity of the analysis area. Therefore, as under the no-action alternative, alternative 1 may affect individual desert suckers but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on desert suckers from alternative 1 would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Loss or degradation of desert sucker habitat in Pinto Creek may be more pronounced due to the longer timeframe of impacts and because baseflow is predicted to further decrease to 73 gallons per minute as compared to 97 gallons per minute at the end of active mining under the no-action alternative (appendix E, “Water Resources and Geochemistry Technical Report”). Baseflows within an additional 0.18 mile of Pinto Creek would be affected as compared to the no-action alternative. Desert suckers within Pinto Creek would be exposed to greater quantities of seepage with high total dissolved solids and sulfate from the tailings storage facilities than under the no-action alternative due to the larger footprint of these facilities.

Arizona Alum Root

Similar to the no-action alternative, impacts on Arizona alum root resulting from activities conducted under alternative 1 are anticipated to be minimal because disturbance would be limited to small areas of potential habitat. Therefore, as under the no-action alternative, activities conducted under alternative 1 may affect the Arizona alum root but are not likely to result in a trend toward Federal listing or loss of viability.

As under the no-action alternative, no drainages, seeps, or riparian areas at elevations suitable for occupancy by Arizona alum root would be directly affected by surface disturbance. Potential Arizona alum root habitat occurs along several drainages that could be subject to groundwater drawdown and are close to facilities that would produce dust during either active operations or reclamation; these areas would also be affected under the no-action alternative. The nature of impacts on Arizona alum root as a result of dust and groundwater drawdown would be as described under the no-action alternative, except that impacts from active mining operations would last approximately 7 more years and impacts experienced during reclamation would occur 7 years later.

Mogollon Fleabane

Due to the greater acreage of potential Mogollon fleabane habitat that would be affected by surface disturbance, effects of alternative 1 are anticipated to be greater than those that would occur under the no-action alternative. However, adverse impacts on Mogollon fleabane resulting from alternative 1 are anticipated to be minimal, as a limited acreage of potential habitat would be directly affected by surface disturbance and other impacts would be limited to those resulting from potential deposition of dust. Therefore, as under the no-action alternative, activities conducted under alternative 1 may affect Mogollon fleabane but are not likely to result in a trend toward Federal listing or loss of viability.

Under alternative 1, approximately 3 acres of vegetation with suitable geology and elevations for Mogollon fleabane on private land would be affected by the expansion of the Castle Dome Marginal Dump. These areas would not be affected under the no-action alternative. Any individual plants that were to occur within areas subject to new surface disturbance would be destroyed. Other potential habitat for Mogollon fleabane near the Open Pit and Castle Dome Marginal Dump would be exposed to dust for approximately 7 more years during active operation and 7 years later during reclamation.

3.3.4.4.9 Alternative 1 Impacts on Management Indicator Species

All five vegetation types affected by surface disturbance and groundwater drawdown under the no-action alternative—pinyon-juniper chaparral, interior chaparral, cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic—would also be affected under alternative 1. No additional vegetation types would be affected by new surface disturbance or groundwater drawdown under alternative 1; however, additional surface disturbance would occur beyond that which would occur under the no-action alternative and indirect impacts caused by groundwater withdrawals would last approximately 7 more years, after which time affected vegetation is anticipated to begin to regenerate. Vegetation types that would be directly or indirectly affected under alternative 1 and the anticipated impacts on management indicator species are described below.

Pinyon-juniper Chaparral

Within the pinyon-juniper chaparral vegetation type, 506.8 acres on private land would be affected by new surface disturbance under alternative 1. New surface disturbance under alternative 1 would affect 0.3 percent of the 192,781.8 acres of pinyon-juniper chaparral vegetation available in the Globe Ranger District. More of this vegetation type would be affected than under the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated management indicator species.

Interior Chaparral

Within the interior chaparral vegetation type, 96.5 acres on private land would be affected by new surface disturbance under alternative 1. New surface disturbance would directly remove habitat for two management indicator species. New surface disturbance under alternative 1 would affect 0.3 percent of the 34,893.9 acres of interior chaparral vegetation available in the Globe Ranger District. More of this vegetation type would be affected than under the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated management indicator species.

Cottonwood Willow Riparian Forest

Within the cottonwood willow riparian forest vegetation type, 179.1 acres on private and National Forest System lands may be indirectly affected by groundwater drawdown, 12.4 acres more than under the no-action alternative. Groundwater drawdown may affect 2.5 percent of the 7,124.4 acres of cottonwood-willow riparian forest vegetation available in the Globe Ranger District, 0.2 percent more than under the no-action alternative. Because only a small fraction of this vegetation type may be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated management indicator species.

Mixed Broadleaf Deciduous Riparian Forest

Within the mixed broadleaf deciduous riparian forest vegetation type, 125.4 acres on private and National Forest System lands may be indirectly affected by pumping of the Peak Well field, 1.7 acres more than under the no-action alternative. Groundwater drawdown would affect 12.7 percent of the 988.3 acres of mixed-broadleaf deciduous riparian forest vegetation available in the Globe Ranger District, 0.2 percent more than under the no-action alternative. Because a relatively large fraction of this vegetation type may be affected under both the no-action alternative and alternative 1, impacts that would occur under either alternative may cause or contribute to declines in associated management indicator species. However, declines would not be substantively greater under alternative 1.

Aquatic

Within the aquatic vegetation type, 5.68 miles of perennial streams on private and National Forest System lands would be indirectly affected by pumping of the Peak Well field, 0.18 mile more than under the no-action alternative. Groundwater drawdown would affect 11.16 percent of the 50.88 miles of the aquatic vegetation type (perennial streams) available in the Globe Ranger District, 0.37 percent more than the no-action alternative. Because a relatively large fraction of this vegetation type would be affected under both the no-action alternative and alternative 1, impacts that would occur under either alternative may cause or contribute to declines in associated management indicator species. However, declines would not be substantively greater under alternative 1.

3.3.4.4.10 Alternative 1 Impacts on Migratory Birds

All five vegetation types affected under the no-action alternative—pinyon pine-juniper woodland, interior chaparral, semiarid grassland, interior riparian deciduous forests and woodlands, and Sonoran riparian deciduous forest and woodlands—would also be affected under alternative 1. No additional vegetation types would be affected by new surface disturbance, which would occur on private land, or groundwater drawdown, which would affect resources on private and National Forest System land; however, additional surface disturbance would occur beyond that which would occur under the no-action alternative and indirect impacts caused by pumping would last approximately 7 more years, after which time affected vegetation is anticipated to begin to regenerate. Vegetation types that would be directly or indirectly affected under alternative 1 and the anticipated impacts on migratory birds of concern are described below. In addition, small numbers of migrating waterfowl and other birds that use surface water features may be susceptible to adverse impacts including mortality from drinking water from the pit lake during periods of high physiological stress, such as migration.

Pinyon Pine – Juniper Woodland (Pinyon-Juniper Grassland, Pinyon-Juniper Chaparral)

Within the pinyon-juniper woodland vegetation type, 506.8 acres on private land would be affected by new surface disturbance under alternative 1. New surface disturbance under alternative 1 would affect 0.2 percent of the 225,726.0 acres of pinyon pine – juniper woodland vegetation available in the Globe Ranger District. More of this vegetation type would be affected than under the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Chaparral: Shrub Live Oak, Manzanita, Mountain-mahogany, and Cliffrose (Interior Chaparral)

Within the interior chaparral vegetation type, 96.5 acres on private land would be affected by new surface disturbance under alternative 1. New surface disturbance under alternative 1 would affect 0.3 percent of the 34,893.9 acres of interior chaparral vegetation available in the Globe Ranger District. More of this vegetation type would be affected than under the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Semiarid Grassland Often with Scattered Sotol, Agaves, Burroweed, Snakeweed, Yucca, and Mesquite (Semi-Desert Grassland)

Within the semiarid grassland vegetation type, 90.2 acres on private land would be affected by new surface disturbance under alternative 1. New surface disturbance under alternative 1 would affect less than 0.1 percent of the 104,352.5 acres of semiarid grassland vegetation available in the Globe Ranger District. More of this vegetation type would be affected than under the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Riparian Deciduous Forests and Woodlands: Paloverde, Ironwood, Mesquite, Catclaw, Acacia, Saguaro, Cholla, Barrel Cactus, Prickly Pear, Creosote Bush, Jojoba, and Crucifixion Thorn (Mixed Broadleaf Deciduous Riparian Forest)

Within the interior riparian deciduous forests and woodlands vegetation type, 125.4 acres on private and National Forest System lands would be indirectly affected by groundwater drawdown, 1.7 acres more than under the no-action alternative. Groundwater drawdown would affect 12.7 percent of the 988.3 acres of the interior riparian deciduous forests and woodlands available in the Globe Ranger District, 0.2 percent more than the no-action alternative. Because a relatively large fraction of this vegetation type would be affected under both the no-action alternative and alternative 1, impacts that would occur under either alternative may cause or contribute to declines in associated migratory birds of concern within the Globe Ranger District. However, declines are not anticipated to be substantively greater under alternative 1.

Sonoran Riparian Deciduous Forest and Woodlands: Primarily Cottonwood, Willow, Mesquite, Tamarisk (Salt Cedar), Some Ash, Walnut, and Hackberry (Cottonwood Willow Riparian Forest)

Within the Sonoran riparian deciduous forest and woodlands vegetation type, 179.1 acres on private and National Forest System lands would be indirectly affected by groundwater drawdown, 12.4 acres more than under the no-action alternative. Groundwater drawdown would affect 2.5 percent of the 7,124.4 acres of the Sonoran riparian deciduous forest and woodlands available in the Globe Ranger

District, 0.2 percent more than the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under alternative 1 are not anticipated to cause or contribute to declines in associated migratory birds of concern.

3.3.4.4.11 Proposed Action Impacts on Threatened and Endangered Species

A biological assessment (Forest Service 2020b) was prepared for the proposed action as required by section 7 of the Endangered Species Act (see section 3.3.1, "Relevant Laws, Regulations, and Policy," for additional detail). Formal consultation was initiated between the Forest Service and U.S. Fish and Wildlife Service in February 2020 due to potential impacts on the western yellow-billed cuckoo. The U.S. Fish and Wildlife Service issued a biological and conference opinion for the proposed action in August 2020 (U.S. Fish and Wildlife Service 2020). This section discusses effects of the proposed action on listed species and provides the results of U.S. Fish and Wildlife Service consultation for each species and, when applicable, its critical habitat.

Ocelot

Similar to alternative 1 and the no-action alternative, dispersing ocelots may be affected under the proposed action but such effects are discountable because it is unlikely that an ocelot would occur within the analysis area during the analysis timeframe. The biological assessment determined that the proposed action may affect but is not likely to adversely affect the ocelot (Forest Service 2020b). The U.S. Fish and Wildlife Service concurred with this determination in the biological opinion (appendix D, "Biological Opinion").

Potential effects on ocelots resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, potential effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and potential effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. This additional acreage of surface disturbance could further reduce the suitability of the analysis area for potentially dispersing ocelots, compared to the other alternatives. Because the footprint of the mine would be larger under the proposed action, some areas would be exposed to noise, light, and human presence that would not be exposed to these disturbances under the other alternatives.

The suitability of Pinto Creek as a potential dispersal corridor for ocelots would continue to diminish over the operational life of the mine from continued operation of the Peak Well field. This would in turn reduce the likelihood of ocelots dispersing into the analysis area. Operation of the Peak Well field during active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative, resulting in additional years of contributions to vegetation declines and further delaying vegetation recovery.

Any ocelot potentially dispersing through the analysis area may be more likely to consume pit lake water under the proposed action because it is anticipated to contain lower levels of total dissolved solids (SRK Consulting, Inc. 2019d). Although the water may be more palatable, it is still predicted to exceed the threshold above which it is palatable to ocelots.

Arizona Hedgehog Cactus

Similar to the no-action alternative and alternative 1, Arizona hedgehog cacti may be affected under the proposed action; however, effects are discountable because individuals are unlikely to occur within portions of the analysis area subject to relevant disturbances. The biological assessment determined that the proposed action may affect but is not likely to adversely affect the Arizona hedgehog cactus (Forest Service 2020b). The U.S. Fish and Wildlife Service concurred with this determination in the biological opinion (appendix D, “Biological Opinion”).

Effects on Arizona hedgehog cacti resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance including 1,087 acres on private land and 229 acres on National Forest System lands. Under the proposed action, the expansion of Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, and the Open Pit would affect potential Arizona hedgehog cactus habitat not affected under the other alternatives. Under the proposed action, 235 acres of unsurveyed area containing suitable substrate, elevation, and geology would be subject to surface disturbance, approximately 51 more acres than under alternative 1. In the unlikely event that Arizona hedgehog cacti occur within the footprint of new surface disturbance, individuals could be crushed during construction of new facilities.

Similarly, because the footprint of the mine would be largest under the proposed action, some areas would be exposed to dust that would not be exposed under other alternatives. Impacts on the known population of Arizona hedgehog cactus in the southwestern corner of the analysis area would be as described under the other alternatives; none of the three alternatives is anticipated to affect this population.

Southwestern Willow Flycatcher

Similar to alternative 1 and the no-action alternative, impacts on southwestern willow flycatcher under the proposed action are anticipated to be minimal because they would be limited to a decline in the suitability of potential migratory stop-over sites in the vicinity of the Pinto Valley Mine. The biological assessment determined that the proposed action may affect, but is not likely to adversely affect, the southwestern willow flycatcher (Forest Service 2020b). The U.S. Fish and Wildlife Service concurred with this determination in the biological opinion (appendix D, “Biological Opinion”).

Effects on southwestern willow flycatchers resulting from the proposed action would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below. As under the other alternatives, no southwestern willow flycatcher stop-over habitat would be affected by new surface disturbance. The nature of effects from noise would be minimal as described under the other alternatives.

The extended timeframe of operation of the Peak Well field would result in additional impacts on southwestern willow flycatcher stop-over sites beyond those experienced under alternative 1 and the no-action alternative. Impacts on riparian vegetation may be more pronounced due to the longer timeframe of impacts on flows in Pinto Creek. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more riparian vegetation along Pinto Creek than alternative 1 and 0.37 mile more vegetation than the no-action alternative. Degradation of stop-over sites may be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4 as compared to the other alternatives.

Western Yellow-billed Cuckoo

The effects of the proposed action on western yellow-billed cuckoos and their proposed critical habitat are anticipated to be greater than those of the no-action alternative and alternative 1. The biological assessment determined that the proposed action may affect and is likely to adversely affect the western yellow-billed cuckoo. The proposed action is not likely to result in the destruction or adverse modification of proposed critical habitat for the western yellow-billed cuckoo (Forest Service 2020d). Formal consultation was initiated between the Forest Service and U.S. Fish and Wildlife Service in February 2020. The U.S. Fish and Wildlife Service issued a biological and conference opinion for the proposed action in August 2020 that concluded that the proposed action is not likely to jeopardize the continued existence of the western yellow-billed cuckoo, and is not likely to destroy or adversely modify its proposed critical habitat (U.S. Fish and Wildlife Service 2020). The U.S. Fish and Wildlife Service does not anticipate the proposed action will result in the incidental take[45] of any western yellow-billed cuckoos (U.S. Fish and Wildlife Service 2020).

Disturbances resulting from the proposed action with the potential to affect western yellow-billed cuckoos include noise, water withdrawals, and contamination of water resources. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below. As under the no-action alternative and alternative 1, no western yellow-billed cuckoo nonbreeding habitat or proposed critical habitat would be affected by new surface disturbance. The nature of effects from noise would be minimal as described for the other alternatives.

The extended timeframe of operation of the Peak Well field would result in additional impacts on western yellow-billed cuckoos and their proposed critical habitat beyond those experienced under alternative 1 and the no-action alternative. Impacts on riparian vegetation are anticipated to be the most pronounced due to the longer timeframe of impacts on flows in Pinto Creek, further prolonging potential impacts on proposed critical habitat and delaying recovery of affected physical and biological features. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more riparian vegetation along Pinto Creek than alternative 1 and 0.37 mile more vegetation than the no-action alternative. Under the proposed

[45] "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Incidental take is not considered to be prohibited under the Endangered Species Act provided it is done in compliance with the terms and conditions of an incidental take statement (U.S. Fish and Wildlife Service 2020).

action, 254 acres within proposed critical habitat unit 26 and 54 acres within unit 29 would be affected by groundwater drawdown. The acreage affected within proposed critical habitat unit 26 and unit 29 would both be 4 acres greater than under alternative 1 and, respectively, 10 acres and 23 acres greater than under the no-action alternative. Degradation of nonbreeding habitat and proposed critical habitat may be the most pronounced under the proposed action due to greater volumes of seepage from Tailings Storage Facility No. 4.

Gila Topminnow

As under the no-action alternative and alternative 1, activities conducted under the proposed action would have no effect on the Gila topminnow or its habitat. The biological assessment determined that the proposed action would have no effect on the Gila topminnow (Forest Service 2020b). No effect determinations do not require U.S. Fish and Wildlife Service review.

The Gila topminnow does not currently occur within the analysis area and the likelihood of this species establishing new populations within analysis area drainages via natural dispersal during the analysis timeframe is speculative. At this time, there are no plans to introduce this species to the analysis area. Therefore, activities associated with the Pinto Valley Mine are not expected to affect the Gila topminnow or its habitat under any alternative.

3.3.4.4.12 Proposed Action Impacts on Bald and Golden Eagles

Golden Eagle

Although the effects of the proposed action on golden eagles are anticipated to be greater than those that would occur under the no-action alternative and alternative 1, the impacts are anticipated to be minimal because alternate foraging habitat occurs throughout the surrounding areas. As under the no-action alternative and alternative 1, the proposed action would not result in take of golden eagles as defined by the Bald and Golden Eagle Protection Act.

Effects on golden eagles resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance to golden eagle foraging habitat including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. Increased sound levels associated with blasting events east of the existing pit would occur only under the proposed action. Golden eagles may avoid additional areas east of the existing Open Pit as a result of this activity. Additionally, because the footprint of the mine would be largest under the proposed action, some areas that would not be exposed to noise and light under the other alternatives would be exposed to these disturbances under the proposed action. Golden eagle nesting sites would not be affected under any alternative, as none are known to occur within portions of the analysis area subject to project-related disturbances. Golden eagles may be more likely to consume pit lake water under the proposed action because it is predicted to contain lower levels of total dissolved solids than under alternative 1 and the no-action alternative (SRK Consulting, Inc. 2019d). Although the water may be more palatable under the proposed action, it is still predicted to exceed the threshold above which palatability is reduced.

3.3.4.4.13 Proposed Action Impacts on Forest Service Sensitive Species

Allen's Big-eared Bat, Pale Townsend's Big-eared Bat, and Western Red Bat

Although the effects of the proposed action on Forest Service sensitive bats are anticipated to be greater than those that would occur under alternative 1 and the no-action alternative, potential foraging areas and roost sites for big-eared bats occur throughout the analysis area and those affected by the proposed action represent a limited portion of that which is available. Therefore, as under the other two alternatives, the proposed action may affect individual Allen's and pale Townsend's big-eared bats but is not likely to result in a trend toward Federal listing or loss of viability. Potential foraging areas for western red bat are also abundant within the analysis area, while riparian vegetation suitable for roosting is less common. However, impacts on riparian vegetation that would occur as a result of the proposed action would affect a small proportion of that which is available in the vicinity of the analysis area. Therefore, as under the other two alternatives, the proposed action may affect individual western red bats but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on Forest Service Sensitive bats resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance to potential foraging or roosting habitat for Forest Service sensitive bats including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. An additional 0.4 mile of potentially suitable riparian habitat for roosting western red bats would be removed along Eastwater Canyon that would not be removed under alternative 1. As compared to the no-action alternative, 0.6 mile more potential western red bat habitat would be removed along Eastwater Canyon and 0.5 mile more habitat would be removed along Gold Gulch. Beneficial and adverse impacts on bats from nighttime lighting would affect additional areas as lighting shifts to accommodate facility expansions.

Loss or degradation of potential foraging habitat for all three Forest Service sensitive bats and potential roost sites for western red bat along Pinto Creek may be the most pronounced of the three alternatives due to the longer timeframe of impacts on baseflow. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining under the proposed action. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more bat habitat along Pinto Creek than alternative 1 and 0.37 mile more bat habitat than the no-action alternative. Degradation of foraging habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Bats may be more likely to consume pit lake water under the proposed action because it is predicted to contain lower levels of total dissolved solids. Although the water may be more palatable, it is still predicted to exceed the threshold above which it is palatable to bats.

American Peregrine Falcon

Although the effects of the proposed action on American peregrine falcons are anticipated to be greater than those that would occur under alternative 1 and the no-action alternative, potential foraging areas and potential nest sites occur throughout the analysis area and those affected by the proposed action represent a limited portion of that which is available. Therefore, as under other two alternatives, the proposed action may affect individual American peregrine falcons but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on American peregrine falcons resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance to potential peregrine falcon foraging and nesting habitat including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. Peregrine falcons may avoid additional areas east of the existing Open Pit through the end of active mining operations as a result of increased noise due to blasting east of the existing Open Pit. Additionally, because the footprint of the mine would be largest under the proposed action, some areas that would not be exposed to noise and light under the other alternatives would be exposed to these disturbances under the proposed action.

Loss or degradation of potential foraging habitat for peregrine falcons along Pinto Creek may be the most pronounced of the alternatives due to the longer timeframe and magnitude of impacts on baseflow. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining under the proposed action. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more foraging habitat along Pinto Creek than alternative 1 and 0.37 mile more foraging habitat along Pinto Creek than the no-action alternative. Degradation of foraging habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Peregrine falcons may be more likely to consume pit lake water under the proposed action because it is predicted to contain lower levels of total dissolved solids. Although the water may be more palatable, it is still predicted to exceed the threshold above which it is palatable to peregrine falcons.

Bezy's Night Lizard

The effects of the proposed action on Bezy's night lizard are anticipated to be greater than those that would occur under alternative 1 and the no-action alternative, because rock crevice habitat within biotic communities and at elevations suitable for occupancy by Bezy's night lizard is common within the analysis area and throughout the species' range. Potential habitat affected by the proposed action represents a limited portion of that which is available. Therefore, as under the other two alternatives, the proposed action may affect individual Bezy's night lizards but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on Bezy's night lizards resulting from the proposed action would be similar in nature to those described under the no-action alternative. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

The proposed action would result in 1,317 acres of new surface disturbance to potential Bezy's night lizard habitat including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. Under the proposed action, 408 more acres of potential foraging habitat for Bezy's night lizard would be subjected to new surface disturbance compared to under alternative 1, including 229 acres on National Forest System lands. Approximately 950 more acres would be subjected to new surface disturbance than under the no-action alternative. Increased sound levels associated with blasting events east of the existing pit would occur only under the proposed action. Although the impacts of elevated noise on reptiles are not well studied, night lizards occupying areas exposed to additional noise from blasting east of the pit could be adversely affected by resulting behavioral or physiological changes such as those described for vehicular noise in other reptile species (Kaseloo and Tyson 2004). Additionally, because the footprint of the mine would be largest under the proposed action, some areas that would not be exposed to noise and light under the other alternatives would be exposed to these disturbances under the proposed action.

Lowland Leopard Frog

Effects of the proposed action on lowland leopard frogs are anticipated to be greater than those that would occur under alternative 1 and the no-action alternative. Although lowland leopard frogs are known to occupy other aquatic features within the analysis area, Pinto Creek provides the majority of aquatic resources suitable for occupancy by lowland leopard frogs as evidenced by the fact that most analysis area records of lowland leopard frogs have occurred along this creek. Adverse impacts on Pinto Creek that would occur as a result of the proposed action would affect a small proportion of the available lowland leopard frog habitat in the vicinity of the analysis area. Therefore, as under the other two alternatives, the proposed action may affect individual lowland leopard frogs but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on lowland leopard frogs resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Loss or degradation of lowland leopard frog habitat along Pinto Creek may be the most pronounced of the alternatives due to the longer timeframe of impacts on baseflow. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining under the proposed action. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more habitat along Pinto Creek than alternative 1 and 0.37 mile more habitat along Pinto Creek than the no-action alternative. Degradation of habitat along Pinto Creek may also be more pronounced due to greater volumes of seepage from Tailings Storage Facility No. 4.

Impacts on lowland leopard frogs using constructed ponds and reservoirs would be similar under all three alternatives, except some storm water ponds on National Forest System lands would be subsumed by the eastward expansion of the Open Pit; this would likely occur before the date the ponds would have been reclaimed under the no-action alternative. Additionally, because the footprint of the mine would be largest under the proposed action, some areas that would not be exposed to noise and light under the other alternatives would be exposed to these disturbances under the proposed action.

Desert Sucker

Effects of the proposed action on desert suckers are anticipated to be greater than those that would occur under alternative 1 and the no-action alternative. Within the analysis area, aquatic resources suitable for occupancy by desert sucker primarily occur within Pinto Creek. Adverse impacts on Pinto Creek that would occur as a result of the proposed action would affect a small proportion of the available desert sucker habitat in the vicinity of the analysis area. Therefore, as under the other two alternatives, the proposed action may affect individual desert suckers but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on desert suckers resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Loss or degradation of desert sucker habitat within Pinto Creek may be the most pronounced of the alternatives due to the longer timeframe of impacts on baseflow. Similar to alternative 1, baseflow in Pinto Creek under the proposed action is predicted to decrease to 73 gallons per minute during the first 6 years of active mining under the proposed action. Baseflow is then predicted to increase to a maximum of 162 gallons per minute over the remaining duration of active mining, which is lower than the 188 gallons per minute experienced in 2018 and the 2013 rate of 1,070 gallons per minute. Groundwater drawdown would affect 0.18 mile more habitat along Pinto Creek than alternative 1 and 0.37 mile more habitat along Pinto Creek than the no-action alternative. Under the proposed action, desert suckers within Pinto Creek would be exposed to greater quantities of seepage with high total dissolved solids and sulfate from the tailings storage facilities than under the no-action alternative or alternative 1.

Arizona Alum Root

Similar to the other alternatives, adverse impacts on Arizona alum root resulting from the proposed action are anticipated to be minimal because they would not affect known populations and disturbance would be limited to small areas of the potential habitat. Therefore, as under the other two alternatives, the proposed action may affect the Arizona alum root but is not likely to result in a trend toward Federal listing or loss of viability.

Effects on Arizona alum root resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively. Other differences in the location, duration, and magnitude of disturbances and effects are described below.

Under the proposed action, additional potential Arizona alum root habitat along 0.3 mile of Eastwater Canyon and 0.3 mile of an unnamed drainage north of Eastwater Canyon would be subsumed by the southeastward expansion of Tailings Storage Facility No. 4 onto National Forest System lands. If Arizona alum roots were to occur within the footprint of this new surface disturbance, they could be crushed during construction of new facilities. Dust-related effects on Arizona alum root habitat along Eastwater Canyon and the unnamed drainage north of Eastwater Canyon would occur farther southeast. Due to a bend in Eastwater Canyon, approximately 1,700 additional feet of potential habitat within Eastwater Canyon would be exposed to dust deposition under the proposed action as compared to the other two alternatives.

Mogollon Fleabane

Due to the greater acreage of potential Mogollon fleabane habitat that would be affected by surface disturbance, effects of the proposed action are anticipated to be greater than those that would occur under the no-action alternative and alternative 1. However, adverse impacts on Mogollon fleabane resulting from the proposed action are anticipated to be minimal because a limited acreage of potential habitat would be directly affected by surface disturbance and other impacts would be limited to those resulting from deposition of dust. Therefore, as under the other two alternatives, the proposed action may affect Mogollon fleabane but is not likely to result in a trend toward Federal listing or loss of viability.

Under the proposed action, approximately 11 additional acres of potential Mogollon fleabane habitat would be affected by the eastward expansion of the Open Pit, including 8 acres on National Forest System land. Any individual plants that were to occur within areas subject to new surface disturbance would be destroyed. Potential habitat near the Castle Dome Marginal Dump and the Open Pit that would be affected by dust under the other alternatives would not be affected by dust under the proposed action because all potential habitat in these areas would be directly affected by surface disturbance.

3.3.4.4.14 Proposed Action Impacts on Management Indicator Species

All five vegetation types affected under the no-action alternative and alternative 1—pinyon-juniper chaparral, interior chaparral, cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic—would also be affected under the proposed action. No additional vegetation types would be affected by new surface disturbance or groundwater drawdown under the proposed action. However, additional surface disturbance would occur beyond that which would occur under the other alternatives. Indirect impacts caused by groundwater withdrawals would last approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate. Vegetation types that would be directly or indirectly affected under the proposed action and the anticipated impacts on management indicator species are described below.

Pinyon-juniper Chaparral

Within the pinyon-juniper chaparral vegetation type, 810.4 acres would be affected by new surface disturbance, 165.5 acres of which occur on National Forest System lands. Surface disturbance would affect 303.6 more acres of this vegetation type than would be affected under alternative 1, which would in turn affect more acreage than the no-action alternative. Additional new surface disturbance under the proposed action would affect 0.1 percent more (0.4 percent overall) of the 192,781.8 acres of pinyon-juniper chaparral vegetation available in the Globe Ranger District than would be affected under alternative 1, which would in turn affect a slightly higher percentage than the no-action alternative.

Because only a small additional fraction of this vegetation type would be affected, impacts on this vegetation type that would occur under any alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Interior Chaparral

Within the interior chaparral vegetation type, 177.8 acres would be affected by new surface disturbance, 39.4 acres of which occur on National Forest System lands. Surface disturbance would affect 81.3 more acres of this vegetation type than would be affected under alternative 1, which would in turn affect more acreage than the no-action alternative. Additional new surface disturbance under the proposed action would affect 0.2 percent more (0.5 percent overall) of the 34,893.9 acres of interior chaparral vegetation available in the Globe Ranger District than would be affected under alternative 1, which would in turn affect a slightly higher percentage than the no-action alternative. Because only a small additional fraction of this vegetation type would be affected, impacts on this vegetation type that would occur under any alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Cottonwood Willow Riparian Forest

Within the cottonwood willow riparian forest vegetation type, 179.6 acres on private and National Forest System lands may be affected by pumping of the Peak Well field under the proposed action. Groundwater drawdown may affect 0.5 more acre of this vegetation type than may be affected under alternative 1 and 12.9 more acres than may be affected under the no-action alternative. Groundwater drawdown may affect less than 0.1 percent more (2.6 percent overall) of the 7,124.4 acres of cottonwood-willow riparian forest vegetation available in the Globe Ranger District as compared to alternative 1 and an additional 0.2 percent as compared to the no-action alternative. However, the entire area of cottonwood-willow riparian forest affected under the proposed action would continue to be affected for approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative. Because only a small fraction of this vegetation type may be affected, impacts that would occur under any alternative are not anticipated to cause or contribute to declines in associated management indicator species.

Mixed Broadleaf Deciduous Riparian Forest

Within the mixed broadleaf deciduous riparian forest vegetation type, 126.1 acres on private and National Forest System lands may be affected by groundwater drawdown under the proposed action. Groundwater drawdown may affect 0.7 more acre of this vegetation type than may be affected under alternative 1 and 2.4 more acres than may be affected under the no-action alternative.

Groundwater drawdown may affect an additional 0.1 percent of the 988.3 acres of mixed broadleaf deciduous riparian forest vegetation available in the Globe Ranger District as compared to alternative 1 and an additional 0.2 percent as compared to the no-action alternative. However, the entire area of mixed broadleaf deciduous riparian forest vegetation affected under the proposed action would continue to be affected for approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative.

Because a relatively large fraction of this vegetation type may be affected (12.8 percent overall), impacts that would occur under the proposed action may cause or contribute to declines in associated management indicator species. However, declines are anticipated to be comparable to those that would occur under either of the other alternatives.

Aquatic

Within the aquatic vegetation type, 5.86 miles of perennial streams on private and National Forest System lands would be affected by groundwater drawdown under the proposed action. Groundwater drawdown would affect 0.18 mile more perennial streams than would be affected under alternative 1 and 0.37 mile more streams than would be affected under the no-action alternative. Groundwater drawdown under the proposed action would affect an additional 0.38 percent of the 50.88 miles of perennial streams available in the Globe Ranger District as compared to alternative 1 and an additional 0.74 percent as compared to the no-action alternative. However, the entire length of perennial streams affected under the proposed action would be affected for an approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative. Because a relatively large fraction of this vegetation type would be affected (11.53 percent overall), impacts that would occur under the proposed action may cause or contribute to declines in associated management indicator species. However, declines are anticipated to be comparable to those that would occur under either of the other alternatives.

3.3.4.4.15 Proposed Action Impacts on Migratory Birds

All five vegetation types affected under the other alternatives—pinyon pine-juniper woodland, interior chaparral, semiarid grassland, interior riparian deciduous forests and woodlands, and Sonoran riparian deciduous forest and woodlands—would also be affected under the proposed action. No additional vegetation types would be affected by new surface disturbance or groundwater drawdown under the proposed action. However, additional surface disturbance would occur beyond that which would occur under the other alternatives. Indirect impacts caused by pumping would last approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate. Vegetation types that would be directly or indirectly affected under the proposed action and the anticipated impacts on migratory birds of concern are described below. In addition, small numbers of migrating waterfowl and other birds that use surface water features may be susceptible to adverse impacts including mortality from drinking water from the pit lake during periods of high physiological stress, such as migration.

Pinyon Pine – Juniper Woodland (Pinyon-Juniper Grassland, Pinyon-Juniper Chaparral)

Within the pinyon-juniper woodland vegetation, 810.4 acres would be affected by new surface disturbance, 165.5 acres of which occur on National Forest System lands. Surface disturbance would affect 303.6 more acres of this vegetation type than would be affected under alternative 1, which would in turn affect more acreage than the no-action alternative. New surface disturbance under the proposed action would affect 0.4 percent of the 225,726.0 acres of pinyon pine – juniper woodland vegetation available in the Globe Ranger District, 0.2 percent more than would be affected under alternative 1, which would in turn would affect a slightly higher percentage than the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts on this vegetation type that would occur under any alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Chaparral: Shrub Live Oak, Manzanita, Mountain-mahogany, and Cliffrose (Interior Chaparral)

Within the interior chaparral vegetation type, 177.8 acres would be affected by new surface disturbance, 39.4 acres of which occur on National Forest System lands. Surface disturbance would affect 81.3 more acres of this vegetation type than would be affected under alternative 1, which would in turn affect more acreage than the no-action alternative. New surface disturbance under the proposed action would affect 0.5 percent of the 34,893.9 acres of interior chaparral vegetation available in the

Globe Ranger District, 0.2 percent more than would be affected under alternative 1, which would in turn affect a slightly higher percentage than the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under any alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Semiarid Grassland Often with Scattered Sotol, Agaves, Burroweed, Snakeweed, Yucca, and Mesquite (Semi-Desert Grassland)

Within semiarid grassland vegetation type, 90.5 acres would be affected by new surface disturbance, 0.3 acre of which occurs on National Forest System lands. Surface disturbance would affect 0.3 more acre of this vegetation type than would be affected under alternative 1, which would in turn affect more acreage than the no-action alternative. Similar to alternative 1 and the no-action alternative, new surface disturbance under the proposed action would affect less than 0.1 percent of the 104,352.5 acres of semiarid grassland vegetation available in the Globe Ranger District. Because only a small fraction of this vegetation type would be affected, impacts that would occur under any alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

Interior Riparian Deciduous Forests and Woodlands: Paloverde, Ironwood, Mesquite, Catclaw, Acacia, Saguaro, Cholla, Barrel Cactus, Prickly Pear, Creosote Bush, Jojoba, and Crucifixion Thorn (Mixed Broadleaf Deciduous Riparian Forest)

Within the interior riparian deciduous forests and woodlands vegetation type, 126.1 acres on private and National Forest System lands would be affected by pumping of the Peak Well field. Groundwater drawdown would affect 0.7 more acre of this vegetation type than would be affected under alternative 1 and 2.4 more acres than would be affected under the no-action alternative. Groundwater drawdown would affect 12.8 percent of the 988.3 acres of the interior riparian deciduous forests and woodlands available in the Globe Ranger District, 0.1 percent more than alternative 1 and 0.2 percent more than the no-action alternative. However, the entire area of interior riparian deciduous forests and woodlands affected under the proposed action would continue to be affected for approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative. Because a relatively large fraction of this vegetation type would be affected, impacts that would occur under the proposed action may cause or contribute to declines in associated migratory birds of concern within the Globe Ranger District. However, declines are not anticipated to be not be substantially greater than those that would occur under either of the other alternatives.

Sonoran Riparian Deciduous Forest and Woodlands: Primarily Cottonwood, Willow, Mesquite, Tamarisk (Salt Cedar), Some Ash, Walnut, and Hackberry (Cottonwood Willow Riparian Forest)

Within the Sonoran riparian deciduous forest and woodlands vegetation type, 179.6 acres on private and National Forest System lands would be affected by groundwater drawdown. Groundwater drawdown would affect 0.5 more acre of this vegetation type than would be affected under alternative 1 and 12.9 more acres than would be affected under the no-action alternative. Groundwater drawdown would affect 2.5 percent of the 7,124.4 acres of the Sonoran riparian deciduous forest and woodlands available in the Globe Ranger District, 0.1 percent more than alternative 1 and 0.2 percent more than the no-action alternative. However, the entire area of Sonoran riparian deciduous forest and woodlands affected under the proposed action would continue to be affected for approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative. Because only a small fraction of this vegetation type would be affected, impacts that would occur under any alternative are not anticipated to cause or contribute to declines in associated migratory birds of concern.

3.3.4.5 **Cumulative Impacts**

The cumulative impacts analysis area for vegetation, wildlife, fish, and special status species includes past, ongoing, and reasonably foreseeable actions that contribute to biologically relevant disturbance within the Globe Ranger District of the Tonto National Forest. The Globe Ranger District encompasses approximately 471,091 acres and was selected as the cumulative impacts analysis area because biological resources on the Tonto National Forest are managed at the district level and biologically relevant disturbances associated with the proposed action would occur within this district. Biologically relevant disturbances that would occur under the proposed action include surface disturbance, traffic, artificial nighttime lighting, dust, noise, and water withdrawals and contamination. Effects of these disturbances on wildlife, fish, and special status species under the no-action alternative, alternative 1, and the proposed action are described in detail in section 3.3.4, "Environmental Consequences." The temporal boundary for analyzing cumulative impacts on biological resources includes the active operation of Pinto Valley Mine and extends through closure and final reclamation, with some effects on vegetation composition and habitat continuing indefinitely into the post-closure period.

Section 3.3.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on biological resources. Within the cumulative impacts analysis area, the following past and present activities have contributed to cumulative impacts and the existing condition biological resources described in section 3.3.3, "Affected Environment":

- Development and operation of the Carlota Copper Mine have resulted in disturbances similar in nature to those associated with the Pinto Valley Mine; however, these disturbances currently affect a more limited spatial extent than those associated with the Pinto Valley Mine due to the Carlota Copper Mine's smaller footprint.
- Development and operation of the Freeport-McMoRan Miami Copper Mine has resulted in disturbances similar in nature to those associated with the Pinto Valley Mine.
- Groundwater withdrawals under existing water rights in the Pinto Creek watershed have contributed to reduced surface water availability.
- Noxious weeds have been introduced and spread from past, present, and ongoing disturbances in the analysis area, particularly in relation to mining activities and road construction.
- Use of cattle allotments is ongoing within the analysis area. Portions of the analysis area, including portions of Pinto Creek, lie within the Pinto Creek grazing allotment, of which Pinto Valley Mining Corp. is the permittee. Fencing around large parts of the allotment excludes cattle from entering the creek, thereby affording enhanced protection of the stream and riparian vegetation. In 2019, a Forest Service employee observed use of vegetation along Pinto Creek in the vicinity of U.S. Highway 60 by cattle. Damage to fencing that excludes cattle from the creek was also noted (Forest Service 2020b).
- The recent Woodbury Fire, which burned 124,000 acres in June and July of 2019 mostly within the Superstition Wilderness area west of the analysis area, also burned areas along Little Campaign Creek in the northwestern tip of the analysis area. Although only a relatively small portion of the analysis area burned, the burned area included the headwaters of several tributaries to Pinto Creek including West Fork Pinto Creek. As a result, portions of the analysis area may be subject to future flooding events and associated erosion. In addition, in 2020 several other fires burned in the Tonto National Forest, affecting existing ecological conditions and potentially contributing to cumulative effects. The closest of these fires to the Pinto Valley Mine was the Salt Fire, which burned over 21,000 acres north and east of the Pinto Valley Mine

> in August and September of 2020. High-severity wildfires that cover large areas have resulted in short-term and long-term impacts on biological resources including changing the structure, function, and composition of the physical habitat and the availability of prey base for birds and other wildlife. In addition, large-scale wildfires can lead to increased erosion, sedimentation, and flooding from the burned areas that degrade conditions within downstream riparian and aquatic habitats until vegetation reestablishes in the burned areas.

This cumulative analysis considers the present effects of past actions described in section 3.3.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect water resources in the future as identified in table 3-3 within the cumulative impacts analysis area for biological resources.

3.3.4.5.1 Vegetation

Vegetation Communities and Terrestrial Habitat Loss

Present effects of the relevant past and present actions have resulted in the vegetative and habitat conditions presented in section 3.3.3, "Affected Environment," through surface disturbance, dust deposition, water withdrawals, and degradation of water quality.

Table 3-24 shows the acreages of existing surface disturbance, combined with incremental disturbances from the proposed action and other reasonably foreseeable projects that have identified surface disturbance within the cumulative impact analysis area by biotic community. The total existing surface disturbance in the cumulative impact analysis area, and associated habitat loss, is estimated at 11,099 acres, which represents approximately 2.4 percent of the 471,091 acres in the cumulative impacts analysis area from past, present, and reasonably foreseeable future actions, including the proposed action. The proposed action would result in an estimated 1,317 acres of surface disturbance, including 1,087 acres on private land and 229 acres on National Forest System lands, all in the interior chapparal biotic community. Past, ongoing, and future construction and operations of Pinto Valley Mine and other past and ongoing mining projects in the cumulative analysis area have contributed to habitat loss and degradation as a result of surface disturbance, traffic, artificial nighttime lighting, dust, and noise.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on vegetation communities, as indicated in table 3-3 in section 3.1.5.3, "Past, Present, and Reasonably Foreseeable Future Actions." The Resolution Copper Project and Land Exchange (3,497 acres of estimated disturbance), Superior West Exploration Drilling Project (7 acres of estimated disturbance), and Highway Tanks Tribal Forest Protection Act Project (unpredictable amount of estimated disturbance) would be the primary contributors to future cumulative surface disturbance in the cumulative impacts analysis area.

As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 15,920 acres or approximately 3 percent of the total cumulative impact analysis area. This cumulative surface disturbance would reduce the overall productivity of interior chapparal and Sonoran desertscrub biotic communities, including potential loss of shelter, breeding sites, food resources, and the prey base that supports fish and wildlife in the analysis area. The total cumulative surface disturbance represents approximately 4 percent of the interior chapparal and 4 percent of the Sonoran desertscrub communities in the analysis area.

Table 3-24. Existing and reasonably foreseeable surface disturbances in biotic communities within the cumulative impact analysis area

Biotic Community	Total Acres	Acres of Existing Disturbance	Acres of New Disturbance from Proposed Action	Acres of New Disturbance from other Reasonably Foreseeable Actions	Total Acres of Cumulative Disturbance
Interior chaparral	271,421	7,690	1,317	1,346	10,353
Arizona upland subdivision - Sonoran desertscrub	110,589	1,885	0	2,151	4,036
Great Basin conifer woodland	33,027	411	0	0	411
Semidesert grassland	24,617	449	0	0	449
Madrean evergreen woodland	14,547	546	0	0	546
Petran montane conifer forest	13,433	118	0	0	118
Total	**467,634**	**11,099**	**1,317**	**3,504**[46]	**15,920**

Source: The Nature Conservancy in Arizona 2004; Forest Service 2020c; U.S. Geological Survey 2013

The differences in cumulative impacts on vegetation communities among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.2, “Direct and Indirect Impacts on Vegetation.” The proposed action would have the greatest impact on upland vegetation communities among the alternatives due to 720 more acres of new surface disturbance on private land than the no-action alternative, 178 more acres of new surface disturbance on private land than alternative 1, and 229 more acres of new surface disturbance on National Forest System lands than both the no-action alternative and alternative 1. The longer operating life of the mine under the proposed action would delay the start of final reclamation for most facilities for approximately 19 years beyond the no-action alternative and 12 years beyond alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on vegetation communities and terrestrial habitat loss compared to the other alternatives.

Riparian Habitat

Present effects of the relevant past and present actions have resulted in the riparian habitat conditions presented in section 3.3.3, “Affected Environment,” through surface disturbance, dust deposition, water withdrawals, and degradation of water quality.

Past, ongoing, and future construction and operations of Pinto Valley Mine and other past and ongoing mining activities in the cumulative analysis area have affected aquatic and semi-aquatic organisms, as well as terrestrial organisms that use riparian and aquatic resources, through habitat loss and degradation as a result of surface disturbance, groundwater withdrawals, and water contamination. Other past, present, and reasonably foreseeable actions contributing to cumulative effects on riparian habitat include livestock grazing, wildfires, and climate change. The proposed action would contribute incremental impacts in the cumulative analysis area through the estimated removal of an additional 39 acres of riparian vegetation (14 acres on private lands owned by Pinto Valley Mining Corp. and 24 acres on National Forest System lands) and through additional reduction in baseflow of perennial streams through the period of active mining operations.

[46] Total acres of new disturbance from other reasonably foreseeable actions includes 7 acres of estimated disturbance from the Superior West Exploration Drilling Project not accounted for in the rows above because the locations of facilities have not been determined.

The differences in cumulative impacts on riparian habitat among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.2, “Direct and Indirect Impacts on Vegetation.” The proposed action would remove an estimated 28 additional acres of riparian vegetation when compared to alternative 1; the no-action alternative would not remove any riparian vegetation. Under the proposed action, riparian areas along perennial stream reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a reduction in baseflow in Pinto Creek greater in magnitude than the no-action alternative and similar in magnitude to alternative 1 but persisting for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on riparian habitat compared to the other alternatives.

Plant Health

Present effects of the relevant past and present actions have resulted in the plant health conditions presented in section 3.3.3, “Affected Environment,” through surface disturbance, dust deposition, water withdrawals, and degradation of water quality. Groundwater pumping from past and ongoing mining activities has contributed to a reduction in groundwater discharge to perennial streams in the cumulative impact analysis area. As a result, riparian areas along perennial reaches have likely been indirectly affected by past and ongoing groundwater pumping through a reduction in stream baseflow. Past and ongoing mining have also contributed to the discharge of low pH, high total dissolved solids, and metal-laden water to surface and groundwater, potentially resulting in cumulative accumulation of heavy metals in soils.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on plant health, as indicated in table 3-3 in section 3.1.5.3, “Past, Present, and Reasonably Foreseeable Future Actions.” When combined with continued pumping from the Peak Well field and operation of the Leach Piles under the proposed action, ongoing and future mining operations in the cumulative impact analysis area, such as the Resolution Copper Mine, Carlota Mine, and Freeport-McMoRan Miami Copper Mine, could have cumulative impacts on plant health similar to the reductions in perennial stream baseflow and the bioaccumulation of contaminants in vegetation as described for the proposed action in section 3.3.4.2.3. The estimated cumulative surface disturbance of 15,915 acres (3 percent of cumulative analysis area) would also result in cumulative impacts on plant health similar to the types of impacts described in section 3.3.4.2, “Direct and Indirect Impacts on Vegetation.”

The differences in cumulative impacts on plant health among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.2, “Direct and Indirect Impacts on Vegetation.” Continued pumping from the Peak Well field under the proposed action is predicted to result in a reduction in groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 162 gallons per minute at the end of active mining operations (an 85-percent reduction from 2013 versus 91 percent under the no-action alternative and 93 percent under alternative 1). Continued pumping of the Peak Well field under the proposed action, which would result in a reduction in baseflow in Pinto Creek greater in magnitude than under the no-action alternative and similar in magnitude to under alternative 1 but persisting for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on riparian habitat compared to the other alternatives.

Invasive Plants

Present effects of the relevant past and present actions have contributed to the establishment and spread of invasive plants as presented in section 3.3.3, "Affected Environment," through surface disturbance, degradation of habitat, and dispersal from project-related activity.

New disturbances and seed dispersal from mining and other development activities would continue to introduce and facilitate the spread of invasive plants despite eradication and control efforts within the cumulative impacts analysis area, contributing to trends in continued proliferation of invasive plants and a corresponding decrease in biodiversity and the relative abundance of native plants.

The proposed action would contribute incremental impacts through an additional estimated 1,317 acres of surface disturbance, which represents approximately 8 percent of the total estimated 15,930 acres of surface disturbance from past, present, and reasonably foreseeable future actions within the cumulative impacts analysis area.

The differences in cumulative impacts on invasive plant establishment and spread among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.2, "Direct and Indirect Impacts on Vegetation." Expansion of mining facilities onto an additional 950 acres compared to the no-action alternative and 408 more total acres compared to alternative 1 would increase the potential for spread and establishment of invasive plant species on the periphery of disturbed areas and during revegetation of disturbed areas. Continued road use and maintenance and other activities may contribute to dispersal for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on invasive plant establishment and spread compared to the other alternatives.

3.3.4.5.2 Fish and Wildlife

Present effects of the relevant past and present actions have resulted in the surface water quantity conditions presented in section 3.3.3, "Affected Environment," through surface disturbance, traffic, artificial lighting, dust, noise, water withdrawals, water discharges, and water contamination. The alternatives analyzed in this EIS would result in additional contributions on impacts on fish and wildlife due to project-related surface disturbance, degradation of habitat, withdrawal and use of water, potential degradation of water quality and quantity, traffic, artificial nighttime lighting, and noise.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on fish and wildlife, as indicated in table 3-3 in section 3.1.5.3, "Past, Present, and Reasonably Foreseeable Actions." The primary ongoing and reasonably foreseeable actions that would contribute to cumulative impacts on fish and wildlife include the Carlota Copper Mine, the Pinto Creek Erosional Control project, and the Pinal Creek Groundwater Remediation project.

The differences in cumulative impacts on fish and wildlife among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.3, "Direct and Indirect Impacts on Fish and Wildlife." Under the proposed action, 408 additional acres would be subjected to new surface disturbance compared with alternative 1, including

229 acres on National Forest System lands. Approximately 950 more acres would be subjected to new surface disturbance compared with the no-action alternative. The final footprint of the Pinto Valley Mine under the proposed action would total 5,232 acres including 795 acres on National Forest System lands. New surface disturbance associated with the proposed action would directly affect 2.2 miles of ephemeral drainages, including 0.9 mile not affected by alternative 1 (Arizona Land Resource Information System 1993).

Impacts on fish and wildlife that would occur as a result of surface disturbance under the proposed action would be greater than under the no-action alternative and alternative 1 due to the larger footprint and duration of active mining operations. The timeframe associated with impacts from surface disturbance under the proposed action would extend for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative. Similarly, impacts on fish and wildlife that would occur from mine-related traffic, artificial nighttime lighting, dust, noise, water withdrawals, and water contamination would affect fish and wildlife within a larger area under the proposed action, and persist for an additional 19 years or 12 years when compared to the no-action alternative or alternative 1, respectively.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on fish and wildlife compared to the other alternatives.

3.3.4.5.3 Special Status Species

Threatened and Endangered Species

The only species listed under the Endangered Species Act that may be adversely affected by the proposed action is the western yellow-billed cuckoo, which is listed as threated under the Endangered Species Act with proposed critical habitat. Cumulative impacts on western yellow-billed cuckoo were analyzed in the biological opinion prepared for the proposed action; see appendix D, “Biological Opinion.” Impacts considered by the U.S. Fish and Wildlife Service are limited to non-Federal actions because all Federal actions that may affect a listed species or its critical habitat must undergo consultation. In addition to the non-Federal, biologically relevant actions described above, the U.S. Fish and Wildlife Service identified climate change and recreation as contributors to cumulative impacts on western yellow-billed cuckoo. These cumulative impacts were considered in the biological opinion, which concluded that the proposed action is not likely to jeopardize the continued existence of the western yellow-billed cuckoo, and is not likely to destroy or adversely modify its proposed critical habitat.

Golden Eagle

Past, ongoing, and reasonably foreseeable projects in the cumulative impacts analysis area have affected, and have potential in the future to affect, potential foraging habitat for golden eagles. Areas affected by new surface disturbance from reasonably foreseeable projects could be rendered unsuitable for use by foraging eagles. Golden eagles may also be adversely affected by existing mine-related noise and traffic, which could cause them to avoid affected areas, a possibility suggested by studies of other avian species (Kaseloo and Tyson 2004). Project activities that reduce the abundance of mammalian prey species due to increased exposure to light and noise may adversely affect foraging opportunities within affected portions of the analysis area. Golden eagle nesting sites would not be affected, as none occurs within portions of the analysis area subject to the aforementioned disturbances.

The differences in cumulative impacts on golden eagles among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.4, “Direct and Indirect Impacts on Special Status Species.” The proposed action would result in 1,317 acres of new surface disturbance to golden eagle foraging habitat including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. Increased sound levels associated with blasting events east of the existing pit would occur only under the proposed action. Golden eagles may avoid additional areas east of the existing Open Pit as a result of this activity. Additionally, because the footprint of the mine would be largest under the proposed action, some areas that would not be exposed to noise and light under the other alternatives would be exposed to these disturbances under the proposed action. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on golden eagles compared to the other alternatives.

Forest Service Sensitive Species

Six Forest Service sensitive species—Allen’s big-eared bat, pale Townsend’s big-eared bat, western red bat, Bezy’s night lizard, lowland leopard frog, and desert sucker—are anticipated to experience more than minimal impacts from continued operation of the Pinto Valley Mine. Of these, western red bat, lowland leopard frog, and desert sucker may be most vulnerable to cumulative impacts due to their dependence on riparian and aquatic resources. Within the cumulative impact analysis area, all three species have experienced declines as a result of past and ongoing disturbances including decline of cottonwoods (western red bat); introduction of predators, chytrid fungus, habitat fragmentation and degradation, and changes in hydrologic patterns (lowland leopard frog); and alteration of historic flow regimes, construction of dams, and introduction of nonnative fish (desert sucker) (Arizona Game and Fish Department 2002c, 2011a; Brennan and Holycross 2009). Continued operation of the Pinto Valley Mine under the proposed action would contribute to these cumulative impacts through new surface disturbances in potential foraging or roosting habitat and continued operation of the Peak Well field for the duration of active mining operations.

The differences in cumulative impacts on Forest Service sensitive species among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.4, “Direct and Indirect Impacts on Special Status Species.” Under the proposed action, additional surface disturbance would occur for approximately 19 more years or 12 more years compared to the no-action alternative or alternative 1, respectively. Indirect impacts caused by pumping would last approximately 12 more years than under alternative 1 and approximately 19 more years than under the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on Forest Service sensitive species compared to the other alternatives.

Management Indicator Species

Because a relatively large fraction of the mixed broadleaf deciduous riparian forest and aquatic vegetation types present on the Globe Ranger District would be affected, continued operation of the

Pinto Valley Mine may cause or contribute to declines in six associated management indicator species. Affected management indicator species consist of hairy woodpecker, Arizona gray squirrel, warbling vireo, western wood pewee, common black hawk, and macroinvertebrates (see table 3-21). Two of these species are considered to be in decline, while the remaining species are stable (Klein et al. 2005). Other past, ongoing, and future projects in the cumulative impacts analysis area have also contributed cumulative impacts on these management indicator species. The proposed action would contribute incremental impacts in the cumulative impact analysis area as a result of groundwater withdrawals and associated impacts on riparian and aquatic habitat.

The differences in cumulative impacts on management indicator species among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.4, “Direct and Indirect Impacts on Special Status Species.” All five vegetation types affected under the no-action alternative and alternative 1—pinyon-juniper chaparral, interior chaparral, cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic—would also be affected under the proposed action. No additional vegetation types would be affected by new surface disturbance or groundwater drawdown under the proposed action. However, additional surface disturbance would occur beyond that which would occur under the other alternatives. Indirect impacts caused by groundwater withdrawals would last approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on management indicator species compared to the other alternatives.

Migratory Birds

A relatively large fraction of the Interior Riparian Deciduous Forests and Woodlands vegetation type present on the Globe Ranger District would be affected by continued operation of the Pinto Valley Mine. As a result, the proposed action may cause or contribute to declines of three species on the 2016 Tonto National Forest migratory bird species of concern list, common black hawk, northern beardless-tyrannulet, and yellow warbler, associated with this vegetation type. Other past, ongoing, and future projects in the cumulative impacts analysis area have also contributed cumulative impacts on these management indicator species. The proposed action would contribute incremental impacts in the cumulative analysis area as a result of groundwater withdrawals and associated impacts on riparian and aquatic habitat.

The differences in cumulative impacts on migratory birds among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.3.4.4, “Direct and Indirect Impacts on Special Status Species.” All five vegetation types affected under the other alternatives—pinyon pine-juniper woodland, interior chaparral, semiarid grassland, interior riparian deciduous forests and woodlands, and Sonoran riparian deciduous forest and woodlands—would also be affected under the proposed action. No additional vegetation types would be affected by new surface disturbance or groundwater drawdown under the proposed action. However, additional surface disturbance would occur beyond that which would occur under the other alternatives. Indirect impacts caused by pumping would last approximately 12 more years as compared to alternative 1 and 19 more years as compared to the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on migratory birds compared to the other alternatives.

3.3.5 Mitigation Measures

The Forest Service identified a variety of mitigation measures to address potential adverse impacts on vegetation, wildlife, and special status species. This section provides a summary of monitoring and mitigation measures for biological resources. Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," section 4.4.3, "Biological Resources," for additional information on the mitigation measures and the impacts being mitigated, the timing of the measures, the regulatory authority for the measures, and the potential effectiveness of the measures.

- **Mitigation Measure BR-1: Biological Resources Monitoring and Mitigation Plan.** This measure addresses potential impacts on vegetation, wildlife, and special status species from surface disturbance, project-related water use, and potential effects on water quality and quantity that could affect vegetation, wildlife habitat, and special status species. This plan outlines a program of monitoring, surveys, and potential mitigation and adaptive management to address the Endangered Species Act-listed threatened yellow-billed cuckoo (*Coccyzus americanus*) and its proposed critical habitat, the endangered Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*), noxious and invasive weeds, and raptor nests and other special status species that may occur within the analysis area. This plan also identifies thresholds for these monitored ecosystem components and identifies possible mitigation actions that could be taken if these thresholds are exceeded.
- **Mitigation Measure BR-2: Whole-Effluent Toxicity Testing.** This measure addresses the potential for high concentrations of total dissolved solids and sulfate that exceed the non-enforceable National Secondary Drinking Water Regulations as well as the potential for seepage to discharge as baseflow (and degrade water quality) in Pinto Creek. Increased levels of total dissolved solids and sulfate in Pinto Creek could have adverse impacts on aquatic organisms including macroinvertebrates, fish, and plants. Mitigation Measure BR-2 would provide a means to understand and assess the aggregate toxic effects of surface water quality conditions in Pinto Creek on representative aquatic organisms at locations up- and downstream of Pinto Valley Mine. If testing indicates adverse impacts on aquatic species attributable to the mine, additional adaptive management strategies would be developed by Pinto Valley Mining Corp. and the Forest Service, and then applied.

Under Mitigation Measure BR-1, certain adaptive management and mitigation actions such as habitat restoration for yellow-billed cuckoo and relocation of Arizona hedgehog or active raptor nests could have additional effects on these target species and their habitats. In general, these activities would result in short-term effects on surface resources while the activities are occurring (such as disturbance and noise); however, these activities would typically result in long-term beneficial effects on habitat and species. At this time, there are no specific restoration or relocation activities proposed. These actions would be subject to approval by the Forest Service and U.S. Fish and Wildlife Service and would be implemented in response to exceedance of thresholds identified in section 4 of the plan.

3.4 Greenhouse Gas and Climate Change Impacts

Greenhouse gases are air pollutants that trap solar energy in the atmosphere and contribute to global warming and climate change. Greenhouse gases are emitted from natural sources and are removed from the atmosphere by natural processes. Greenhouse gases are also emitted from human processes, which are now outpacing the natural processes that remove greenhouse gases from the atmosphere. Greenhouse gas emissions can be emitted locally but contribute to warming and climate change impacts on a global scale. Increasing concentrations of carbon dioxide, methane, nitrous oxide, and other greenhouse gases in the atmosphere absorb radiation from the Earth and have contributed to climate change. Impacts from climate change include average temperature increases, sea-level rise, snowpack and ice loss, terrestrial and marine ecosystem changes, and other global impacts.

This analysis of greenhouse gas and climate change impacts focuses on the activities within the Pinto Valley Mine project boundary and the resulting greenhouse gas emissions and climate change impacts. The temporal boundary for analyzing the direct and indirect effects related to greenhouse gas emissions and climate change impacts includes ongoing operations at the Pinto Valley Mine and extends through mine closure and final reclamation. These spatial and temporal boundaries encompass the extent of potential changes to greenhouse gas emissions and climate change impacts from the proposed action.

3.4.1 Relevant Laws, Regulations, and Policy

3.4.1.1 <u>**Federal Authorities**</u>

3.4.1.1.1 Clean Air Act (42 U.S. Code 7401 et seq.)

The Clean Air Act is the comprehensive Federal law that provides for regulation of air emissions from stationary and mobile sources, establishment of National Ambient Air Quality Standards to protect public health and public welfare, and protection of visibility in relatively pristine areas such as national parks and wilderness areas. The Clean Air Act prescribes the measures that the U.S. Environmental Protection Agency and other Federal agencies and State, local, and tribal governments must take in order to regulate air pollution and achieve air quality that meets the National Ambient Air Quality Standards. In 2007, the U.S. Supreme Court ruled that greenhouse gas emissions are considered air pollutants under the Clean Air Act (Massachusetts v. U.S. Environmental Protection Agency, 549 U.S. 497). Arizona and Pinto Valley Mine are located in U.S. Environmental Protection Agency Region IX.

3.4.1.1.2 National Environmental Policy Act

National Environmental Policy Act regulations currently require EISs to consider the direct and indirect environmental consequences of a proposed action (40 CFR 1502.16) as well as the impacts on the affected environment (40 CFR 1502.15).

3.4.1.1.3 Greenhouse Gas Reporting Program (Title 40, Part 98 of the Code of Federal Regulations)

Owners and operators of certain facilities that directly emit greenhouse gases as well as certain suppliers are subject to mandatory greenhouse gas reporting requirements. For suppliers, the greenhouse gases reported are the quantity that would be emitted from combustion or use of the products supplied. In general, facilities within certain source categories or exceeding set energy consumption or greenhouse gas emission levels are subject to annual reporting (U.S. Environmental Protection Agency 2018b).

3.4.2 Resource Indicators

This analysis includes two parts:

1. A quantitative assessment of greenhouse gas emissions related to the no-action alternative, alternative 1, and the proposed action; and

2. A qualitative assessment of climate change impacts that could affect the Tonto National Forest and the surrounding region, based on the no-action alternative, alternative 1, and the proposed action.

Greenhouse gas emissions have impacts on a global scale regardless of where emissions occur; for example, emissions from the alternatives would be generated in the vicinity of Pinto Valley Mine, but these emissions would contribute to higher surface temperature worldwide.

Increased anthropogenic emissions of carbon dioxide, methane, nitrous oxide, and other greenhouse gases result in increased concentrations in the atmosphere, which lead to increased absorption of energy and re-emission of that energy to the atmosphere rather than allowing it to be reflected into space. These factors increase the atmosphere's ability to retain heat. Annual average temperature in the U.S. has increased by 1.8 degrees Fahrenheit relative to the beginning of the 20th century (Hayhoe et al. 2018). Annual average temperature is expected to increase by an additional 2.5 degrees Fahrenheit over the next few decades independent of future emissions and by 3 to 12 degrees Fahrenheit by the end of the 21st century, depending on whether low or high global emission scenarios are followed (Hayhoe et al. 2018).

The impacts of higher global surface temperatures include widespread changes in the Earth's climate system. Sea-level rise in Earth's oceans is occurring due to thermal expansion of seawater and melting of ice sheets. Rising temperatures are also changing weather patterns, including the frequency, severity, and duration of heat waves, drought, and extreme precipitation events. Freshwater resources will experience changes in physical flows and quality including reduced snowpacks, changes to seasonal streamflows, and changes to runoff pollutant concentrations. Climate change also affects the natural environment and virtually all aspects of society, including biodiversity, invasive species, human health, cultural resources, infrastructure, and other sectors. The impacts will vary by location and depend on the nature of the hazards experienced (Hayhoe et al. 2018). Table 3-25 outlines the related resource elements for the greenhouse gas and climate change assessment (ICF 2020).

Table 3-25. Resource indicators and measures for assessing greenhouse gas and climate change effects

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Greenhouse gas emissions	Carbon dioxide, methane, and nitrous oxide emissions	Metric tons of carbon dioxide equivalent	Yes	Construction, operations, and reclamation emissions estimates for the alternatives; Carbon On-Line Estimator; Western Electricity Coordinating Council distribution projections
Climate change impacts	Projected regional climate change impacts	Qualitative risk to the region	Yes	National Climate Assessment, U.S. Geological Survey National Climate Change Viewer, The Climate Explorer

3.4.3 Affected Environment

Table 3-26 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-26. Resource indicators and measures for the existing condition for greenhouse gas and climate change

Resource Element	Resource Indicator	Measure	Data Source
Greenhouse gas emissions	Carbon dioxide, methane, and nitrous oxide emissions	Metric tons of carbon dioxide equivalent	Greenhouse gas emission inventories for Phoenix and Pima County; Arizona energy consumption data
Climate change impacts	Projected regional climate change impacts	Qualitative risk to region and Pinto Valley Mining Corp.	National Oceanic and Atmospheric Administration Climate Explorer and National Climate Assessment data

3.4.3.1 Greenhouse Gas Emissions

The U.S. Environmental Protection Agency has not established National Ambient Air Quality Standards for greenhouse gases, which are gases that trap heat in the atmosphere and contribute to climate change. The major greenhouse gases are carbon dioxide, methane, nitrous oxide, and several industrial gases. Because the heat-trapping ability of each gas differs, greenhouse gases are commonly expressed in terms of carbon dioxide equivalent, which quantifies greenhouse gas emissions with each gas weighted by its global warming potential.

This section uses local and regional greenhouse gas emission inventories and State-level energy data to characterize the existing conditions for greenhouse gas emissions. Arizona's two largest metropolitan areas have recently developed greenhouse gas emission inventories: City of Phoenix in 2015 (Arizona State University 2016) and Pima County (Tucson and surrounding area) from 2012 through 2014 (Pima Association of Governments 2017). Pinto Valley Mine is located in the same region as both of these areas.

Table 3-27 details the scope 1 and scope 2 emissions from both regional emission inventories. Scope 1 emissions consist of energy consumption through onsite fossil fuel use (stationary and mobile combustion from construction equipment and vehicles), while scope 2 emissions result from electricity consumption. In the city of Phoenix, 65 percent of scope 1 greenhouse gas emissions are energy related, while 35 percent are non-energy related. For both scopes 1 and 2, 87 percent of emissions are energy related, and 13 percent are non-energy related. In Pima County, 84 percent of scope 1 greenhouse gas emissions and 93 percent of scopes 1 and 2 greenhouse gas emissions are energy related. All scope 2 emissions are associated with electricity consumption and generation, and are therefore entirely energy related.

Table 3-27. City of Phoenix and Pima County greenhouse gas emission inventories

	Scope 1		Scope 2		Scopes 1 and 2 Total	
	Energy Related	*Non-Energy Related*	*Energy Related*	*Non-Energy Related*	*Energy Related*	*Non-Energy Related*
City of Phoenix 2015 Inventory						
Metric tons of carbon dioxide equivalent	133,426	70,924	336,776	0	470,202	70,924
Percentage of scope greenhouse gases	65%	35%	100%	0%	87%	13%
Total greenhouse gases (metric tons of carbon dioxide equivalent)	204,350		336,776		541,126	
Pima County 2014 Inventory						
Metric tons of carbon dioxide equivalent	5,127,914	975,991	7,636,898	0	12,764,812	975,991

	Scope 1		Scope 2		Scopes 1 and 2 Total	
	Energy Related	*Non-Energy Related*	*Energy Related*	*Non-Energy Related*	*Energy Related*	*Non-Energy Related*
Percentage of scope greenhouse gases	84%	16%	100%	0%	93%	7%
Total greenhouse gases (metric tons of carbon dioxide equivalent)	6,103,905		7,636,898		13,740,803	

Sources: Arizona State University 2016; Pima Association of Governments 2017

Figure 3-4 shows combined greenhouse gas emissions from Phoenix and Pima County, where energy-related emissions represent most of total scope 1 and scope 2 emissions, with scope 2 representing a larger share (56 percent) of total greenhouse gas emissions than scope 1.

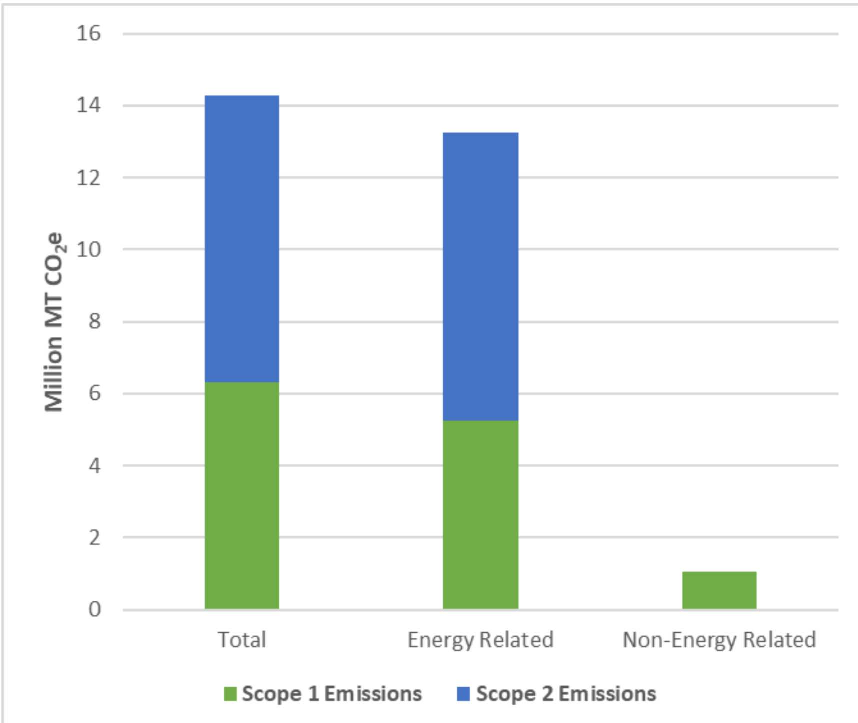

Figure 3-4. Phoenix and Pima County greenhouse gas emission inventory totals

Source: Arizona State University 2016; Pima Association of Governments 2017

In 2005, Arizona developed a statewide inventory of historical greenhouse gas emissions from 1990 through 2003, with projections through 2020 (Arizona Department of Environmental Quality and Center for Climate Strategies 2005). According to the inventory, in 2000, Arizona emitted approximately 80 million metric tons of net carbon dioxide equivalent, primarily from electricity use and transportation. Combustion of fossil fuels in these two sectors accounted for almost 80 percent of Arizona's gross greenhouse gas emissions (Arizona Department of Environmental Quality and Center for Climate Strategies 2005).

Figure 3-5 shows how energy-related carbon dioxide emissions in Arizona have trended over the last 20 years through different sectors and fossil fuel resources based on data from the U.S. Energy Information Administration (2018a). In 2015, 90.9 million metric tons of carbon dioxide were emitted from fossil fuel consumption in Arizona, 55 percent (49.6 million metric tons of carbon dioxide) of which were from the electric power sector (U.S. Energy Information Administration 2018a). Similar to the Phoenix and Pima

County inventories, scope 2 emissions (electric power sector) represent the majority of energy-related emissions for most years in the time series.

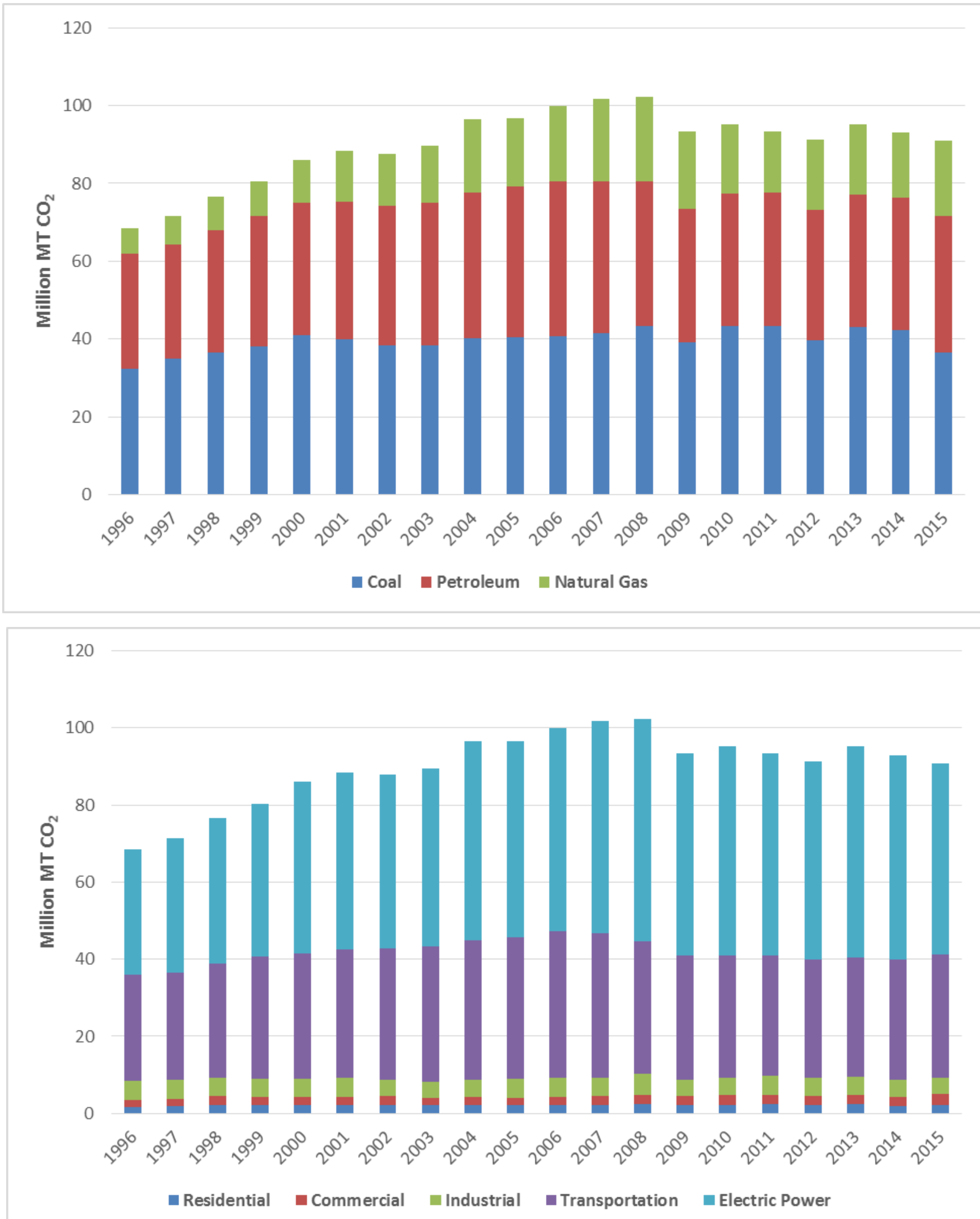

Figure 3-5. Arizona's energy-related carbon dioxide emissions by fossil fuel resource and sector, 1996–2015

Source: U.S. Energy Information Administration 2018a

Similar to Arizona's State, county, and city-level greenhouse gas inventories, greenhouse gas emissions from copper mining activities are also primarily driven by energy consumption (Mudd et al. 2012). As such, greenhouse gas emissions from energy-related activities are the primary drivers of the alternatives assessment as detailed in section 3.4.4, "Environmental Consequences," below. More specifically, greenhouse gas emissions from the alternatives would largely be from energy consumption through onsite fossil fuel use (stationary and mobile combustion from construction equipment and vehicles) (scope 1) and electricity consumption (scope 2).

3.4.3.2 **Climate Change Impacts**

3.4.3.2.1 Air Temperature

Gila County has a semiarid climate characterized by hot summers and moderate to warm winters. Historically, mean maximum temperatures range from 55 degrees Fahrenheit in January to 92 degrees Fahrenheit in June and mean minimum temperatures range from 23 degrees Fahrenheit in December to 59 degrees Fahrenheit in July (National Oceanic and Atmospheric Administration 2018). Gila County has experienced a pronounced warming trend over the observational record; annual mean maximum and minimum temperatures have risen by 1.5 and 1.2 degrees Fahrenheit, respectively, between 1950 and 2005 (U.S. Geological Survey 2016). Heat waves are not uncommon. Gila County averages approximately 5 days per year above 105 degrees Fahrenheit (U.S. Geological Survey 2016).

Climate model projections reveal that air temperatures are expected to warm significantly in the analysis area through mid-century (U.S. Geological Survey 2016). Figure 3-6 shows annual mean maximum temperature in Gila County for both the historical period (black line) and projections under two greenhouse gas emission scenarios (representative concentration pathways 4.5 and 8.5 in the blue and red lines, respectively). Representative concentration pathway 8.5 represents a business-as-usual emissions scenario, while representative concentration pathway 4.5 assumes mitigation actions will limit future greenhouse gas emissions. Minimum temperatures are also projected to consistently increase over time. Average annual minimum temperatures could increase nearly 10 degrees Fahrenheit between 2006 and the end of the century (U.S. Geological Survey 2016). Together, these projections confirm that both daytime highs and nighttime lows will become warmer in the future (Gonzalez et al. 2018).

Simultaneously, the number of extreme heat days, defined as days when the temperature exceeds 90 degrees Fahrenheit, will increase by more than 30 days per year by mid-century compared to the historical period between 1976 and 2005 (Vose et al. 2017). Climate models project that extreme heat days exceeding 105 degrees Fahrenheit could be two to three times more common by 2050 and three to ten times more common by end-of-century in Gila County (National Oceanic and Atmospheric Administration 2018).

Atmospheric warming is a primary driver of droughts, wildfires, and extreme precipitation events, all of which represent significant climate change impacts on the Pinto Valley Mine and are subsequently discussed in this section.

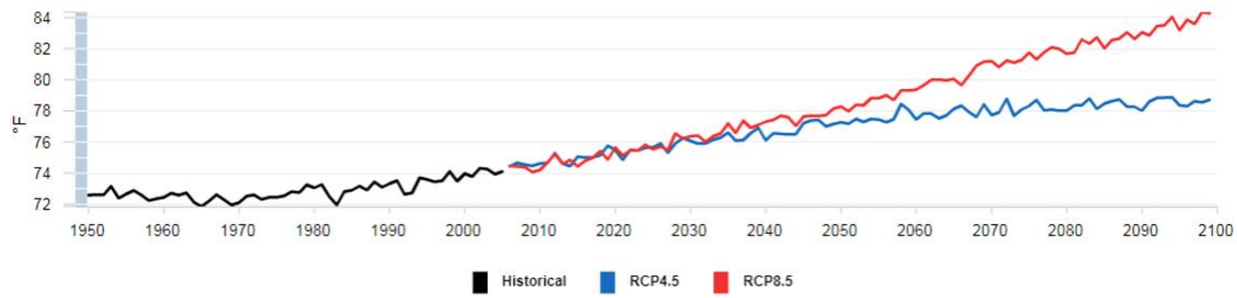

Figure 3-6. Historical and projected annual mean maximum temperatures (Gila County)

Source: U.S. Geological Survey 2016

3.4.3.2.2 Precipitation and Drought

Gila County averages 15.2 inches of rain per year and experiences a bimodal rainfall pattern, typified by dry early summer and late fall months separating relatively wet late summer and winter months (National Oceanic and Atmospheric Administration 2018). Mean monthly precipitation ranges from 0.1 inch in June to 2.3 inches in August (National Oceanic and Atmospheric Administration 2018). Historically, Arizona has been prone to surface water shortages due to periods of low precipitation and higher temperatures, with much of the Colorado River Basin (in which Arizona lies) experiencing record periods of drought in the last decade (Cook et al. 2015). Over the last two decades, Gila County has been in a nearly continuous state of drought while experiencing uninterrupted drought conditions between both 2002 and 2008 and 2011 and 2018[47] (National Drought Mitigation Center 2018).

Climate model projections reveal large interannual variability and a small decline in annual mean precipitation through mid-century in Gila County (U.S. Geological Survey 2016). Figure 3-7 shows annual mean precipitation in Gila County for both the historical period (black line) and projections under two greenhouse gas emission scenarios (representative concentration pathways 4.5 and 8.5 in the blue and red lines, respectively). In addition, projections show that regional interannual precipitation variation will likely be significant. This pattern causes periods of precipitation whiplash, whereby drought conditions can transition quickly to extreme precipitation events and, in turn, floods.

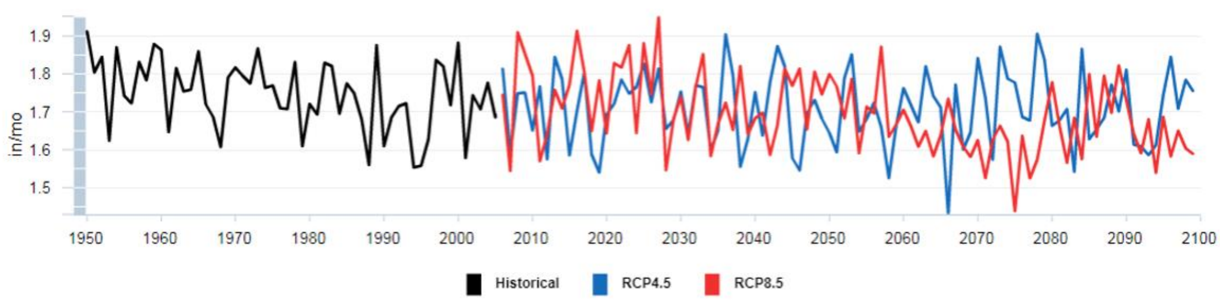

Figure 3-7. Historical and projected annual mean precipitation (Gila County)

Source: U.S. Geological Survey 2016

[47] This is based on a range of factors including soil moisture, precipitation, and streamflow. For more information, see the National Drought Mitigation Center's drought classification summary (National Drought Mitigation Center 2018).

In part because warmer air temperatures drive increased evapotranspiration, cloud formation, and rainfall amounts, climate studies also project an increase in the frequency and magnitude of severe precipitation events in the Pinto Valley Mine region through mid-century (Luong et al. 2017).

The Fourth National Climate Change Assessment attributes recent increases in drought length, severity, and frequency to ongoing climate change in the Pinto Valley Mine region (Gonzalez et al. 2018). Recent research reveals southern Arizona will continue to experience more intense droughts in the future (Cook et al. 2015). Figure 3-8 shows projected negative changes in runoff within Gila County, suggesting water shortages will become more prevalent in the future.

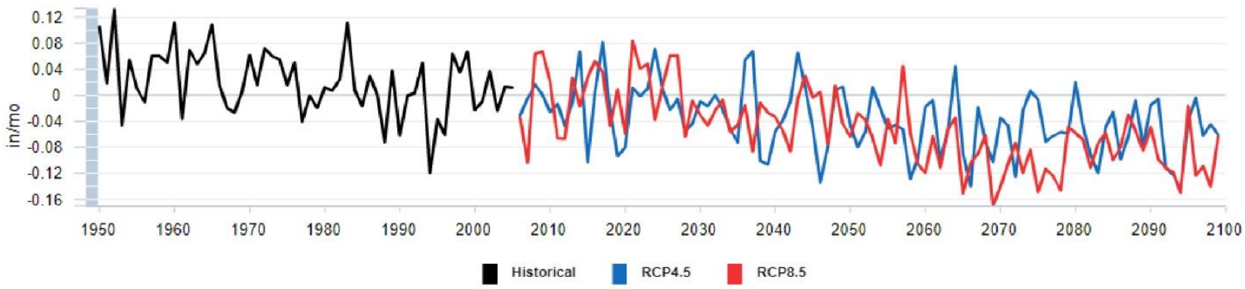

Figure 3-8. Historical and projected annual mean runoff change (Gila County)

Source: U.S. Geological Survey 2016

Precipitation and drought pattern changes could result in a variety of impacts on the Pinto Valley Mine and analysis area. Reduced long-term precipitation and more frequent droughts could increase the likelihood of regional water shortages (Gonzalez et al. 2018). Pinto Valley Mining Corp. consumptively uses groundwater sourced from wells on private land (except for Peak Well 37) for processing ore and dust suppressant.

3.4.3.2.3 Wildfires

Climate conditions are historically favorable to wildfire formation in Gila County. Increases in temperature and drought, as well as more extensive human activity and fire suppression throughout the region, have combined to cause larger and more severe wildfires over the last century. Climate studies project increasing wildfire frequency and severity in the analysis area through mid-century (Barbero et al. 2015; Moritz et al. 2012). Climate change drives increasing air temperatures, more frequent drought conditions, and migration of invasive species such as the mountain pine beetle, which, collectively, cause landscape desiccation and higher tree mortality rates. Together, these factors increase wildfire fuel availability and create conditions favorable to wildfire ignition and severity (Gonzalez et al. 2018). Overall, the increase in cumulative forest area across the Southwest U.S. burned by wildfires over the historical record are attributed to these climate-driven factors (Gonzalez et al. 2018).

3.4.4 Environmental Consequences

3.4.4.1 Analysis Methodology and Assumptions

The analysis of greenhouse gas emissions and climate change impacts includes the methodologies and assumptions summarized in the following sections.

3.4.4.1.1 Greenhouse Gas Emissions Assessment

The greenhouse gas emissions assessment for the alternatives includes scopes 1 and 2 greenhouse gas emissions (including carbon dioxide, methane, and nitrous oxide), as defined by the Greenhouse Gas Protocol (World Resources Institute 2018). Scope 1 emissions for this assessment include direct emissions from the Pinto Valley Mine facilities, and scope 2 emissions include indirect emissions resulting from Pinto Valley Mining Corp. electricity consumption. Scope 2 emissions may occur outside the project boundary, but these emissions come from electricity that is consumed within the project boundary. The temporal bounds of this analysis are defined by the mining phases during which there would be notable emissions that could contribute to climate change, including active mining operations and reclamation and closure. Emissions are quantified for construction (such as access roads, water pipelines, and power lines), operations, land clearing, reclamation, and closure activities during these phases. Table 3-28 details the greenhouse gas emission sources included in this assessment, primary activity data sources, and related emission scope.

Table 3-28. Greenhouse gas emission sources, data sources, and emission scope

Activity	Emission Sources	Primary Data Source	Emission Scope
Facility construction	Increase in equipment and vehicles used for project construction and associated fuel or electricity type used for each alternative.	Construction equipment and vehicle usage from Pinto Valley Mining Corp.	Scope 1 & 2
Operations	Equipment and vehicles used for the project, fuel type used, and anticipated fuel or electricity use for each alternative as a result of additional milling, processing, tailings disposal, waste rock disposal, and other Pinto Valley Mine operations.	Facility, equipment, vehicle energy consumption, and electricity consumption from Pinto Valley Mining Corp.	Scope 1 & 2
Reclamation	Equipment and vehicles used for the project, fuel type used, and anticipated fuel or electricity use for each alternative as a result of reclamation activities.	Equipment and vehicle usage as provided by Pinto Valley Mining Corp.	Scope 1 & 2
Closure	Equipment and vehicles used for the project, fuel type used, and anticipated fuel or electricity use for each alternative as a result of closure activities.	Equipment and vehicle usage as provided by Pinto Valley Mining Corp.	Scope 1 & 2
Land use	Vegetation and soil expected to be disturbed for each alternative as a result of surface disturbance.	Facility layout, surface disturbance estimates, and Tonto National Forest characteristics	Scope 1

Project-related greenhouse gas emissions are primarily from energy combusted on site (vehicles and equipment using fossil fuels) and electricity generated off site for Pinto Valley Mine activities. Where specific energy consumption data were not available directly from Pinto Valley Mining Corp., estimates were generated using available literature for energy consumption based on vehicle and equipment specifications used at Pinto Valley Mine.

Greenhouse gas emissions from stationary and mobile equipment during operational and reclamation activities are derived from energy use by applying emission factors to fuel consumption data provided by Pinto Valley Mining Corp. As summarized in table 3-29, emission factors were derived from relevant literature (such as 2006 Intergovernmental Panel on Climate Change guidelines), reports (such as from the U.S. Environmental Protection Agency), and available greenhouse gas models (such as Argonne's Greenhouse Gases, Regulated Emissions, and Energy Use model). Global warming potential values for each of the greenhouse gases were obtained from the Intergovernmental Panel on Climate Change's Fourth Assessment Report (Intergovernmental Panel on Climate Change 2007).

Table 3-29. Summary of greenhouse gas emission factors and data sources

Source Category and Fuel Type	Fuel Type	Greenhouse Gas	Value	Source
Mobile Sources	Diesel	Carbon dioxide	73.96 kilograms per one million British thermal units	U.S. Environmental Protection Agency (2018a)
		Methane	4.15 kilograms per terajoule	Intergovernmental Panel on Climate Change (2006)
		Nitrous oxide	28.6 kilograms per terajoule	Intergovernmental Panel on Climate Change (2006)
	Gasoline	Carbon dioxide	70.22 kilograms per one million British thermal units	U.S. Environmental Protection Agency (2018c)
		Methane	29.0 kilograms per terajoule	Intergovernmental Panel on Climate Change (2006)
		Nitrous oxide	5.6 kilograms per terajoule	Intergovernmental Panel on Climate Change (2006)
	Propane	Carbon dioxide	61.71 kilograms per one million British thermal units	U.S. Environmental Protection Agency (2018c)
		Methane	0.024 gram per liter	The Climate Registry (2016)
		Nitrous oxide	0.108 gram per liter	The Climate Registry (2016)
Reclamation Activities	Diesel	Carbon dioxide	73.96 kilograms per one million British thermal units	U.S. Environmental Protection Agency (2018c)
Stationary Sources	Varies	Carbon dioxide, methane, nitrous oxide	Varies	Emissions estimated by Pinto Valley Mining Corp.
Electricity	Coal	Carbon dioxide	947 grams per kilowatt-hour	GREET® 1 Model
		Methane	0.01 gram per kilowatt-hour	GREET® 1 Model
		Nitrous oxide	0.015 gram per kilowatt-hour	GREET® 1 Model
	Petroleum	Carbon dioxide	840 grams per kilowatt-hour	GREET® 1 Model
		Methane	0.032 gram per kilowatt-hour	GREET® 1 Model
		Nitrous oxide	0.006 grams per kilowatt-hour	GREET® 1 Model
	Natural Gas	Carbon dioxide	404 grams per kilowatt-hour	GREET® 1 Model
		Methane	0.043 gram per kilowatt-hour	GREET® 1 Model
		Nitrous oxide	0.001 gram per kilowatt-hour	GREET® 1 Model
	Renewables	Carbon dioxide, methane, nitrous oxide	0	Emissions associated with renewables are outside of Scope 1 and 2 emissions (World Resources Institute 2018)
	All (2018 weighted value)	Carbon dioxide	439 grams per kilowatt-hour	U.S. Energy Information Administration (2018b)
		Methane	0.020 gram per kilowatt-hour	U.S. Energy Information Administration (2018b)
		Nitrous oxide	0.005 gram per kilowatt-hour	U.S. Energy Information Administration (2018b)

The construction or relocation of linear features (access roads, water pipelines, electrical power lines) to support the expansion of the Open Pit, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4 is expected under the proposed action, but greenhouse gas emissions associated with these specific construction activities are not quantified in this analysis. Emissions associated with these activities are also not quantified in section 3.2, "Air Quality," because they are not expected to be significant in comparison to those from other activities under the proposed action and alternative 1.

For electricity consumption, emissions are developed using electricity consumption reported by Pinto Valley Mining Corp. and the Western Electricity Coordinating Council's current and projected annual electricity grid mix for the Southwest region from the U.S. Energy Information Administration's Annual Energy Outlook 2018 (U.S. Energy Information Administration 2018b).

Land use emissions are based on the change in carbon sequestration capacity of land affected by the alternatives. To estimate the loss of upland carbon stocks from the net change in upland vegetation cover types as a result of the alternatives, estimates of vegetation cover (such as aboveground carbon, belowground carbon, and understory carbon) and soil carbon stocks (soil organic carbon) in the Pinto Valley Mine project boundary are based on average carbon stock per area estimates for Gila County from the Carbon Online Estimator (Van Deusen and Heath 2016). Carbon fraction and aboveground biomass growth factors are from the 2006 Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories, based on the assumption that the Tonto National Forest is a subtropical dry forest (Intergovernmental Panel on Climate Change 2006).

3.4.4.1.2 Climate Change Impacts

Using the sources listed below and other relevant literature, this assessment identifies and characterizes climate change stressors (increasing temperatures, wildfires, drought, extreme precipitation) specific to the analysis area. Global climate model ensembles are used to project climate change though mid-century relative to existing conditions. The assessment uses this information to constrain both how climate stressors are likely to alter the future environment and how climate change may exacerbate or ameliorate the effect of Pinto Valley Mining Corp. operations and construction on the analysis area environment and resources. Future conditions and impacts are presented in the context of the alternatives.

This assessment primarily uses data, climate projections, and information from the following sources:

- **2018 National Climate Assessment.** The 2018 National Climate Assessment was conducted by the U.S. Global Change Research Program (2018). This assessment summarizes the current and future impacts of climate change on the United States. The findings, which have undergone extensive public and expert peer review, were compiled by a team of more than 300 experts guided by the 60-member Federal Advisory Committee of the National Academy of Sciences. The report uses multimodel ensemble projections developed under the Fifth Coupled Model Intercomparison Project[48] and incorporates the latest state-of-the-art climate research to evaluate the climate change impacts.
- **National Climate Change Viewer.** The National Climate Change Viewer contains historical and future climate projections at watershed, State, and county levels for the continental United States. The viewer contains multimodel ensemble data (mean model), combining the results from over 30 independent climate models of greenhouse gas emission scenarios (representative concentration pathways developed by researchers around the world under the coordination of the Fifth Coupled Model Intercomparison Project). Multimodel data increase the robustness of projections and provide information on the level of uncertainty in the direction and magnitude of future climate trends. Climate information in the viewer has been downscaled, or processed using statistical analysis to provide projections with higher geographic resolution of temperature, precipitation, runoff, and snowfall (U.S. Geological Survey 2016). In this assessment, model outputs are used for Gila County, Arizona.

[48] A list of the climate models can be found in the appendix of the National Climate Change Viewer Tutorial (U.S. Geological Survey 2016).

- **National Oceanic and Atmospheric Administration Climate Explorer.** The National Oceanic and Atmospheric Administration provides and maintains the Climate Explorer, part of the U.S. Climate Resilience Toolkit (National Oceanic and Atmospheric Administration 2018). The climate explorer uses over 30 climate models developed under the Fifth Coupled Model Intercomparison Project. The tool condenses downscaled historical and projected data for precipitation and temperature, generating visualizations that include model uncertainty ranges and averages for multiple representative concentration pathways. The tool also provides downloadable data outputs.

3.4.4.2 No-action Alternative – Direct and Indirect Impacts

This section presents the direct and indirect impacts associated with greenhouse gas emissions and climate change.

3.4.4.2.1 Greenhouse Gas Emissions

Under the no-action alternative, the following activities are expected to result in or affect greenhouse gas emissions:

- Recoverable copper production at Pinto Valley Mine is projected to continue for 2 months following the record of decision.
- The Forest Service would allow the temporary continued use of existing facilities on National Forest System lands that are necessary to ensure proper closure and reclamation (such as access roads, water pipelines, and power lines) until the Forest Service determines reclamation is complete and releases the reclamation bond.
- Increase in total surface disturbance of 367 acres on private land associated with 10 acres of lateral expansion of Tailings Storage Facility No. 4 during the 2-month active mining period and 357 acres of new surface disturbance associated with excavation of borrow and riprap sources during reclamation.
- There would be no further lateral expansion of the Open Pit during the 2 months of active mining, but continued processing of available materials would yield an estimated 58,000 tons of ore and 82,000 tons of waste rock per day, yielding an estimated total of 3,480,000 tons of ore and 4,920,000 tons of waste rock during 2 months of active mining operations.
- The total power requirement for the mine is 47 megawatts per hour and would require a minimum power voltage of 115 kilovolts. There is no anticipated change in power requirements from current levels.
- All indoor lights are on 24 hours a day, 7 days a week, for the most part and most outdoor lights are on dusk-to-dawn photocells or timers.
- Use of the existing administration and maintenance building at the plant site, which is close to the mill and concentrator, would continue.

During active mining operations under the no-action alternative (2 additional months), mobile sources (on-road vehicles and off-road equipment, for example) and electricity consumption would contribute the most to greenhouse gas emissions (68.6 percent and 29.5 percent of total greenhouse gas emissions, respectively). Under the no-action alternative the estimated greenhouse gas emissions would be the greatest in year 2021 while active mining operations are continuing during the first 2-months of the 6 months transition period.

Total greenhouse gas emissions through the end of the mine life are estimated to be 1.04 million metric tons of carbon dioxide equivalent and 0.9 million metric ton of carbon dioxide equivalent throughout reclamation activities under the no-action alternative. Post-closure activities are not anticipated to result in notable emissions.

Table 3-30 summarizes annual greenhouse gas emissions by gas and source and table 3-31 summarizes total greenhouse gas emissions by life-of-mine phase under the no-action alternative.

Table 3-30. Annual and total greenhouse gas emissions under the no-action alternative by greenhouse gas and source category (metric tons of carbon dioxide equivalent)

No Action Timeline	Mine Operation	Reclamation (2022–2034)			Total	% of Total
Greenhouse Gas and Source Category	***2021***	***2022***	***2027***	***2034***		
Carbon Dioxide	**240,812**	**84,619**	**72,120**	**2,821**	**1,787,665**	**90.4%**
Mobile Sources	94,419[49]	83,940	72,120	1,140	1,171,457	59.2%
Reclamation Activities	0	679	0	1,140	6,269	0.3%
Stationary Sources	6,635	0	0	0	26,540	1.3%
Electricity	139,758	0	0	0	583,398	29.5%
Land Use Change[50]	0	0	0	0	0	0.0%
Methane	**649**	**623**	**606**	**2**	**9,761**	**0.5%**
Mobile Sources	639	623	606	2	9.719	0.5%
Stationary Sources	3	0	0	0	12	0.0%
Electricity	7	0	0	0	29	0.0%
Nitrous Oxide	**14,598**	**12,289**	**10,858**	**171**	**179,907**	**9.1%**
Mobile Sources	13,563	12,289	10,858	171	175,767	8.9%
Stationary Sources	1,034	0	0	0	4,134	.2%
Electricity	1	0	0	0	6	0.0%
Total (all greenhouse gases)	**256,049**	**97,532**	**83,634**	**2,994**	**1,977,332**	**100%**

Table 3-31. Total greenhouse gas emissions under the no-action alternative by greenhouse gas and operational phase (metric tons of carbon dioxide equivalent)

Operational Phase	Carbon Dioxide	Methane	Nitrous Oxide	Total
Mine Operation (2018–2021)	984,330	2,592	43,455	1,044,916
Reclamation (2022–2034)	803,335	7,168	121,913	932,417
Post-Closure (2035–2065)	0	0	0	0
Total	**1,787,665**	**9,761**	**165,368**	**1,977,332**

Source: ICF 2020

3.4.4.2.2 Climate Change

Air Temperature

Under the no-action alternative, continued mining operations for 2 months following the record of decision and subsequent closure, reclamation, and post-closure would coincide with general air temperature patterns as shown on figure 3-6. Warming and more frequent heat waves would increase

[49] While active mining operations and associated mobile sources would end after approximately 2 months, reclamation activities and associated mobile emission would be conducted during the remainder of the year.

[50] Emissions from land use changes were assumed to be zero, as the change in land use and associated emissions would be minimal under the no-action alternative.

the number of annual cooling degree days and, in turn, energy demand and expenditures in the analysis area (Zamuda et al. 2018). Additionally, some air pollution concentrations (ozone) may increase through 2034 due to effects driven by increasing temperatures. Specifically, increasing air temperature could create hotter and more arid conditions conducive to more dust and ground-level ozone pollution, which would create transient and localized hazards for the analysis area. In order to maintain current mitigation success rates, Pinto Valley Mining Corp. may need to increase control measures under the Class II "synthetic minor" air quality control permit, such as revegetating inactive surfaces, watering haul roads, and applying regular dust suppressant to heavily traveled roads.

Precipitation and Drought

Under the no-action alternative, continued mining operations for 2 months following the record of decision, followed by closure, reclamation, and post-closure phases, would coincide with generally increasing frequency and severity of extreme precipitation events, as well as a slight overall decrease in annual precipitation. Continued mining operations under the no-action alternative may potentially exacerbate water shortages due to prolonged and severe droughts. Pinto Valley Mining Corp. currently monitors surface and groundwater quality pursuant to storm water pollution prevention plan and Arizona Department of Environmental Quality Aquifer Protection Permit Program requirements, respectively. Under the no-action alternative, surface and groundwater quality could potentially be affected by more intense and sustained precipitation events caused by climate change. This may increase the likelihood of waste and storm water discharge into surrounding surface water systems, which may adversely affect ecosystems within National Forest System lands.

Wildfires

Greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine are not expected to notably affect the frequency or severity of wildfires. Refer to section 3.8, "Fire and Fuels Management," for additional information on wildfires.

3.4.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.4.4.3.1 Greenhouse Gas Emissions

Under alternative 1, the following activities are expected to result in or affect greenhouse gas emissions:

- Recoverable copper production at Pinto Valley Mine is projected to continue for approximately 7 years following the record of decision.
- Increase in total surface disturbance by 909 acres on private land. No new surface disturbance on National Forest System lands.
- Total mining tonnages are assumed to continue at a constant throughput rate of approximately 58,000 tons of ore and 82,000 tons of waste rock per day through the projected end of the mine life in 2027.
- Pinto Valley Mining Corp. would continue to use approximately 29.8 miles of National Forest System roads and 15.2 miles of access roads on National Forest System lands to support mining activities.
- Pinto Valley Mining Corp. may realign some existing haul and access roads on private land; there would be no change in the use of existing access roads on National Forest System lands.

- The total power requirement for the mine is 47 megawatts per hour and would require a minimum power voltage of 115 kilovolts. There is no anticipated change in power requirements from current levels.
- All indoor lights are on 24 hours a day, 7 days a week, for the most part and most outdoor lights are on dusk-to-dawn photocells or timers.
- Use of the existing administration and maintenance building at the plant site, which is close to the mill and concentrator, would continue.

During active mining operations under alternative 1 (approximately 7 additional years compared to the no-action alternative), mobile sources (on-road vehicles and off-road equipment, for example) and electricity consumption would contribute the most to greenhouse gas emissions (56.8 percent and 40.9 percent of total greenhouse gas emissions, respectively). Under alternative 1, the estimated greenhouse gas emissions would be the largest in 2024 which is the year associated with the greatest amount of haul truck activity.

Total greenhouse gas emissions through the end of the mine life would be 2.6 million metric tons of carbon dioxide equivalent and 0.9 million metric ton of carbon dioxide equivalent throughout reclamation activities under alternative 1. Post-closure activities are not anticipated to result in notable emissions.

Table 3-32 summarizes annual greenhouse gas emissions by gas and source and table 3-33 summarizes total greenhouse gas emissions by operating phase under alternative 1.

Table 3-32. Annual and cumulative greenhouse gas emissions under alternative 1 by greenhouse gas and source category (metric tons of carbon dioxide equivalent)

Alternative 1 Timeline	Mine Operation (2021–2027)		Reclamation (2028–2040)			Total	% of Total
Greenhouse Gas and Source Category	***2024***	***2027***	***2030***	***2035***	***2040***		
Carbon Dioxide	**242,920**	**234,270**	**78,705**	**62,193**	**2,821**	**3,194,205**	**92.0%**
Mobile Sources	97,216	88,854	78,026	62,193	1,410	1,703,625	49.1%
Reclamation Activities	0	0	679	0	1,410	6,269	0.2%
Stationary Sources	6,635	6,635	0	0	0	66,350	1.9%
Electricity	139,069	138,782	0	0	0	1,417,961	40.9%
Land Use Change[51]	0	0	0	0	0	0	0.0%
Methane	**653**	**641**	**615**	**591**	**2**	**13,606**	**0.4%**
Mobile Sources	643	631	615	591	2	13,501	0.4%
Stationary Sources	3	3	0	0	0	31	0.0%
Electricity	7	8	0	0	0	74	0.0%
Nitrous Oxide	**14,938**	**13,922**	**11,570**	**9,645**	**171**	**263,320**	**7.6%**
Mobile Sources	13,903	12,887	11,570	9,645	171	252,971	7.3%
Stationary Sources	1,034	1,034	0	0	0	10,335	0.3%
Electricity	1	1	0	0	0	14	0.0%
Total (all greenhouse gases)	**258,512**	**248,833**	**90,890**	**72,430**	**2,994**	**3,471,131**	**100%**

Source: ICF 2020

[51] Emissions from land use changes were assumed to be zero, as the change in land use and associated emissions would be minimal.

Table 3-33. Total greenhouse gas emissions under alternative 1 by greenhouse gas and operational phase (metric tons of carbon dioxide equivalent)

Operational Phase	Carbon Dioxide	Methane	Nitrous Oxide	Total
Mine Operation (7 years)	2,425,417	6,489	145,607	2,577,513
Reclamation (12 years)	768,788	7,117	117,713	893,618
Post-Closure (30 years)	0	0	0	0
Total	**3,194,205**	**13,606**	**263,320**	**3,471,131**

Source: ICF 2020

3.4.4.3.2 Climate Change

Air Temperature

Continued mining operations for approximately 7 years under alternative 1 would coincide with general air temperature warming described above under the no-action alternative. Warming and more frequent heat waves would increase the number of annual cooling degree days and, in turn, energy demand and expenditures in the analysis area (Zamuda et al. 2018). Additionally, some air pollution concentrations (ozone) may increase through 2027 due to effects driven by increasing temperatures. Specifically, air temperature increases would create hot and arid conditions conducive to dust and ground-level ozone pollution, which may create transient and localized hazards for the analysis area.

Precipitation and Drought

Similar to the no-action alternative, under alternative 1 extreme precipitation events may become more frequent and severe, even while overall precipitation decreases.

Wildfires

Similar to the no-action alternative, greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine are not expected to notably affect the frequency or severity of wildfires. Refer to section 3.8, “Fire and Fuels Management,” for additional information on wildfires.

3.4.4.4 <u>**Proposed Action – Direct and Indirect Impacts**</u>

3.4.4.4.1 Greenhouse Gas Emissions

Under the proposed action, the following activities would result in potential changes to greenhouse gas emissions:

- Recoverable copper production at Pinto Valley Mine is projected to continue for approximately 19 years following the record of decision (12 more years than alternative 1 and 19 more years than the no-action alternative).
- Proposed mine development, including expansion of the Open Pit, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4 onto National Forest System lands, resulting in an additional 229 acres of surface disturbance of National Forest System lands and 1,087 acres of surface disturbance on private lands.
- The mill and concentrator site would be used in the same manner as described under the no-action alternative, except that approximately 398,750,000 more tons of ore would be generated for milling, and the mill and concentrator operational period would be approximately 12 years longer than alternative 1 and 19 years longer than the no-action alternative.

- Pinto Valley Mining Corp. would continue to use National Forest System roads and access roads in the same manner as described under alternative 1, but their use to support active mining would continue for approximately 12 more years than alternative 1.
- Total mining tonnages are forecast to remain at 58,000 tons of ore and 82,000 tons of waste rock per day, and then gradually decrease during the last 7 years of active mining.
- Assuming a constant throughput rate, the mine could process an estimated total of 402,230,000 tons of ore and 568,670,000 tons of waste rock during active mining operations, producing an estimated 2,430,100,000 pounds of copper and 23,750,000 pounds of molybdenum.
- Electrical infrastructure use for active mining would be lengthened by 12 years compared to alternative 1.
- Vehicle trips would be the same as described under the no-action alternative, except vehicle trips associated with active mining would be extended for approximately 12 years compared to alternative 1 and the vehicle miles traveled would be higher.

During active mining operations under the proposed action, mobile sources (on-road vehicles and off-road equipment, for example) and electricity consumption would contribute the most to greenhouse gas emissions (55.6 percent and 41.6 percent of total greenhouse gas emissions, respectively). Similar to alternative 1, the year with the largest amount of emissions would be year 4 following the record of decision. Because climate change results from the cumulative past and present greenhouse gas emissions on a global basis, emissions from the proposed action cannot be said to cause any particular effect on climate change.

Cumulative greenhouse gas emissions through the end of the mine life would be 6.3 million metric tons of carbon dioxide equivalent and 0.9 million metric ton of carbon dioxide equivalent throughout reclamation activities under the proposed action. Under the proposed action, the only emissions during post-closure of the mine would be due to lost carbon sequestration from additional disturbance on National Forest System lands, until vegetation is re-established from the reclamation activities.

Table 3-34 summarizes annual greenhouse gas emissions by greenhouse gas and source and table 3-35 summarizes total greenhouse gas emissions by life-of-mine phase under the proposed action.

The increase in greenhouse gas emissions under the proposed action would be primarily driven by continuing active mining operations by 19 more years than under the no-action alternative and 12 more years than under alternative 1, which includes additional materials processing, electricity consumption, and on-site fossil fuel consumption. In addition, the proposed action would increase the vehicle miles traveled by the mine’s haul trucks (an additional 12.4 million miles over the lifetime of the mine compared to the no-action alternative).

Table 3-34. Annual and cumulative greenhouse gas emissions under the proposed action by greenhouse gas and source category (metric tons of carbon dioxide equivalent)

Proposed Action Timeline	Mine Operation (2021–2039)			Reclamation (2040–2052)			Total	% of Total
Greenhouse Gas and Source Category	*2024*	*2027*	*2039*	*2040*	*2045*	*2052*		
Carbon Dioxide	**285.490,**	**264,333**	**246,357**	**84,726**	**72,277**	**63,534**	**6,711,044**	**92.5%**
Mobile Sources	139,678	118,809	118,809	83,940	72,170	62,017	3,510,332	48.6%
Reclamation Activities	0	0	0	679	0	1,410	6,269	0.1%
Stationary Sources	6,635	6,635	6,635	0	0	0	145,970	2.0%
Electricity	139,069	138,782	120,806	0	0	0	3,018,642	41.8%

Proposed Action Timeline	Mine Operation (2021–2039)			Reclamation (2040–2052)			Total	% of Total
Greenhouse Gas and Source Category	***2024***	***2027***	***2039***	***2040***	***2045***	***2052***		
Land Use Change	107	107	107	107	107	107	29,832	0.4%
Methane	**716**	**686**	**684**	**623**	**606**	**591**	**22,392**	**0.3%**
Mobile Sources	706	675	675	623	606	591	22,163	0.3%
Stationary Sources	3	3	3	0	0	0	69	0.0%
Electricity	7	8	6	0	0	0	160	0.0%
Nitrous Oxide	**10,101**	**17,563**	**17,563**	**12,289**	**10,858**	**9,624**	**520,403**	**7.2%**
Mobile Sources	19,066	16,529	16,529	12,289	10,858	9,624	497,636	6.9%
Stationary Sources	1,034	1,034	1,034	0	0	0	22,737	0.3%
Electricity	1	1	1	0	0	0	30	0.0%
Total (all greenhouse gases)	**306,307**	**282,582**	**264,604**	**97,639**	**83,741**	**73,749**	**7,253,839**	**100%**

Source: ICF 2020

Table 3-35. Total greenhouse gas emissions under the proposed action (metric tons of carbon dioxide equivalent)

Operational Phase	Carbon Dioxide	Methane	Nitrous Oxide	Total
Mine Operation (19 years)	5,903,100	15,223	398,490	6,316,813
Reclamation (12 years)	804,728	7,168	121,913	933,810
Post-Closure (30 years)	3,216	0	0	3,216
Total	**6,711,044**	**22,392**	**520,403**	**7,253,839**

Source: ICF 2020

In comparison to the no-action alternative, an additional 5.3 million metric tons of carbon dioxide equivalent emissions would occur under the proposed action (267-percent increase) over the analysis period due to the extended lifetime of the mine operations by approximately 19 years, which includes additional materials processing, electricity consumption, and on-site fossil fuel consumption. The increase in greenhouse gas emissions under the proposed action would primarily be driven by the increase in distance traveled by the mine's haul trucks (an additional 13.9 million miles over the lifetime of the mine).

In comparison to alternative 1, an additional 3.8 million metric tons of carbon dioxide equivalent total emissions may occur under the proposed action (109 percent increase) over the analysis time period due to the extended lifetime of mine operations by 12 years, which includes additional materials processing, electricity consumption, and onsite fossil fuel consumption. The increase in greenhouse gas emissions under the proposed action would be driven by the increase in distance traveled by the mine's haul trucks (an additional 12.4 million miles over the lifetime of the mine).

Table 3-36 shows a comparison of annual greenhouse gas emissions under alternative 1 and proposed action by greenhouse gas and source category (such as mobile, stationary, and electricity). Table 3-37 shows a comparison of total greenhouse gas emissions under alternative 1 and proposed action over the analysis time period. Figure 3-9 and figure 3-10 compare the annual emissions for all greenhouse gases and total emissions for all greenhouse gases by source category, respectively, under alternative 1 and proposed action.

Table 3-36. Incremental difference in annual greenhouse gas emissions under the proposed action in comparison to alternative 1 (metric tons of carbon dioxide equivalent)

Alternative 1 Timeline	Mine Operation (2021–2027)			Reclamation (2028–2040)			Post-Closure (2041–2070)	
Proposed Action Timeline	**Mine Operation (2018–2039)**							
Greenhouse Gas and Source Category	***2021***	***2024***	***2027***	***2030***	***2035***	***2039***	***2045***	***2050***
Carbon Dioxide	**62,321**	**42,570**	**30,062**	**185,172**	**196,844**	**242,363**	**72,277**	**63,534**
Mobile Sources	39,350	42,462	29,955	40,783	56,616	116,225	72,170	62,017
Reclamation Activities	0	0	0	(679)	0	(1,410)	0	1,410
Stationary Sources	0	0	0	6,635	6,635	6,635	0	0
Electricity	0	0	0	138,326	133,487	120,806	0	0
Land Use Change	107	107	107	107	107	107	107	107
Methane	**58**	**63**	**44**	**71**	**94**	**181**	**606**	**591**
Mobile Sources	58	63	44	60	84	172	606	591
Stationary Sources	0	0	0	3	3	3	0	0
Electricity	0	0	0	8	7	6	0	0
Nitrous Oxide	**4,784**	**5,163**	**3,642**	**5,993**	**7,918**	**15,165**	**10,858**	**9,624**
Mobile Sources	4,784	5,163	3,642	4,958	6,883	14,131	10,858	9,624
Stationary Sources	0	0	0	1,034	1,034	1,034	0	0
Electricity	0	0	0	1	1	1	0	0
Total (all greenhouse gases)	**67,164**	**47,795**	**33,749**	**191,237**	**204,857**	**257,709**	**83,741**	**73,749**

Source: ICF 2020

Table 3-37. Incremental difference in total greenhouse gas emissions under the proposed action in comparison to the no-action alternative and alternative 1 (metric tons of carbon dioxide equivalent)

Operational Phase	Carbon Dioxide	Methane	Nitrous Oxide	Total
Incremental Difference Between Proposed Action and No-action Alternative				
Mine Operation	4,918,770	12,631	355,035	5,271,897
Reclamation	1,393	0	0	1,393
Post-Closure	3,216	0	0	3,216
Total	**4,923,380**	**12,631**	**355,035**	**5,276,507**
Percent Change	**275%**	**129%**	**215%**	**267%**
Incremental Difference Between Proposed Action and Alternative 1				
Mine Operation	3,477,683	8,735	252,883	3,739,300
Reclamation	35,940	51	4,200	40,192
Post-Closure	3,216	0	0	3,216
Total	**3,516,839**	**8,786**	**257,083**	**3,782,708**
Percent Change	**110%**	**65%**	**98%**	**109%**

Source: ICF 2020

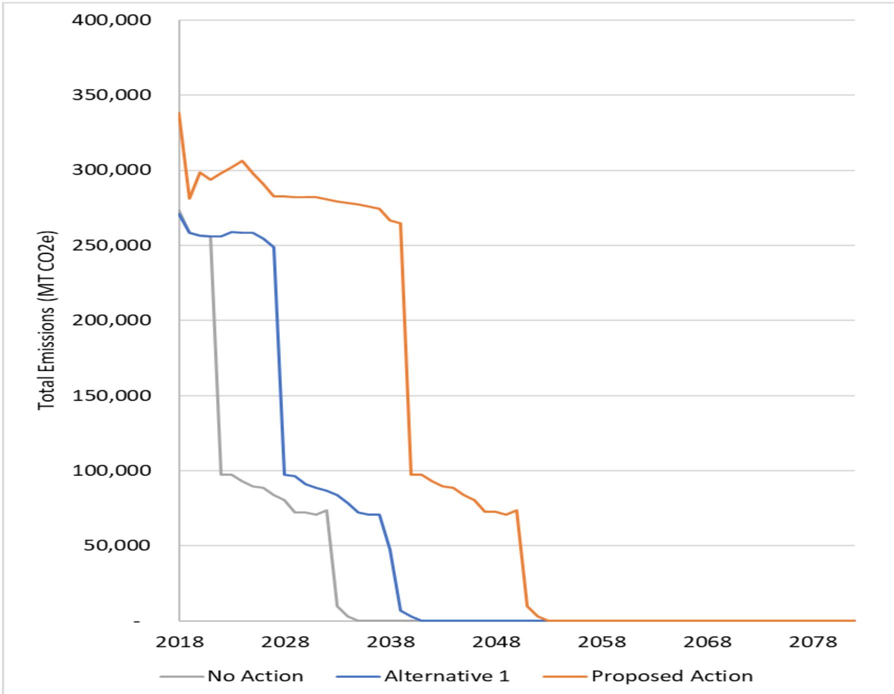

Figure 3-9. Total annual greenhouse gas emissions under the no-action alternative, alternative 1, and proposed action

Source: ICF 2020

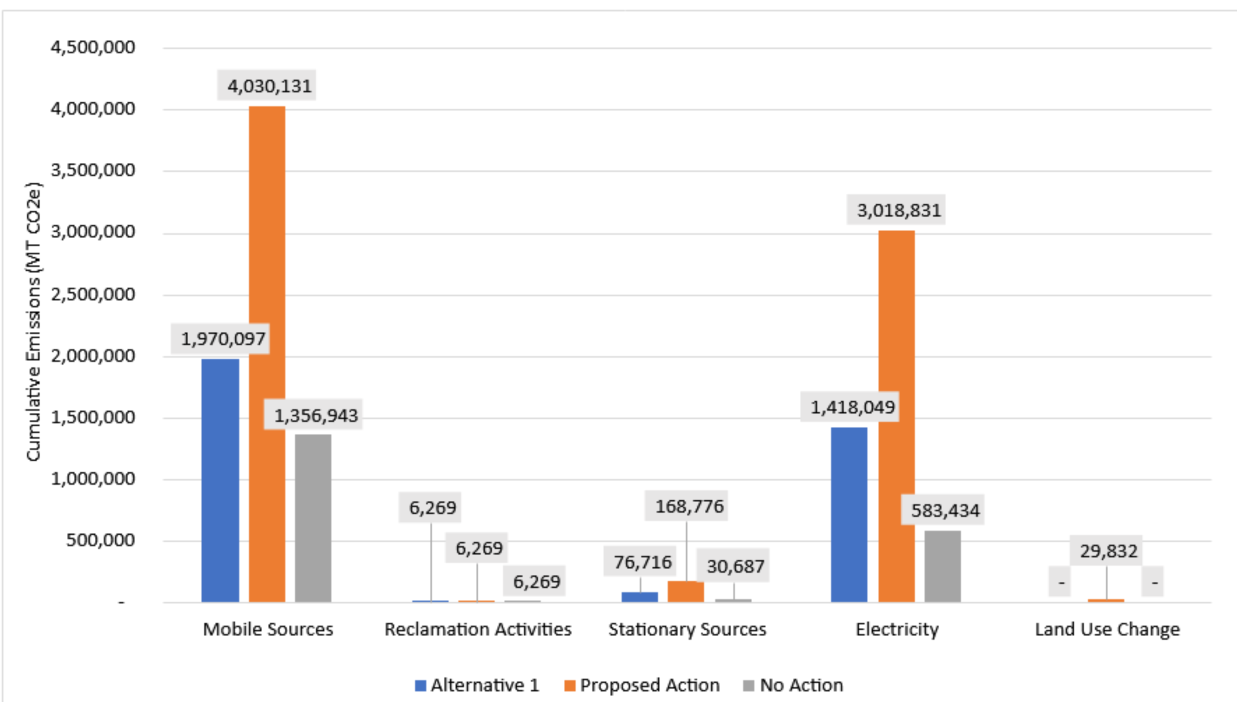

Figure 3-10. Total greenhouse gas emissions by source category under the no-action alternative, alternative 1, and proposed action

Source: ICF 2020

3.4.4.4.2 Climate Change

Air Temperature

As detailed and summarized for the no-action alternative, climate models project that air temperatures will warm in the analysis area through mid-century. Annual mean maximum temperatures may increase by nearly 5 degrees Fahrenheit and the number of extreme heat days, defined as days when the temperature exceeds 90 degrees Fahrenheit, may increase by more than 30 days per year by mid-century compared to the historical baseline between 1976 and 2005 (Vose et al. 2017). Impacts on the analysis area due to increasing temperatures would be exacerbated by extended operation of the Pinto Valley Mine (approximately 19 more years than the no-action alternative). Extended mine operations would increase energy demands under extreme heat (Zamuda et al. 2018). In addition, warming air temperatures may increase localized dust and ground-level ozone pollution.

Precipitation and Drought

As detailed and summarized for the no-action alternative, climate models project large interannual variability and a small decline in annual mean precipitation through mid-century in Gila County. Precipitation decline and increases in extreme heat will drive more frequent and intense droughts in the analysis area (Cook et al. 2015; Gonzalez et al. 2018). At the same time, warming air temperatures will support more frequent and longer-duration extreme precipitation events (Luong et al. 2017). As a result, climate change would simultaneously increase the likelihood of both drought and extreme precipitation during active mining operations under the proposed action.

Similar to the no-action alternative and alternative 1, changing precipitation and drought patterns will likely affect the analysis area under the proposed action. More frequent drought conditions coupled with extended groundwater withdrawal for ore processing and dust suppressant could increase the likelihood of water shortages during active mining operations. Coincidentally, groundwater recharge rates could be slower in a warmer and drier climate. As a result, the water table in the analysis area could lower at an accelerated rate under the proposed action, potentially adversely affecting surrounding stream habitat and wildlife.

Under the proposed action, more frequent extreme precipitation events, expansion of the Open Pit, and construction of roads and power lines on National Forest System lands to support operation at Tailings Storage Facility No. 4 may increase the likelihood of sediment transport away from the Pinto Valley Mine and deposition in the surrounding area.

Wildfires

Similar to alternative 1, greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine under the proposed action are not expected to notably affect the frequency or severity of wildfires. Refer to section 3.8, “Fire and Fuels Management,” for additional information on wildfires.

3.4.4.5 **Cumulative Impacts**

The cumulative impacts analysis area for greenhouse gas emissions and climate change includes the Pinto Valley Mine project boundary—the same area used to analyze direct and indirect effects in section 3.4.4, “Environmental Consequences”—as well as the local, regional, and statewide boundaries used to quantify existing conditions for greenhouse gas emissions and climate change impacts in section 3.4.3, “Affected Environment.” The temporal boundary for analyzing cumulative impacts related to greenhouse gas emissions and climate change includes the duration of active mining operations, reclamation and closure, and post-closure under the alternatives.

The cumulative impact analysis considers scopes 1 and 2 greenhouse gas emissions during the three phases of the Pinto Valley Mine: active mining, reclamation and closure, and post-closure. This includes any actions that could influence the direct, indirect, and induced emissions resulting from transportation and equipment use at the mine. Cumulative greenhouse gas emissions contribute to climate change on a global scale.

3.4.4.5.1 Greenhouse Gas Emissions

Present effects of the relevant past and present actions have resulted in the greenhouse gas emission conditions presented section 3.4.3, “Affected Environment.” The primary past, present, and reasonably foreseeable actions contributing to cumulative effects on greenhouse gas emissions include energy consumption from onsite fossil fuel use (stationary and mobile combustion from construction equipment and vehicles), emissions from electricity consumption, and associated emissions from other permitted mines and smelters within the analysis area. The recent Woodbury Fire, which burned 124,000 acres in June and July of 2019 mostly within the Superstition Wilderness area west of the analysis area, also burned areas along Little Campaign Creek northwest of the Pinto Valley Mine. In addition, in 2020 several other fires burned in the Tonto National Forest, affecting existing ecological conditions and potentially contributing to cumulative effects. The closest of these fires to the Pinto Valley Mine was the Salt Fire, which burned over 21,000 acres north and east of the Pinto Valley Mine in August and September of 2020. These fires contribute to greenhouse gas emissions.

During active mining operations under the proposed action, mobile sources (on-road vehicles and off-road equipment, for example) and electricity consumption would contribute the most to greenhouse gas emissions (55.6 percent and 41.6 percent of total greenhouse gas emissions, respectively). Cumulative greenhouse gas emissions through the end of the mine life would be 6.3 million metric tons of carbon dioxide equivalent and 0.9 million metric ton of carbon dioxide equivalent throughout reclamation activities under the proposed action. Present and reasonably foreseeable actions that could contribute to cumulative greenhouse gas emissions in the future are identified in table 3-3 and further described in table 3-2. Potential cumulative impacts of other ongoing actions (table 3-2) are considered to be accounted for in existing greenhouse gas inventories, as discussed in section 3.4.3.1, “Greenhouse Gas Emissions.” The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on greenhouse gas emissions include the construction and operation activities for all active projects in the analysis area (such as construction and operation of Resolution Copper Project and Land Exchange and smelters in the analysis area) that generate greenhouse gas emissions.

The differences in cumulative impacts on greenhouse gas emissions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.4.4.2 through 3.4.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are summarized in section 3.4.4.4.1.

The proposed action would result in the greatest potential contributions to greenhouse gas emissions due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions compared to the other alternatives.

3.4.4.5.2 Climate Change Impacts

Present effects of the relevant past and present actions have resulted in the climate change conditions presented in section 3.4.3, “Affected Environment.” Climate change is projected to create warmer air temperatures and large interannual variability and a small decline in annual mean precipitation in the analysis area. Coupled with these impacts, the proposed action may also increase energy demands under extreme heat, increase localized dust, increase ground-level ozone pollution, and increase the likelihood of water shortages, sediment transport, and unplanned wildfire ignitions.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on climate change include the construction and operation activities for all active projects in the analysis area (such as construction and operation of Resolution Copper Project and Land Exchange and smelters in the analysis area) that generate greenhouse gas emissions. Prescribed fire, wildfire, or mechanical vegetation treatments under the Highway Tanks Tribal Forest Protection Act Project could affect the cumulative area available for carbon sequestration and increase the likelihood of adverse climate change impacts (such as wildfire risk).

The differences in cumulative impacts on climate change among the alternatives would generally be commensurate with the differences in direct and indirect climate change impacts among the alternatives described in sections 3.4.4.2 through 3.4.4.4. The proposed action would result in the greatest potential contributions to cumulative impacts on climate change due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions compared to the other alternatives. However, because climate change results from the cumulative past and present greenhouse gas emissions on a global basis, emissions from the proposed action cannot be said to cause any particular effect on climate change.

3.5 Cultural Resources

The term “cultural resource” is commonly used but has not been formally defined by law or regulation. Forest Service Manual 2360.5 offers a definition of cultural resource: *“*An object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties.” Cultural resources that are listed on or eligible for the National Register of Historic Places are designated “historic properties.”[52] The National Historic Preservation Act and its implementing regulations found at 36 CFR 800 give Federal agencies the responsibility to assess and pursue resolution of adverse effects on historic properties. In accordance with 36 CFR 800.5(a)(1), an adverse effect on historic properties occurs when an undertaking alters, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that would diminish the property’s integrity including the site’s location, design, setting, materials, workmanship, feeling, or association.

This section describes historic properties and analyzes potential impacts on these resources. Other resources of tribal interest found on the landscape in the vicinity of the Pinto Valley Mine such as sacred sites and traditional gathering areas may have value and be of concern to affiliated tribes but would not necessarily qualify as historic properties. Resources of tribal interest are discussed further in section 3.6, “Resources of Tribal Interest.”

The area of potential effects for a Federal undertaking, such as Pinto Valley Mining Corp.’s proposed action, is defined in 36 CFR 800.16(d) as the “geographic area or areas within which an undertaking may

[52] Section 300308 (formerly section 301) of the National Historic Preservation Act defines historic properties to be “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register, including artifacts, records, and material remains related to such a property or resource.” Historic properties also include traditional cultural properties, which are cultural resources that are eligible for inclusion in the National Register of Historic Places because of their association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community.

directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking." The analysis area for historic properties is the area of potential effects determined by the Tonto National Forest during section 106 consultation for proposed activities at Pinto Valley Mine. The area of potential effects covers a total of 21,813 acres, composed of a 1,930-acre direct effects area and 19,883-acre indirect effects area, as depicted on map 3-6 in appendix A. The direct effects portion of the area of potential effects includes all areas within locations of proposed surface disturbance for the proposed action. The indirect effects portion of the area of potential effects represents a 0.5-mile buffer surrounding the location of proposed surface-disturbing activities for the proposed action that could be indirectly affected by changes in the visual environment and noise.

The temporal boundaries for analyzing the direct and indirect effects on historic properties include the ongoing operation of Pinto Valley Mine and extend through mine closure and final reclamation. These spatial and temporal boundaries encompass the extent of potential changes to historic properties stemming from the proposed action.

3.5.1 Relevant Laws, Regulations, and Policy

3.5.1.1 **Federal Authorities**

The management of cultural resources on lands owned, leased, or administered by the Federal Government is regulated by a series of laws, regulations, and policies. The major Federal laws pertaining to this analysis are summarized below.

3.5.1.1.1 American Antiquities Act of 1906 (6 U.S. Code 431-433)

Establishes a penalty for disturbing or excavating any historic or prehistoric ruin, monument, or object of antiquity on Federal lands as a maximum fine of $500 or 90 days in jail.

3.5.1.1.2 National Historic Preservation Act of 1966 (Public Law 89 665; 54 U.S. Code Section 300101 et. seq.)

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of the undertaking on any historic property (district, site, building, structure, or object that is included in or has been determined to be eligible for inclusion in the National Register of Historic Places).

3.5.1.1.3 Archaeological Resources Protection Act of 1979 (16 U.S. Code Section 470aa – 470mm)

This act also provides guidance to land-managing Federal agencies for improved management and protection of archaeological resources on public and Indian lands, and assigns authority to Federal officials to enforce laws that protect archaeological sites on public lands and enforce financial and incarceration penalties for those who are convicted of unpermitted excavation or removal and damage or defacement of archaeological resources. Section 9 of the Archaeological Resources Protection Act also requires that managers responsible for the protection of archaeological resources hold information about the locations and nature of these resources confidential unless providing the information would further the purpose of the statute and not create a risk of harm for the resources.

3.5.1.1.4 Native American Graves Protection and Repatriation Act of 1990 (23 U.S. Code 3001 et seq.)

Provides for the protection of Native American graves and items of cultural patrimony on Federal lands. This act requires consultation with appropriate Indian tribes prior to the intentional excavation or removal of certain kinds of cultural items and establishes procedures to determine the appropriate treatment of burials encountered during future planned excavation or as inadvertent discovery on Federal lands.

3.5.1.2 **Forest Service Regulations, Policies, and Guidance**

3.5.1.2.1 Forest Service Manual 2300

Chapter 2360, "Heritage Program Management," establishes Forest Service policies to protect cultural resources from Forest Service–authorized undertakings, unauthorized uses, and environmental damage.

3.5.1.2.2 Region 3 Forest Service Handbook 2309.24, "Heritage Program Handbook"

This handbook provides Forest Service guidance for administering the Heritage Program, including survey standards and methods, sampling procedures, predictive modeling, and the format for survey reports.

3.5.1.2.3 First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities among New Mexico Historic Preservation Officer and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer and Oklahoma State Historic Preservation Officer and The Advisory Council on Historic Preservation and United States Department of Agriculture Forest Service Region 3

This programmatic agreement (Forest Service 2003) describes roles and responsibilities of the Forest Service Region 3 and State Historic Preservation Offices in Region 3.

3.5.1.2.4 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan includes the following provisions for protection and management of cultural resources (Forest Service 1985):

- "The Forest Service will comply with the National Historic Preservation Act (as amended) and the Programmatic Agreement (PA)."
- "The standards specified in the PA will be followed. Where the settlement document does not specify standards, those in the Forest Service Manual and Handbook will apply."
- "During the conduct of undertakings, the preferred management of sites listed in, nominated to, eligible for, or potentially eligible for the National Register is avoidance and protection. Exceptions may occur in specific cases where consultation with the SHPO indicates that the best use of the resource is data recovery and interpretation."

A forest plan conformance assessment was conducted in 2017 and identified one resource area, cultural resources, that may have required a project-specific forest plan amendment for the Pinto Valley Mine Project to achieve conformance with the following forest-wide cultural resources standard guideline.

> "Sites listed in, nominated to, eligible for, or potentially eligible for the National Register will be managed during the conduct of undertakings to achieve a 'No Effect' finding, in consultation with the State Historic Preservation Officer" (Forest-Wide Cultural Resource Standard and Guideline #4, as included in the forest plan prior to July 31, 2017).

However, on July 31, 2017, the Forest Service completed a forest-wide programmatic forest plan amendment and associated decision (Forest Service 2017b) to remove this language, which conflicted with standard practices used to meet the requirements of the National Historic Preservation Act and reflected a need to align the forest plan with the 2003 Programmatic Agreement Regarding Historic Property Protection and Responsibilities among and the State Historic Preservation Officers of Arizona, New Mexico, Texas, and Oklahoma, the Advisory Council on Historic Preservation, and United States Department of Agriculture Forest Service Region 3.

With Forest Service completion of the programmatic forest plan amendment and the associated decision, the Pinto Valley Mine Project no longer requires a project-specific amendment related to the above standard and guideline for cultural resources that appeared in the previous version of the forest plan. The forest plan amendment #29, signed on July 31, 2017, amended the 1985 Tonto National Forest Plan to permanently remove the forest-wide standard and guideline #4 from page 38-1.

3.5.1.3 **State and Local Laws, Regulations, and Policies**

3.5.1.3.1 Arizona Antiquities Act of 1960

The Arizona State Museum administers one State statute (Arizona Revised Statute 41-865) related to private lands. Arizona Revised Statute 41-865 prohibits the intentional disturbance of human remains and funerary objects on privately owned lands and establishes rules and procedures for consultation and reporting on such actions.

3.5.1.3.2 Arizona State Historic Preservation Act of 1982

The Arizona State Historic Preservation Act and associated policies (Title 41, Chapter 4.2, Historic Preservation, Article 4, General Provisions, Arizona Revised Statute 41-861 through 41-864) are administered partly by the Arizona State Historic Preservation Office. It requires State agencies to consult with the State Historic Preservation Office regarding projects that may affect historic properties or archaeological sites, and provides guidance to land management agencies and institutions (such as the University of Arizona) through their responsibilities to protect and preserve cultural resources on lands they own or control. Arizona Revised Statutes 32-1364, 32-1365, and 36-831 provide additional regulations regarding the disinterment of human remains, and Arizona Revised Statute 36-327 stipulates that, except as otherwise provided by law, a disinterment-interment permit is required before a person disinters human remains.

3.5.2 Resource Indicators

The resource indicator for this analysis is the determination that there would be an adverse effect on historic properties, as defined under the National Historic Preservation Act. Determining the number of historic properties adversely affected (informed by archaeological surveys, archival research, and formal determinations of eligibility) is a method of quantitatively measuring adverse effects.

3.5.3 Affected Environment

The Tonto National Forest, including the analysis area, contains archaeological sites that document continuous human presence for at least the past 12,000 years. Refer to chapter 3, “Cultural and Historic Resources,” in the draft EIS for the Tonto National Forest Draft Land Management Plan for additional information on prehistoric and historic human presence in the analysis area (Forest Service 2019c).

A Class I literature review and records search was conducted for the entire 21,813-acre area of potential effects including the 1,930-acre direct area of potential effects and the 19,883 indirect area of potential effects. The literature review identified 213 previously recorded archaeological sites (King et al. 2018). Of these previously identified sites, 54 are partially or wholly within the direct effects portion of the area of potential effects. In April 2020, the Forest Service conducted another records search for the area of potential effects and did not identify any additional archaeological sites. An on-the-ground Class III cultural resource survey was also conducted for the 1,930-acre direct effects area, resulting in the identification of 64 archaeological sites, including 40 sites on National Forest System lands, 10 sites that occur on both National Forest System lands and private land, and 14 sites on private land. Forty-five of these 64 sites have been determined eligible for inclusion in the National Register of Historic Places (table 3-38). Fourteen of the 64 sites were previously recorded sites that could not be relocated during the surveys; therefore, these sites are no longer under Tonto National Forest management consideration and will not be analyzed further. Five of the 64 sites were determined to be not eligible for the National Register of Historic Places and documentation at the survey level exhausted their information potential; therefore, no further work is recommended for these sites.

Determinations of eligibility and effect shown in table 3-38 were made by the Tonto National Forest in consultation with the Arizona State Historic Preservation Office (Hill 2018).

Table 3-38. Determinations of eligibility and effect for cultural resource sites in the area of potential effects

Determination of Eligibility	Effect	Existing Condition
Not relocated within the area of potential effects or overtaken by mining operations	Not applicable	14
Not eligible	No effect	5
Eligible	Potential adverse effect	45
	Total	**64**

Source: Hill 2018

As indicated in table 3-38, 45 sites within the area of potential effects have been determined to be eligible for inclusion in the National Register of Historic Places and are therefore considered historic properties. The 45 historic properties in the area of potential effects include prehistoric Native American habitation and resource procurement sites, protohistoric and early historical Native American sites, historical Euroamerican sites, and multicomponent sites (table 3-39). Of the 45 historic properties, further site investigation determined that 18 properties would not be adversely affected by the authorized activities, while 27 of the sites have the potential to be directly affected by the proposed action or are vulnerable to indirect effects due to their proximity to existing roads. In compliance with the National Historic Preservation Act, a historic properties treatment plan was prepared to identify data recovery and protective measures to mitigate effects on the 27 historic properties (WestLand Resources, Inc. 2019a). Due to imminent danger of one of these historic properties being inundated by continued expansion of a tailings storage facility occurring as part of the currently authorized mining operations, data recovery was conducted in July and August of 2019 at that site in accordance with the historic properties treatment plan approved by the Arizona State Historic Preservation Office (WestLand Resources, Inc. 2019b). The State Historic Preservation Office concurred with the adequacy of treatment of that site on January 17, 2020 (State Historic Preservation Office 2020).

Table 3-39. Historic properties by cultural affiliation

Resource Element	Resource Indicator	Number of Historic Properties
Prehistoric Native American sites	Artifacts or features on existing ground surface	30
Protohistoric and early historical Native American sites	Artifacts or features on existing ground surface; information from archival sources	2
Historical Euroamerican sites	Artifacts or features on existing ground surface; information from archival sources	7
Multicomponent sites	Artifacts or features on existing ground surface; information from archival sources	3
Native American sites that may be prehistoric, protohistoric, or early historical	Artifacts or features on existing ground surface; information from archival sources	3

3.5.4 Environmental Consequences

3.5.4.1 Analysis Methodology and Assumptions

The analysis of impacts on historic properties applies the following methods:

- Information gathered to identify the historic properties that would be adversely affected and to evaluate the alternatives is based on the following activities and investigations:
  - Archaeological surveys of proposed disturbance areas.
  - Consultation with culturally affiliated tribes and cooperating agencies.
  - Archival and oral history investigations.
- Potential impacts on the identified historic properties are assessed based on the location of proposed surface disturbance and other project-related activity that can have a direct physical effect on historic properties. The analysis also considers auditory, visual, and atmospheric effects that could affect historic properties.
- Effects on historic properties are of interest to tribes, and the Forest Service consults with tribes under the National Historic Preservation Act, in part, to give tribes an opportunity to communicate any concerns they may have regarding effects on historic properties.

The following types of impacts are described, analyzed, and compared across the alternatives:

- Proposed mine activities, from mine expansion through final reclamation and closure, could bury, remove, or damage all or portions of historic properties.
- Mine activities or the addition of structural elements to the landscape could affect the integrity of setting of historic properties.
- Proposed mine activities, from mine expansion through final reclamation and closure, have the potential to disturb human remains.
- Potential for increased public access to historic properties.

The analytical approach for comparing alternatives is based on the following factors:

- Quantitative and qualitative assessment of direct impacts on historic properties within the area of potential effects that could be affected (buried, destroyed, or damaged) by project activities.

- Qualitative assessment of potential visual resource impacts from surface disturbance, project facilities, and other project activity, and how these changes in the visual landscape could affect the integrity of historic properties within the area of potential effects.
- Assessment of potential impacts on historic properties and the development of a historic properties treatment plan and appropriate mitigation to address potential impacts.
- Qualitative assessment of the efficacy of treatment plans and mitigation to address potential impacts on historic properties.

The analysis of impacts on historic properties includes the following assumptions:

- For purposes of this analysis, direct impacts are defined as the destruction, burial, or damage of historic properties.
- Indirect impacts could include changes in the visual environment and noise effects on historic properties whose significance is tied to the current setting, as well as the potential for increased public access to historic properties in areas where public access was limited or restricted, leading to possible theft or disturbance.
- The historic properties treatment plan prepared by WestLand Resources, Inc. (2019b) and concurred on by the Arizona State Historic Preservation Office applies to the proposed action. Although the authorization of activities on National Forest System lands under alternative 1 would also occur under the proposed action, the historic properties treatment plan would need to be updated specific to alternative 1.
- Vibrations from blasting and drilling are not anticipated to damage structural components of historic properties relative to their existing condition under any alternative because blasting and drilling have occurred at the Pinto Valley Mine for a long period of time at similar frequencies, intensities, and locations as would occur under alternative 1 or the proposed action. Any structures susceptible to damage have likely already been affected by past vibration effects and no such effects have been documented. Additionally, vibration effects from blasting are not anticipated to exceed Office of Surface Mining Reclamation and Enforcement regulatory standards, which do not specifically identify historic properties as protected structures but do set maximum allowable limits on the ground vibration. Lastly, data recovery would be completed at 14 historic properties in the immediate area of existing mining facilities, which are likely to experience the highest levels of ground vibration, prior to their consumption by mining activities.

3.5.4.2 No-action Alternative – Direct and Indirect Impacts

There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land and the 0 acres of new disturbance on National Forest System lands under the no-action alternative. Ongoing use and maintenance of National Forest System Road 287 would continue to provide public access through the mine and to a variety of recreation areas in the vicinity, including the Haunted Canyon and Pinto Creek trailheads of the Superstition Wilderness area. However, opportunities for public access and associated risk of theft or vandalism would be essentially the same as the existing condition.

There are 14 historic properties within or near (within 50 feet of) existing roads. However, the no-action alternative is not anticipated to directly affect these sites provided that the continued use of the roads is contained within the road prism and no additional surface disturbance occurs within the property boundaries. However, these properties are vulnerable to indirect or inadvertent adverse effects resulting from use of the roads.

Direct impacts including, but not limited to, 367 acres of surface and subsurface disturbance, realignment of roads and utilities, and vegetation removal could also affect undiscovered historic properties. However, previous cultural resource surveys in areas of proposed disturbance make the discovery of undiscovered properties unlikely. As these impacts on historic properties would occur on private lands, they would not be subject to the section 106 process. Under the no-action alternative, any new sites that may be discovered during the course of mining activities would not necessarily need to be reported if they occur on private land. This is in contrast to sites discovered during the implementation of an action alternative, which would be covered by a historic properties treatment plan. Any human remains discovered on private lands during implementation of the no-action alternative would be protected by Arizona laws (Arizona Revised Statutes 41-865, 32-1364, 32-1365, 36-831, and 36-327).

Potential alteration of historic property settings due to the introduction of visual, atmospheric, and noise impacts is not anticipated to affect the integrity of any historic properties within the area of potential effects because all properties are eligible for the National Register of Historic Places under Criterion D, for the information they may yield. Setting does not contribute to the National Register of Historic Places eligibility of these historic properties.

3.5.4.3 Alternative 1 – Direct and Indirect Impacts

Alternative 1 would result in an estimated 909 acres of new disturbance on private land and continued use of National Forest System lands for previously authorized roads, pipelines, transmission lines, and other infrastructure. Similar to the no-action alternative, there would be no new surface disturbance on National Forest System lands. Surface disturbance from expansion of mining facilities onto an additional 909 acres of private lands under alternative 1 has the potential to have direct physical effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. Proposed activities under alternative 1 are anticipated to bury, disturb, or destroy these historic properties.

Similar to the no-action alternative, alternative 1 is not expected to result in adverse effects on the 14 historic properties located within or near existing roads; however, these sites would be vulnerable to indirect or inadvertent effects resulting from the use of the roads.

Direct impacts including, but not limited to, 909 acres of surface and subsurface disturbance associated with expansion of mining facilities on private land, realignment of roads and utilities, and vegetation removal could also affect undiscovered historic properties; however, previous cultural resource surveys in areas of proposed disturbance make the discovery of undiscovered historic properties unlikely.

In contrast to the no-action alternative, under alternative 1, undertakings in the area of potential effect would generally be subject to the National Historic Preservation Act section 106 process because alternative 1 includes authorization of activities on National Forest System lands. Additionally, alternative 1 would ensure that new sites discovered during the course of mining activities are reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment and mitigation specified in a historic properties treatment plan, and a memorandum of agreement that would be developed for this alternative. Affiliated tribes also would be afforded the opportunity to consult regarding the identification and treatment of new historic properties, including traditional cultural properties. The historic properties treatment plan prepared by WestLand Resources, Inc. (2019a) and concurred on by the Arizona State Historic Preservation Office applies to the proposed action. Adverse effects on historic properties under alternative 1 would be mitigated by revising the historic properties treatment plan to implement portions of the plan applicable to alternative 1. Any human remains discovered on private lands during implementation of alternative 1 would be protected by Arizona laws (Arizona Revised Statutes 41-865, 32-1364, 32-1365, 36-831, and 36-327).

Ongoing use and maintenance of existing roads that would provide continued access to Pinto Valley Mine facilities under alternative 1 would persist for approximately 7 more years than under the no-action alternative and would increase the duration of visual and noise effects on historic properties. However, similar to the no-action alternative, potential alteration of historic property settings due to visual, atmospheric, and noise impacts from use and maintenance of roads is not anticipated to degrade the integrity of any historic properties within the area of potential effects because all properties are eligible for the National Register of Historic Places under Criterion D for the information they may yield, and setting does not contribute to the National Register of Historic Places eligibility of these historic properties.

3.5.4.4 Proposed Action – Direct and Indirect Impacts

Surface disturbance from expansion of mining facilities onto an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. under the proposed action could have an adverse effect on some or all of the 27 known historic properties within the area of potential effects. These 27 properties include the three historic properties that could be directly adversely affected by alternative 1, the 14 historic properties that are vulnerable to indirect effects due to their proximity to existing roads, and 10 additional sites that could be affected under the proposed action that would not be affected under alternative 1. Direct impacts resulting from the proposed action could bury, disturb, or destroy these historic properties, some of which have the potential to contain human remains, and would directly alter the characteristics that qualify them for inclusion in the National Register of Historic Places.

Similar to the no-action alternative, the proposed action is not expected to result in direct adverse effects on the 14 historic properties located within or near existing roads; however, these sites would be vulnerable to indirect or inadvertent effects resulting from use of the roads. In contrast to the no-action alternative, the proposed action would apply the historic properties treatment plan (WestLand Resources, Inc. 2019a) developed for the project. In accordance with the historic properties treatment plan, implementation of protective measures including signage and barriers would prevent indirect or inadvertent adverse effects on these 14 properties.

Direct impacts including, but not limited to 1,317 acres of surface and subsurface disturbance associated with expansion of mining facilities (229 acres on National Forest System lands and 1,087 acres on private land), realignment of roads and utilities, and vegetation removal could also affect undiscovered historic properties. However, similar to the no-action alternative and alternative 1, previous cultural resource surveys in areas of proposed disturbance make the discovery of undiscovered historic properties unlikely.

In August 2019, the Arizona State Historic Preservation Office concurred with the Pinto Valley Mining Corp. historic properties treatment plan as prepared by WestLand Resources, Inc. (2019a) that provides specific measures for avoidance or mitigation of impacts on historic properties to resolve adverse effects. Previous analysis documented in the historic properties treatment plan indicates that 18 historic properties will be protected from direct physical effects by their natural topographic setting. The historic properties treatment plan directs that protective measures (signs and barriers) be used to protect an additional 14 historic properties from direct effects. The historic properties treatment plan also directs that data recovery be completed at 14 historic properties (including partial data recovery at a site that will also receive protective measures) prior to any project activities that could affect these sites.

Ongoing use and maintenance of existing roads that would provide continued access to Pinto Valley Mine facilities under the proposed action would persist for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 and would increase the duration of visual and noise effects at 14 historic properties located near existing roads. Similar to the no-action alternative and alternative 1, potential alteration of historic property settings due to the introduction of visual, atmospheric, and noise impacts is not anticipated to adversely affect the integrity of any historic properties within the area of potential effects because all properties are eligible for the National Register of Historic Places under Criterion D for the information they may yield and setting does not contribute to the National Register of Historic Places eligibility of these historic properties.

In contrast to the no-action alternative, all undertakings in the area of potential effect would be subject to the National Historic Preservation Act section 106 process. Additionally, under the proposed action, the section 106 process would ensure that new sites discovered during the course of mining activities are reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment and mitigation specified in the historic properties treatment plan, and memorandum of agreement among the Forest Service, Arizona State Historic Preservation Office, Advisory Council on Historic Preservation, and Pinto Valley Mining Corp. (Forest Service 2020d; WestLand Resources, Inc. 2019a). Affiliated tribes also would be afforded the opportunity to consult regarding the identification and treatment of new historic properties, including traditional cultural properties.

The historic properties treatment plan addresses adverse effects on all known historic properties and potential inadvertent discoveries, and the agreed-upon measures have been codified in a memorandum of agreement among the Forest Service, Arizona State Historic Preservation Office, Advisory Council on Historic Preservation, and Pinto Valley Mining Corp. (Forest Service 2020d). Although implementation of data recovery of historic properties may not fully address all the concerns of affiliated tribes, the scientific community, and the general public, it is the most common method of resolving adverse effects on historic properties eligible under National Register of Historic Places eligibility Criterion D. As a result, avoiding, minimizing, and resolving adverse effects on historic properties through implementation of the historic properties treatment plan, including both protective and data recovery measures, would reduce potential impacts on historic properties. Any human remains discovered on private lands during implementation of the no-action alternative would be protected by Arizona laws (Arizona Revised Statutes 41-865, 32-1364, 32-1365, 36-831, and 36-327), while any remains discovered on National Forest System lands would be protected under the Native American Graves Protection and Repatriation Act.

3.5.4.5 Cumulative Impacts

The cumulative impact analysis area for historic properties encompasses 21,813 acres and lies in the Pinal Mountains and surrounding uplands, which are predominantly within the Globe Ranger District of the Tonto National Forest. This distinct geographical area has a similar cultural history due to its biological characteristics, complex geology, and mineral resources (WestLand Resources, Inc. 2019a). The temporal boundaries for analyzing the cumulative effects on historic properties include the ongoing operation of Pinto Valley Mine and extend through mine closure and final reclamation.

Section 3.5.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on historic properties. Within the cumulative impacts analysis area, the following past and present activities have contributed to cumulative Impacts and the existing condition of historic properties described in section 3.5.3, “Affected Environment”:

- Past and ongoing mining activities at the Pinto Valley Mine, Carlota Copper Mine, and Freeport-McMoRan Miami Copper Mine
- Past wildfires within the Globe Ranger District, including the Woodbury Fire in 2019 (123,875 acres) and the Salt Fire in 2020 (21,670 acres), which occurred in close proximity to Pinto Valley Mine
- Other past mining activities, road development, and vandalism, some of which occurred on private lands or prior to the passage of the National Historic Preservation Act and were not subject to compliance requirements to identify and mitigate potential impacts on historic properties

Existing surface disturbance within the historic properties cumulative impacts analysis area encompasses an estimated 4,475 acres, which represents approximately 21 percent of the 21,813 acres in the cumulative impacts analysis area. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. Potential authorization of new rights-of-way for roads and utilities on Federal lands, as well as similar types of development on private lands, potential changes in management of cross-country travel and other motor vehicle uses associated with the Travel Management Plan for the Tonto National Forest, and other Tonto National Forest authorizations for special use permits and grazing permits would contribute to future cumulative surface disturbance in the cumulative impacts analysis area, but cannot be accurately estimated with information available at this time. The combined total of existing surface disturbance and new surface disturbance that would occur under the proposed action is estimated to be 5,792 acres, which is approximately 27 percent of the cumulative impacts analysis area.

This cumulative analysis considers the present effects of past actions described in section 3.5.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect historic properties in the future as identified in table 3-3.

3.5.4.5.1 Historic Properties

Present effects of the relevant past and present actions listed above and presented in section 3.5.3, “Affected Environment,” have resulted in permanent loss of known and undiscovered historic properties, as well as the discovery of new historic properties on Federal lands through pre-mining cultural resource surveys or during the course of mining or construction activities. Cultural resource surveys, as well as documentation and recovery efforts for these historic properties determined to be adversely affected through the National Historic Preservation Act section 106 process, have contributed to a repository of cultural resource data that inform the public understanding of human occupation within the region. Historic properties have been affected by a variety of other historic mining activities, road development, natural erosion, and vandalism.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on historic properties in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on historic properties include potential authorization of new rights-of-way for roads and utilities on Federal lands, development on private lands, potential changes in management of cross-country travel and other motor vehicle uses associated with the Travel Management Plan for the Tonto National Forest, and other Tonto National Forest authorizations for special use permits and grazing permits. For those ongoing and reasonably foreseeable actions on Federal lands or otherwise subject to Federal requirements, adherence to existing laws, regulations, and policies would avoid or mitigate impacts on known or newly discovered historic properties. The National Historic Preservation Act section 106 compliance process has resulted in the development of a historic properties treatment plan providing specific measures for avoidance or mitigation of historic properties to resolve adverse effects. Cultural resource inventories and pending data documentation and recovery efforts conducted in association with Pinto Valley Mining Corp.'s proposed action would further contribute to the existing repository of cultural resource information.

The differences in cumulative impacts on historic properties among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.5.4.2 through 3.5.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. New surface disturbance from expansion of mining facilities under the proposed action would affect 27 historic properties, including the three historic properties that could be adversely affected by alternative 1. Under the proposed action, 18 of these historic properties would be protected from direct physical effects by their natural topographic setting. The historic properties treatment plan directs protective measures to protect an additional 14 historic properties and requires data recovery be completed at 14 historic properties (including partial data recovery at a site that will also receive protective measures) prior to project activities that could affect these sites under the proposed action.
- In contrast to the no-action alternative, all undertakings in the area of potential effect would be subject to the National Historic Preservation Act section 106 process under the proposed action. Additionally, under the proposed action, the section 106 process would ensure that new sites discovered during the course of mining activities are reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment, and mitigation specified in the historic properties treatment plan and memorandum of agreement among the Forest Service, Arizona State Historic Preservation Office, Advisory Council on Historic Preservation, and Pinto Valley Mining Corp. (Forest Service 2020d; WestLand Resources, Inc. 2019a).
- Ongoing use and maintenance of existing roads that would provide continued access to Pinto Valley Mine facilities under the proposed action would persist for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 and would increase the duration of visual and noise effects at 14 historic properties near existing roads.

Based on the factors listed above, the proposed action is anticipated to result in greater cumulative impacts on historic properties compared to the other alternatives.

3.5.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on historic properties. This section provides a summary of the monitoring and mitigation measure for cultural resources. Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," section 4.4.4, "Cultural Resources," for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measures CR-1: Historic Properties Treatment Plan.** This measure addresses potential adverse effects on 45 historic properties associated with surface disturbance and other project-related activity and potential impacts on undiscovered properties that may be affected by project-related activities. The historic properties treatment plan (WestLand Resources, Inc. 2019a) developed for Pinto Valley Mining Corp.'s proposed action identifies specific protective measures and data recovery strategies that would be applied to minimize potential impacts on the identified historic properties and identifies procedures that would be put in place if unexpected discoveries are encountered during project-related activity.

Under Mitigation Measure CR-1 and in accordance with the historic properties treatment plan, there are 14 historic properties that would be subject to data recovery efforts (including partial data recovery at a site that will also receive protective measures). Data recovery for historic properties would generally consist of a variety of tasks that could result in human activity, surface use, and minor levels of disturbance including reconnaissance and documentation, surface artifact collections, archaeological testing, feature excavation, exploration of extramural areas, and post-excavation stripping. Reconnaissance and documentation, surface artifact collection, and archaeological testing are not anticipated to result in any impacts on resources on National Forest System lands, as there is no excavation associated with these tasks. Feature excavation, exploration of extramural areas, and post-excavation stripping would generally employ hand and mechanical excavation of relatively small areas associated with the property (such as 2-meter by 2-meter or 4-meter by 4-meter grids with hand excavation up to approximately 20 centimeters deep). Due to the relatively minimal amount of expected excavation area, the localized nature of the hand excavation areas, and the limited duration of these activities, there are no anticipated impacts on surface resources on National Forest System lands.

In accordance with the historic properties treatment plan, there are 14 historic properties that would be subject to protective measures (including protective measures at a site that will also receive partial data recovery). Protective measures for historic properties would generally consist of the installation of boulder barriers, protective signage, construction monitoring, and annual review of the effectiveness of the protective measures. In general, construction monitoring and annual review of the effectiveness of the protective measures are not anticipated to result in impacts on surface resources on National Forest System lands. Boulders used as barriers would be a minimum of 3 feet in diameter and would be obtained off site, and protective signage would generally entail signs with estimated footings of up to 1 foot by 1 foot installed along roadways. Boulder barriers and protective signs may result in minor, localized surface disturbance where the boulders are placed or the signs are installed. Due to the relatively limited size of the boulders and signs and the localized nature of their placement, there are no anticipated impacts on resources on National Forest System lands. In general, boulders or signs placed along National Forest System roads would be installed outside the main road surface or on pullouts from the main road surface. As such, there are no anticipated impacts on access to or use of National Forest System roads from the general public due to these protective measures besides the intended effect of limiting access to the identified historic properties.

3.6 Resources of Tribal Interest

The Forest Service and federally recognized American Indian tribes have a special and unique government-to-government relationship based on the U.S. Constitution, law, and policy. The Tonto National Forest honors that relationship and regularly consults with American Indian tribes that maintain an interest in how the Tonto National Forest manages lands within its jurisdiction. Consultations are ongoing among Tonto National Forest and the Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pueblo of Zuni, Salt River Pima-Maricopa

Indian Community, San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, and Yavapai-Prescott Indian Tribe, as well as the Ak-Chin Indian Community and the Tohono O'odham Nation.

The analysis area covers a total of 21,813 acres, composed of a 1,930-acre direct effects area and 19,883-acre indirect effects area, as depicted on map 3-6 in appendix A. The direct effects portion of the area of potential effects includes all areas within locations of proposed surface disturbance for the proposed action. The indirect effects portion of the area of potential effects represents a 0.5-mile buffer surrounding the location of proposed surface-disturbing activities for the proposed action that could be indirectly affected by changes in the visual environment and by noise.

The temporal boundaries for analyzing the direct and indirect effects on resources of tribal interest include the ongoing operation of Pinto Valley Mine and extend through mine closure and final reclamation. These spatial and temporal boundaries encompass the extent of potential changes to resources stemming from the proposed action.

3.6.1 Relevant Laws, Regulations, and Policy

There are a variety of Federal and State laws and regulations related to tribal relations and resources of values to tribes. This section contains a brief description of the most pertinent laws as they relate to the proposed Pinto Valley Mine Project. It should be noted that this is not an all-inclusive list; rather, it is a summary of the major authorities pertaining to this analysis.

3.6.1.1 **Federal Authorities**

American Indian Religious Freedom Act of 1978 (42 U.S. Code 1996–1996a)

Established official recognition that "the religious practices of the American Indian (as well as Native Alaskan and Hawaiian) are an integral part of their culture, tradition, and heritage, such practices forming the basis of Indian identity and value systems" and that "Federal policy has often resulted in the abridgment of religious freedom for traditional American Indians." The act declared that it is Federal policy to preserve and protect the right of Native Americans to access sacred sites; however, it included no enforcement provisions.

3.6.1.1.1 Religious Freedom Restoration Act of 1993 (42 U.S. Code 2000bb–2000bb-4)

Established the rights of Native Americans to enjoy the freedom of religion guaranteed by the Free Exercise clause of the First Amendment of the U.S. Constitution.

3.6.1.1.2 Native American Graves Protection and Repatriation Act of 1990 (23 U.S. Code 3001 et seq.)

Provides for the protection of Native American graves and items of cultural patrimony on Federal lands. This act requires consultation with appropriate Indian tribes prior to the intentional excavation or removal of certain kinds of cultural items and establishes procedures to determine the appropriate treatment of burials encountered during future planned excavation or as inadvertent discovery on Federal lands.

3.6.1.1.3 National Environmental Policy Act of 1970 (42 U.S. Code 4321 et seq.)

Council on Environmental Quality implementing regulations for the National Environmental Policy Act require meaningful coordination with tribal entities and analysis of a proposed action's potential effect on tribal lands, resources, or areas of historic significance.

3.6.1.1.4 25 U.S. Code 32A

Authorizes the Forest Service to provide resources to American Indians free of charge, when used for traditional and cultural purposes. The law also authorizes the Forest Service to temporarily close areas to the public for Native American traditional ceremonies and to restrict information about the location of burial sites and other resources uses for traditional and cultural purposes. This law also includes provisions to prohibit the disclosure of information provided by tribes.

3.6.1.1.5 Executive Order 13007: Indian Sacred Sites

Requires that Federal agencies seek to avoid adverse effects on Native American tribal sacred sites on Federal or tribal land, and on tribal access to such sites. Sacred sites are identified by Native American tribes but are required to be discrete and bounded. Tribal religious practitioners are identified by tribal governments.

3.6.1.1.6 Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

Affirms the Federal Government's commitment to a government-to-government relationship with Native American tribes and directs Federal agencies to establish procedures to consult and collaborate with tribal governments when new agency regulations would have tribal implications.

3.6.1.2 **Forest Service Regulations, Policies, and Guidance**

3.6.1.2.1 Forest Service Manual 2360, "Heritage Program Management"

This manual provides Forest Service guidance for management of the heritage program, including resources of tribal concern.

3.6.1.2.2 Forest Service Manual 1500, "External Relations: Chapter 1560 – State, Tribal, County, and Local Agencies: Public and Private Organizations"

This manual provides Forest Service guidance for consulting with tribes and for maintain tribal relations.

3.6.1.2.3 Forest Service Handbook 1509.13, "Tribal Relations Handbook," chapter 10, "Consultation with Indian Tribes and Alaska Native Corporations"

This handbook provides Forest Service guidance for consulting with Indian tribes, compensating tribes, and Forest Service training.

3.6.1.2.4 Region 3 Forest Service Handbook 2309.24, "Heritage Program Handbook"

This handbook provides Forest Service guidance for administering the Heritage Program, including survey standards and methods, sampling procedures, predictive modeling, and the format for survey reports.

3.6.1.2.5 First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities among New Mexico Historic Preservation Officer and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer and Oklahoma State Historic Preservation Officer and The Advisory Council on Historic Preservation and United States Department of Agriculture Forest Service Region 3

This programmatic agreement (Forest Service 2003) describes roles and responsibilities of the Forest Service Region 3 and State Historic Preservation Offices in Region 3.

3.6.1.2.6 Forest Service "Tribal Relations Strategic Plan"

The Forest Service Tribal Relations Strategic Plan, 2019–2022 (Forest Service 2018b) describes the Forest Service's goals, objectives, and strategies to build, strengthen, and uphold nation-to-nation relationships that sustain tribal sovereignty and help meet the Forest Service's trust responsibility and treaty obligations.

3.6.1.2.7 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan includes the following provisions for protection and management of tribal resources and tribal consultation (Forest Service 1985):

- "Surface disturbing undertakings will be managed to comply with 36 CFR 800, the Programmatic Agreement, [Native American Graves Protection and Repatriation Act], and Bulletin 38. All consultation responsibilities to the State Historic Preservation office and Tribes, before, during, and after an undertaking, will be followed. The area of an undertaking's potential environmental impact will be surveyed for cultural resources and areas of traditional and/or religious use by Indian Tribes. Inventory standards will be as specified in the settlement document and in the Forest Service Handbook, and will be determined in consultation with the [State Historic Preservation Office]. Tribes will be consulted, as appropriate."

3.6.2 Resource Indicators

Resource indicators for potential impacts on resources of tribal interest include potential adverse impacts on a variety of resources specifically identified by one or more tribes. These could include sacred sites, traditional gathering areas, or historic properties identified by a tribe as important through tribal consultation for this final EIS.

3.6.3 Affected Environment

The Tonto National Forest contains archaeological sites that document continuous human presence for at least the past 12,000 years. American Indians ancestral to the contemporary Apache, Hopi, O'odham, Yavapai, and Zuni have inhabited or utilized resources in the Tonto National Forest throughout that time. As such, lands administered by the Tonto National Forest are considered to be tribal ancestral lands. Refer to chapter 3, "Tribal Relations and Areas of Tribal Importance," in the draft EIS for the Tonto National Forest Draft Land Management Plan for additional information (Forest Service 2019c).

Tribal values and interests are typically identified through tribal engagement at various levels (government-to-government and less formal staff-to-staff interactions). Tribes may be interested in a wide range of resources that may be the subject of other laws and regulations. For example, a tribe may identify a sacred site as defined by Executive Order 13007 that, in some instances, might also meet the requirements of a traditional cultural property as defined by National Register Bulletin 38, "Guidelines for Documenting and Evaluating Traditional Cultural Properties" (Parker and King 1998), although a traditional cultural property is not necessarily a sacred site.

On March 6, 2017, the Tonto National Forest began consultation with tribes including the Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pueblo of Zuni, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, and Yavapai Prescott Indian Tribe regarding the preparation of an EIS for the proposed expansion of the mine and the tailings storage facilities. One goal of consultation is to identify issues of tribal concern and possible measures to mitigate the negative effects on resources of tribal interest. In addition to various correspondence with tribes in the intervening years, meetings were held with multiple tribes on April 27, 2018, and May 1, 2018. The Hopi Tribe and Pueblo of Zuni participated in a field visit on November 13, 2018, as did the San Carlos Apache Tribe on November 25, 2019. In addition to the tribes listed above, the Tonto National Forest also provided the Tohono O'Odham Nation and AK-Chin Indian Community, in accordance with the Native American Graves Protection and Repatriation Act, with the Native American Graves Protection and Repatriation Act Plan of Action and other documents related to the project and the opportunity to consult on the project.

The tribes consulted during the course of the Pinto Valley Mine EIS process continue to identify a traditional connection to the region in and around the Pinto Valley Mine. Tribes expressed concern about impacts on the historic properties discussed in section 3.5, "Cultural Resources," because tribes consider archaeological sites associated with their ancestors to be important. Some tribes recognize particular archaeological sites to be sacred. Tribes may also consider locations of burials, places of ceremonial activities, specific landforms, viewsheds, springs and other water sources, and traditional resource gathering areas (including the locations of plants and minerals) as sacred sites or otherwise ascribe some cultural value to them. These resources can be the result of direct human action or can be naturally occurring features. They are finite, nonrenewable resources that cannot be returned to their original states once they have been altered, damaged, or removed. The tribes generally recommend avoiding any adverse impacts on historic properties and other resources of tribal interest. If impacts on historic properties cannot be avoided, tribes have requested that tribal monitors participate in data recovery and reserve the opportunity to visit sites of cultural importance.

During the course of the consultation process for this EIS, the tribes did not make the Forest Service aware of any specific sites of cultural concern, sacred sites, or other resources of tribal interest within the analysis area during meetings or field visits. However, the tribes did express broad concern that the mine expansion may generally affect sacred sites and stated that resources of tribal interest had been affected in the past. Some tribes also noted the past loss of acorn gathering areas in the oak groves near the Carlota Mine. One tribe expressed a desire to be able to access the analysis area to collect chrysocolla and azurite from the ground surface. Another tribe noted that the mine has been in existence long enough to become part of the landscape and that the area has already been contaminated by previous mining disturbance, which may suggest that the proposed action, though undesirable from a tribal perspective, might not cause significant further degradation to resources of tribal interest.

Several tribes have expressed general concern with impacts across the Pinto Creek watershed and impacts on water sources and springs in the area during previous consultation on similar projects in the area. Based on an ethnographic study done for another project that covers the general vicinity, several tribes have identified particular springs in the general area as being important, but none of those occur within the analysis area. The tribes have identified several topographic features in the general area with traditional names, but, again, none have been made known within the analysis area.

3.6.4 Environmental Consequences

3.6.4.1 Analysis Methodology and Assumptions

The analysis of impacts on resources of tribal interest applies the following methods:

- Quantitative and qualitative assessment of potential adverse impacts on historic properties because historic properties may be of tribal interest. Refer to section 3.5, "Cultural Resources," for additional information on potential impacts on historic properties.

- Qualitative assessment of tribal concerns and potential impacts on tribal interests, as identified through tribal consultation.

The analysis of impacts on resources of tribal interest applies the following assumption:

- Impacts on historic properties described in section 3.5, “Cultural Resources,” could also result in impacts on resources of tribal interest. Although none of the tribes specifically identified historic properties as being of particular tribal interest, this analysis makes the conservative assumption that disturbing any of these properties could be perceived as an adverse effect on tribes.

3.6.4.2 No-Action Alternative – Direct and Indirect Impacts

As described in section 3.5.4.2, “No-action Alternative – Direct and Indirect Impacts,” there are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land and the 0 acres of new disturbance on National Forest System lands. As such, there are no anticipated adverse impacts on historic properties of tribal interest under the no-action alternative.

Based on tribal consultation conducted during the course of this EIS, tribes have expressed general concern with potential impacts on sacred sites and other resources of tribal interest associated with the historic and continued operation of the Pinto Valley Mine including impacts on the Pinto Creek watershed and springs in the area, loss of gathering areas and access to gathering areas, and overall impacts on the landscape. These potential impacts on resources of tribal interest could generally continue during the first 2 months of the 6-month transition period as active mining operations continue and would generally persist until mining activities cease and successful reclamation is completed. However, in some cases, reclamation may not fully resolve these impacts. Refer to section 3.21, “Water Resources and Hydrogeochemistry,” for information on potential impacts on water resources. As noted above in section 3.6.3, “Affected Environment,” tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.

3.6.4.3 Alternative 1 – Direct and Indirect Impacts

As described in section 3.5.4.3, “Alternative 1 – Direct and Indirect Impacts,” surface disturbance from expansion of mining facilities onto an additional 909 acres of private lands under alternative 1 has the potential to have direct physical effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. As a result, these potential adverse impacts on historic properties could result in impacts on resources of tribal interest that would not occur under the no-action alternative.

Potential impacts on other resources of tribal concern such as impacts on the Pinto Creek watershed and springs in the area, loss of gathering areas and access to gathering areas, and overall impacts on the landscape would increase compared to the no-action alternative because active mining operations would continue for approximately 7 more years than under the no-action alternative and final reclamation activities would begin approximately 7 years later. Similar to the no-action alternative, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.

3.6.4.4 Proposed Action – Direct and Indirect Impacts

Surface disturbance from expansion of mining facilities onto an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. under the proposed action could have an adverse effect on some or all of the 27 known historic properties within the analysis area, some of which have the potential to contain human remains. These 27 properties include the three historic properties that could be directly adversely affected by alternative 1, 13 historic properties that are vulnerable to indirect effects due to their proximity to existing roads, and 11 additional sites that could be affected under the proposed action that would not be affected under alternative 1. As a result, these potential adverse impacts on historic properties could result in impacts on resources of tribal interest. Although none of the tribes specifically identified historic properties as being of particular tribal interest, this analysis makes the conservative assumption that disturbing any of these properties could be perceived as an adverse effect on tribes. As a result, the proposed action may have a greater impact on resources of tribal interest than the no-action alternative and alternative 1.

Potential impacts on other resources of tribal concern such as impacts on the Pinto Creek watershed and springs in the area, direct loss of gathering areas and access to gathering areas, and overall impacts on the landscape could increase compared to the other alternatives because active mining operations would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative and reclamation activities would occur later. Refer to section 3.21, "Water Resources and Hydrogeochemistry," for information on potential impacts on water resources. Similar to the other alternatives, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.

3.6.4.5 **Cumulative Impacts**

The cumulative impact analysis area for resources of tribal interest encompasses 21,813 acres and lies in the Pinal Mountains and surrounding uplands, which are predominantly within the Globe Ranger District of the Tonto National Forest. This distinct geographical area has a similar cultural history due to its biological characteristics, complex geology, and mineral resources (WestLand Resources, Inc. 2019a). The temporal boundaries for analyzing the cumulative effects on resources of tribal interest include the ongoing operation of Pinto Valley Mine and extend through mine closure and final reclamation. This is the same cumulative impact analysis area that was defined for cultural resources in section 3.5, "Cultural Resources."

Section 3.6.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on resources of tribal interest. Within the cumulative impacts analysis area, the following past and present activities have contributed to cumulative impacts and the existing condition of resources of tribal interest described in section 3.6.3, "Affected Environment":

- Past and ongoing mining activities at the Pinto Valley Mine, Carlota Copper Mine, and Freeport-McMoRan Miami Copper Mine
- The Woodbury Fire, the Salt Fire, and other recent fires that have resulted in surface disturbance and alteration of the visual setting
- Other past mining activities, road development, and vandalism, some of which occurred on private lands or prior to the passage of the National Historic Preservation Act and were not subject to compliance requirements to identify and mitigate potential impacts on historic properties

Existing surface disturbance within the historic properties cumulative impacts analysis area encompasses an estimated 4,475 acres, which represents approximately 21 percent of the 21,813 acres in the cumulative impacts analysis area. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. Potential authorization of new rights-of-way for roads and utilities on Federal lands, as well as similar types of development on private lands, potential changes in management of cross-country travel and other motor vehicle uses associated with the Travel Management Plan for the Tonto National Forest, and other Tonto National Forest authorizations for special use permits and grazing permits would contribute to future cumulative surface disturbance in the cumulative impacts analysis area, but cannot be accurately estimated with information available at this time. The combined total of existing surface disturbance and new surface disturbance that would occur under the proposed action is estimated to be 5,792 acres, which is approximately 27 percent of the cumulative impacts analysis area.

This cumulative analysis considers the present effects of past actions described in section 3.6.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect resources of tribal interest in the future as identified in table 3-3.

3.6.4.5.1 Resources of Tribal Interest

Present effects of the relevant past and present actions listed above and presented in section 3.6.3, “Affected Environment,” have resulted in permanent loss of known and undiscovered historic properties that may be of tribal interest, as well as the discovery of new historic properties on Federal lands through pre-mining cultural resource surveys or during the course of mining or construction activities. Cultural resource surveys, as well as documentation and recovery efforts for these historic properties determined to be adversely affected through the National Historic Preservation Act section 106 process, have contributed to a repository of cultural resource data that inform the public understanding of human occupation within the region, including Native American history. Historic properties and other resources of tribal interest have been affected by a variety of other historic mining activities, road development, natural erosion, and vandalism. Some of these activities occurred on private lands or prior to the passage of the National Historic Preservation Act and were not subject to compliance requirements to identify and mitigate potential impacts on historic properties. Additionally, tribes may recognize other sites, resources, and landscapes of interest that have not been determined eligible for inclusion in the National Register of Historic Places.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on resources of tribal interest in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on resources of tribal interest include continued operation of the Carlota Mine, authorization of any new rights-of-way or other projects that would result in additional surface disturbance, and potential changes in management of cross-country travel and other motorized vehicle uses associated with pending Travel Management Plan for the Tonto National Forest.

For those ongoing and reasonably foreseeable actions on Federal lands or otherwise subject to Federal requirements, adherence to existing laws, regulations, and policies would avoid or mitigate impacts on known or newly discovered resources of tribal interest that are listed as historic properties. The National Historic Preservation Act section 106 compliance process has resulted in the development of a historic properties treatment plan providing specific measures for avoidance or mitigation of historic properties to resolve adverse effects. Cultural resource inventories and pending data documentation and recovery efforts conducted in association with Pinto Valley Mining Corp.’s proposed action would further contribute to the existing repository of cultural resource information. However, implementation of the proposed action would also result in incremental permanent loss or removal of historic properties from their original context and setting. The proposed action could also contribute to incremental adverse effects on other resources of tribal interest, such as surface disturbance and altered hydrology of the

Pinto Creek watershed and springs, direct loss of gathering areas and access to gathering areas, and overall impacts on the visual and auditory characteristics of the landscape within the analysis area.

The differences in cumulative impacts on resources of tribal interest among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.6.4.2, "Direct and Indirect Impacts." Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. New surface disturbance from expansion of mining facilities under the proposed action would affect 27 historic properties, including the three historic properties that could be adversely affected by alternative 1. Under the proposed action, 18 of these historic properties would be protected from direct physical effects by their natural topographic setting. The historic properties treatment plan directs protective measures to protect an additional 14 historic properties and requires data recovery be completed at 14 historic properties prior to project activities that could affect these sites under the proposed action.
- In contrast to the no-action alternative, all undertakings in the area of potential effect would be subject to the National Historic Preservation Act section 106 process under the proposed action. Additionally, under the proposed action, the section 106 process would ensure that new sites discovered during the course of mining activities are reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment, and mitigation specified in the historic properties treatment plan and memorandum of agreement among the Forest Service, Arizona State Historic Preservation Office, Advisory Council on Historic Preservation, and Pinto Valley Mining Corp. (Forest Service 2020d; WestLand Resources, Inc. 2019a).
- Potential impacts on other resources of tribal concern such as impacts on the Pinto Creek watershed and springs in the area, direct loss of gathering areas and access to gathering areas, and overall impacts on the landscape could increase compared to the other alternatives because active mining operations would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative and reclamation activities would occur later.

Based on the factors listed above, the proposed action is anticipated to result in greater cumulative impacts on resources of tribal interest compared to the other alternatives. Although none of the tribes specifically identified historic properties as being of particular tribal interest, it is a reasonable assumption that disturbing any of these properties would be perceived as an adverse effect on resources of tribal interest.

3.6.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on resources of tribal interest. This section provides a summary of the monitoring and mitigation measure for resources of tribal interest. Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," section 4.4.5, "Tribal Resources of Concern," for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measures TR-1: Tribal Monitors.** This measure addresses potential impacts on historic properties that are of concern to tribes. As part of the memorandum of agreement, tribal monitors would be invited to participate in the data recovery phase of the historic properties treatment plan.

3.7 Environmental Justice

The analysis of environmental justice assesses impacts on minority or low-income communities from implementation of the alternatives, with a focus on any disproportionately high and adverse impacts on low-income and minority communities. Executive Order 12898 established a requirement for Federal agencies to incorporate environmental justice considerations into planning and decision processes to ensure that no person or group bears a disproportionate burden of high and adverse impacts. The discussions of the affected environment and environmental consequences focus on the population and demographics of potential low-income and minority communities, potential environmental risk exposure for low-income and minority communities, and any disproportionately high and adverse impacts on low-income and minority communities from implementation of the alternatives.

The analysis area for environmental justice effects is Gila County (including the Town of Miami, City of Globe, and Claypool census-designated place) and populated townships (Town of Superior and Top of the World census-designated place) in which any potential low-income and minority communities might experience disproportionately high and adverse impacts as a result of the Pinto Valley Mine Project. The Town of Superior is in Pinal County and the Top of the World census-designated place is in Gila and Pinal Counties. Local towns and unincorporated areas near the mine are the primary focus of this analysis. The temporal boundaries for the analysis including the ongoing operation of Pinto Valley Mine through mine closure and final reclamation.

Section 3.17, “Socioeconomic Conditions,” provides additional information on social conditions and demographics in the analysis area.

3.7.1 Relevant Laws, Regulations, And Policy

3.7.1.1 **Federal Authorities**

Executive Order 12898 (Federal Register, Vol. 59, No. 32, February 11, 1994), “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” directs all Federal agencies to focus attention on the human health and environmental conditions for low-income populations, minority populations, or Indian tribes. “Indian tribes” refers to any federally recognized Native American or Alaska Native tribes, bands, nations, pueblos, villages, or communities that the Secretary of the Interior recognizes to be eligible for special programs and services provided by the United States to Native Americans because of their status as Native Americans (25 U.S. Code 479a). The purpose of Executive Order 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes that may experience common conditions of environmental exposure or effects associated with a plan or project. Executive Order 12898 also requires Federal agencies to ensure opportunities for effective public participation by identified potentially affected low-income populations, minority populations, or Native American tribes that are considered low-income and minority populations.

3.7.1.2 **Other Federal and Forest Service Guidance**

This analysis uses Council on Environmental Quality and Forest Service guidance for considering environmental justice within the National Environmental Policy Act process (Council on Environmental

Quality 1997; Grinspoon et al. 2014). A community with potential low-income and minority populations is one that has a greater percentage of minority or low-income populations than an identified reference community. The Council on Environmental Quality suggests the following approach for identifying potential low-income and minority populations:

- "Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is 'meaningfully greater' than the minority population percentage in the general population or other appropriate unit of geographic analysis."
- "Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

Council on Environmental Quality guidance does not provide a specific threshold for determining when an area's population is "meaningfully greater."

Forest Service Handbook 1709.11, "Civil Rights Handbook," describes basic principles and techniques for conducting civil rights impact analyses and identifies several additional interest groups for consideration in addition to the minority and low-income populations defined above.

3.7.1.2.1 Forest Service Manual 1730

It is the policy of the Forest Service that the responsible Forest Service Official review proposed organizational changes or proposed policy actions for civil rights impacts and take either of the following actions in compliance with Departmental Regulation 4300-4 and 1010-1 (Forest Service Manual 1730.1):

> a. Prepare a civil rights impact analysis and statement of its findings for any proposed policy or organizational action which may have a major civil rights impact, or
>
> b. Document the determination that a civil rights impact analysis and a statement of findings are not needed.

The Forest Service has made the determination that a civil rights impact analysis is not needed for this EIS because there are no proposed organizational or policy actions associated with the alternatives analyzed in this EIS.

3.7.2 Resource Indicators

Table 3-40 provides the resource indicators and measures for assessing potential effects on low-income and minority communities.

Table 3-40. Resource indicators and measures for assessing effects on minority and low-income communities

Resource Element	Resource Indicator	Measure	Used to address purpose and need, or key issue?	Source
Minority and low-income communities	Presence of minority and low-income communities	Identification of minority or low-income populations based on	Yes	Council on Environmental Quality

Resource Element	Resource Indicator	Measure	Used to address purpose and need, or key issue?	Source
		multiyear trends in demographics by race or ethnicity		1997; U.S. Census Bureau 2019a
Environmental risk exposure	Comparison of regions based on environmental and demographic indicators and environmental justice indices	Comparison of environmental indicators to national averages	Yes	U.S. Environmental Protection Agency (2015) environmental justice screening and mapping tool
Disproportionately high and adverse impacts on minority and low-income communities	Potential for disproportionately high adverse impacts on minority and low-income communities	Varies	Yes	U.S. Census Bureau 2019a, analysis of impacts on other resources in the Pinto Valley Mine EIS

3.7.3 Affected Environment

Table 3-41 summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-41. Resource indicators and measures for the existing condition for environmental justice

Resource Element	Resource Indicator	Measure	Existing Condition
Minority and low-income communities	Presence of minority and low-income communities	Identification of minority or low-income populations based on multiyear trends in demographics by race or ethnicity	The towns of Miami and Superior, the Claypool Census-Designated Place, and the city of Globe are identified as potential minority or low-income communities.
Environmental risk exposure	Comparison of regions based on environmental and demographic indicators and environmental justice indices	Comparison of environmental indicators to national averages	Gila County performed below national averages for three environmental indicators: ozone, traffic proximity and volume, and wastewater discharge.
Disproportionately high and adverse impacts on minority and low-income communities	Potential for disproportionately high and adverse impacts on minority and low-income communities	Varies	See “Environmental Consequences.”

3.7.3.1 Minority and Low-income Communities

Environmental justice impacts tend to be highly localized geographically and typically occur close to project activities. Examples of localized environmental justice impacts include noise or visual impacts associated with project construction in or adjacent to residential neighborhoods with disproportionately large low-income or minority populations. However, in some cases, environmental justice impacts are relatively dispersed environmental impacts, such as air pollution affecting an entire air basin, where the entire air basin has a disproportionately large low-income or minority population. To ensure that both localized and dispersed impacts on environmental justice populations would be considered, the low-income and minority components of various types of geographic areas were considered in this analysis.

Specifically, the environmental justice analysis considered Gila County and the five communities in the county near Pinto Valley Mine for which U.S. Census Bureau data were available (see table 3-42).

Executive Order 12898 also applies to tribes that are present or exercise treaty rights in the area. As described in section 3.6, "Resources of Tribal Interest," a variety of Native American tribes have historically used the project area as evidenced through identified cultural resources.

A community is considered in this environmental justice analysis if the total number of individuals living below the poverty level or total minority population, as defined by the U.S. Census Bureau, is 50 percent or more of the community or is "meaningfully greater" than the reference community. In 2014, the Forest Service updated its environmental justice analysis guidance in "Striving for Inclusion: Addressing Environmental Justice for Forest Service NEPA" (Grinspoon et al. 2014). In this document, the Forest Service recommends identifying communities that have "meaningfully greater" minority populations compared to the reference community as the preferred approach. The 2014 guidance does not set a threshold for a "meaningfully greater" minority population, but does recommend the use of a threshold of 5 percent difference between the individual community and the county.[53] The 2014 guidance document also recommends identifying low-income populations by looking for meaningful differences between the reference area and communities. For consistency, the same "meaningful greater" definition of a difference of 5 percent or more between the communities and the reference area is also used for low-income populations.

By applying this analysis criteria to 2013–2017 U.S. Census Bureau American Community Survey 5-year estimates, the following were identified as potential low-income and minority populations:

- Town of Miami– Hispanic or Latino minority population, total minority population, low-income population
- Town of Superior – Hispanic or Latino minority population, total minority population
- Claypool Census-Designated Place – Hispanic or Latino minority population, total minority population
- City of Globe – Hispanic or Latino minority population, total minority population

Table 3-42 provides details on the minority and low-income populations for the State, and for the local and county reference area populations. This table is intended to demonstrate the data used to identify the potential low-income and minority communities considered in the analysis.

[53] "Striving for Inclusion: Addressing Environmental Justice for Forest Service NEPA" (Grinspoon et al. 2014) recommends determining which minority communities meet the 5 percent difference threshold through simple subtraction of the community minority population percentage from the reference area minority population percentage. This analysis employs that approach.

Table 3-42. Minority and low-income populations in the reference area (Gila County), and in local communities

Locality	Total Population	Black or African American alone, not Hispanic or Latino	American Indian or Alaskan Native alone	Asian or Pacific Islander alone[54]	Hispanic or Latino[55]	Total Minority Population	Income Below Poverty Level[56]
Arizona[57]	6,392,017	259,008 (4.1%)	296,529 (4.6%)	189,343 (3.0%)	1,895,149 (29.6%)	2,640,029 (41.3%)	17.0%
Gila County (*Reference Area*)	53,597	233 (0.4%)	7,946 (14.8%)	320 (0.6%)	9,588 (17.9%)	18,087 (33.7%)	21.9%
Town of Miami	1,837	5 (0.3%)	42 (2.3%)	3 (0.2%)	**1,029 (56.0%)**	**1,079 (58.7%)**	**28.6%**
Claypool Census-Designated Place	1,538	11 (0.7%)	28 (1.8%)	6 (0.4%)	**593 (38.6%)**	**638 (41.5%)**	22.3%
City of Globe	7,532	69 (0.9%)	430 (5.7%)	94 (1.2%)	**2,775 (36.8%)**	**3,368 (44.7%)**	20.2%
Top of the World Census-Designated Place	231	1 (0.4%)	1 (0.4%)	-	40 (17.3%)	42 (18.2%)	10.8%
Town of Superior	2,837	17 (0.6%)	56 (2.0%)	18 (0.6%)	**1,942 (68.5%)**	**2,033 (71.7%)**	16.6%

Source: U.S. Census Bureau 2019a.
Note: **Bold text** indicates a potential low-income or minority community.

3.7.3.1.1 Other Demographic Groups of Interest

In addition to communities addressed under Executive Order 12898, the Forest Service examines the effects of environmental actions on several other potentially affected interest groups and population categories with special needs or concerns (Forest Service Handbook 1709.11). This examination is intended to review proposed actions to identify any major civil rights impacts. For this analysis, these groups and categories consist of people with disabilities, the elderly, and women.

Individuals with Disabilities

Individuals with disabilities are potentially at heightened risk from adverse changes in environmental conditions, especially when they occur rapidly. For example, disabled individuals may have mobility impairments that prevent them from reaching safe areas in the event of an emergency. The population with disabilities in Gila County is approximately 21.8 percent, which is higher than the 12.8 percent for Arizona as whole (Headwaters Economics 2019).

Elderly Population

Residents of Gila County tend to be older than the average for Arizona. In Gila County, approximately 28.2 percent of the population is 65 years or older, with a median age of 49.3 years (U.S. Census Bureau 2019a). This compares to 17.1 percent of the population and a median age of 37.2 years for Arizona as

[54] In accordance with the minority population groups identified in guidance from the Council on Environmental Quality (1997), this column represents the sum of the "Asian alone" and "Native Hawaiian and Other Pacific Islander alone" populations.
[55] People who identify as Hispanic or Latino may be of any race.
[56] The U.S. Census Bureau threshold for poverty in 2017 was $12,752 for an individual under the age of 65, $11,756 for an individual over the age of 65, and $25,094 for a family of four (U.S. Census Bureau 2019b). Percent represents U.S. Census Bureau "All People" below the poverty line.
[57] The reference area used to identify communities for the environmental justice analysis is the county. Data for the State of Arizona are provided for information/illustrative purposes only.

whole. The number of residents 65 or older in Gila County has increased since 2000, while the number of residents under 18 has declined.

Women

The percentage of adult female residents in Gila County is 50.5 percent, which is similar to Arizona as a whole at 50.3 percent (U.S. Census Bureau 2019a).

3.7.3.2 Environmental Risk Exposure

The U.S. Environmental Protection Agency developed an environmental justice mapping and screening tool called EJSCREEN. Based on national data sets, EJSCREEN combines 11 environmental and 6 demographic indicators in maps and reports.[58] By incorporating these environmental indicators to national averages, EJSCREEN is able to identify potential populations subjected disproportionately high and adverse human health or environmental effects.

The Forest Service examined EJSCREEN results for both Gila County and communities surrounding the mine. Gila County's average environmental indicators are better than or are similar to national averages in all categories except for ozone, traffic proximity and volume, and wastewater discharge, indicating environmental quality is generally better in the analysis area than in the nation as a whole (table 3-43). The following paragraphs describe environmental indicators for which Gila County was below the national average.

Gila County's average daily maximum 8-hour-average ozone of 50 parts per billion during the ozone season was above the national average. The county, towns, and census-designated places near the mine analyzed are near the 90th percentile in the U.S. (table 3-43). Ozone is associated with a variety of negative health outcomes, especially reduced lung function. The relatively high ozone concentration paired with the large elderly population in the analysis area, a population susceptible to ozone-induced effects, increases risks of adverse health effects from ozone.

Gila County and the towns and census-designated places near the mine have greater traffic proximity than the national average (table 3-43). Proximity to motor vehicle traffic is associated with increased exposure to ambient noise, toxic gases, and particulate matter including diesel particulates (U.S. Environmental Protection Agency 2015).

Wastewater discharge environmental indicator scores for Gila County and the towns and census-designated places within the analysis area were higher than the national average. Wastewater discharge scores reflect reported pollutant discharge information to a given waterbody, which is then weighted for toxicity and adjusted for dilution effects. Gila County is in the 95th percentile nationally (U.S. Environmental Protection Agency 2019b); table 3-43 presents values and percentiles for wastewater discharge for Gila County as well as specific towns and census-designated places within the analysis area. Proximity to wastewater discharge sites is included as a potential indicator for environmental justice issues because water pollutants can have adverse effects on both human health and the local ecology and are indirect indicators for potential exposure to water pollutants (U.S. Environmental Protection Agency 2015).

[58] 11 Environmental indicators: National-Scale Air Toxics Assessment air toxics cancer risk, National-Scale Air Toxics Assessment respiratory hazard index, National-Scale Air Toxics Assessment diesel, particulate matter, ozone, traffic proximity and volume, lead paint indicator, Proximity to Risk Management Plan sites, Proximity to Hazardous Waste Facilities, Proximity to National Priorities List sites, and Wastewater Dischargers Indicator (Stream Proximity and Toxic Concentration). The 6 demographic indicators are: percent low/income, percent minority, less than high school education, linguistic isolation, individuals under age 5, and individuals over age 64.

Table 3-43. Environmental indicators in analysis area and percentile in the United States

Environmental Indicator	Gila County		Claypool Census-designated Place		Town of Miami		City of Globe		Town of Superior		Top of the World Census-designated Place	
	Value	*Percentile in U.S.*	*Value*	*Percentile in U.S.*	*Value*	*Percentile in U.S.*	*Value*	*Percentile in U.S.*	*Value*	*Percentile in U.S.*	*Value*	*Percentile in U.S.*
Ozone (parts per billion)	50.4	90	50.1	90	50.3	90	49.8	89	50.2	90	50.6	90
Traffic Proximity and Volume (daily traffic count and distance to road)	120	54	150	58	260	66	350	72	160	59	43	38
Wastewater Discharge (toxicity-weighted concentration per meter distance)	0.7	95	5.4	97	7.7	98	0.3	93	0.65	95	0.12	91

Source: U.S. Environmental Protection Agency 2019b

Note: Only indicators for Gila County that are above the national average and are potentially affected by the project are included here. Indicators, such as lead paint in pre-1960s housing, that were above the national average but would not be affected by the project are not included.

3.7.4 Environmental Consequences

3.7.4.1 Analysis Methodology and Assumptions

The assessment of potential environmental justice impacts is guided by the Council on Environmental Quality's "Environmental Justice Guidance under the National Environmental Policy Act" (Council on Environmental Quality 1997). Determination of environmental justice impacts requires three steps: (1) determining the geographic distribution of low-income and minority populations in the analysis area; (2) assessing whether the action under consideration would result in adverse impacts, and (3) if there are adverse impacts, determining whether these impacts would result in disproportionately high and adverse effects on minority and low-income populations.

The impacts analysis for environmental justice applies the following methods and approaches:

- Identification of potential minority and low-income populations in the analysis area using U.S. Census Bureau data.
- Quantitative assessment of potential economic and demographic impacts on minority and low-income populations.
- Using the analysis of environmental consequences in this chapter, determine if adverse impacts occur for each resource category.
- Determine if adverse impacts would disproportionately affect identified low-income and minority communities, focusing on environmental indicators of concern identified through EJSCREEN.
- Qualitative assessment of whether impacts on minority and low-income communities from the alternatives are disproportionate compared to those on the population as a whole.

The environmental justice analysis assumes that impacts of the alternatives would be predominantly borne by populations residing in the analysis area. Although some impacts could extend outside of the analysis area (for example, to communities outside of the analysis area where mine-related expenditures are made, where mine employees reside, or where resources may be affected), the majority of social, economic, and environmental effects are expected to occur within the analysis area.

The Forest Service did not receive comments during project scoping, either from the public or the interdisciplinary team, and is not aware of other information indicating that the no-action, alternative 1, or the proposed action are currently or would in the future result in civil rights issues for people with disabilities, the elderly, or women. Effects on these populations are, therefore, not further addressed in this analysis.

3.7.4.2 All Alternatives – Direct and Indirect Impacts

3.7.4.2.1 Minority and Low-Income Communities

The communities of Miami and Superior, the Claypool Census-Designated Place, and the city of Globe were identified as potentially having "meaningfully greater" minority or low-income populations than the reference area of Gila County and are therefore the focus of the environmental justice analysis. Table 3-44 identifies whether resource impacts would affect low-income and minority communities and if those effects would disproportionately affect low-income and minority communities. As indicated below, anticipated adverse impacts on socioeconomic conditions under the no-action alternative could disproportionately affect minority or low-income populations. Potential adverse effects of alternative 1 and the proposed action are not anticipated to disproportionately affect low-income and minority communities.

Table 3-44. Potential impacts on low-income and minority communities and determination if impacts would disproportionately affect low-income and minority populations

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Air Quality and Greenhouse Gas and Climate Change Impacts (see sections 3.2.4 and 3.4.4)	Yes	No. Impacts would be regional in nature, not localized to low-income and minority communities.	No. Same as no-action alternative.	No. Same as no-action alternative.
Biological Resources - Vegetation (see section 3.3.4)	Yes	No. Impacts from vegetation removal would be limited to the Pinto Valley Mine project boundary area and would last only until the area is revegetated. Vegetation removal is not anticipated to disproportionately affect low-income or minority communities.	No. Same types of effects and conclusion as the no-action alternative, although the extent of vegetation removal would be greater and the duration of activities would last approximately 7 more years.	No. Same types of effects and conclusion as the no-action alternative and alternative 1, although the extent of vegetation removal would be greater and duration of activities would last approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.
Biological Resources - Wildlife, including Special Status Species (see section 3.3.4)	Yes	No. Loss or degradation of wildlife habitat and potential wildlife mortality or avoidance due to vehicle traffic, noise, and lighting would occur, but area not anticipated to reduce species abundance in the local area due to the limited extent and duration of these effects. Public and internal scoping has not identified information that minority or low-income populations are dependent on wildlife populations in or adjacent to the mine site, and disproportionately high and adverse effects are not anticipated.	No. Same types of effects and conclusion as the no-action alternative, although the extent of habitat removal would be greater and duration of activities contributing to the wildlife mortality and avoidance would last approximately 7 more years.	No. Same types of effects and conclusion as the no-action alternative and alternative 1, except potential effects on wildlife would expand onto immediately adjacent National Forest System lands and effects would last for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Cultural Resources (see section 3.5.4)	Yes	No. There are no anticipated direct adverse impacts on known historic properties, and indirect effects from public access and associated risk of theft or vandalism would be the same as existing conditions. The discovery of undiscovered properties is unlikely.	No. Mining-related surface disturbance and ongoing use and maintenance of existing roads could result in adverse direct and indirect effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. Public and internal scoping has not identified information that minority or low-income populations place specific value on affected cultural resources. Although historic properties on private lands are not subject to compliance with section 106, some of the historic properties that could be affected by alternative 1 have the potential to contain human remains, and human remains on private lands are protected by Arizona laws.	No. Mining-related surface disturbance and ongoing use and maintenance of existing roads could result in adverse direct and indirect effects on 45 historic properties and other cultural resources. In contrast to alternative 1, all historic properties are subject to the section 106 process. Public and internal scoping has not identified information that minority or low-income populations place specific value on affected cultural resources. Any new sites discovered under the proposed action would be reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment, and mitigation specified in the historic properties treatment plan and memorandum of agreement.
Resources of Tribal Interest (see section 3.6.4)	Yes	No. Tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area. Tribes have expressed general concern with potential impacts on sacred sites and other resources of tribal interest associated with the historic and continued operation of the Pinto Valley Mine including impacts on the Pinto Creek watershed and springs in the area, direct loss of gathering areas and access to gathering areas, and overall impacts on the landscape. Impacts would generally persist until mining activities cease and successful reclamation is completed.	No. Similar to the no-action alternative but increased potential impacts on other resources of tribal concern because active mining operations would continue for approximately 7 more years under alternative 1. Tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.	No. Similar to the no-action alternative but increased potential impacts on other resources of tribal concern because active mining operations would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative. Tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Fire and Fuels Management (see section 3.8.4)	Yes	No. Effects from management of vegetation and the creation of firebreaks would generally result in beneficial impacts to prevent and manage wildfire. The potential for unplanned ignitions from ongoing mining and reclamation activities would continue, but there is no indication that the associated risk of wildfire would disproportionately affect environmental low-income or minority communities.	No. Effects would be similar to those under the no-action alternative, except the potential for unplanned ignitions from mining activities would continue for approximately 7 more years.	No. Effects would be similar to those under the no-action alternative and alternative 1, except management of vegetation would extend on to National Forest System lands, and the potential for unplanned ignitions from mining activities would continue for approximately 19 more years than under the no-action alternative or 12 more years compared to alternative 1.
Geology, Minerals, Geotechnical Stability (see section 3.9.4)	Yes	No. Effects on geologic features and mineral extraction would be limited to the Pinto Valley Mine project boundary and would not disproportionately affect low-income or minority communities.	No. Effects on geologic features and mineral extraction would be limited to the Pinto Valley Mine project boundary and expansion area and would not disproportionately affect low-income or minority communities.	No. Effects on geologic features and mineral extraction would be limited to the Pinto Valley Mine project boundary and expansion area and would not disproportionately affect low-income or minority communities.
Paleontology (see section 3.10.4)	No. There are no known paleontological localities and it is unlikely that fossils would be encountered.	Not applicable.	Not applicable.	Not applicable.
Hazardous Materials and Nonhazardous Material (see section 3.11.4)	Yes	No. Mine-related hazardous or nonhazardous materials would continue to be generated and stored for use within the Pinto Valley Mine project boundary, which includes no potential to affect low-income and minority populations. No changes to material transportation routes along U.S. Highway 60 through the communities of Superior, Miami, Claypool, and Globe are anticipated. There would be continued risk of accidental release of materials from mining activities, but proper material management and implementation of precautionary measures would minimize these risks.	No. Effects from hazardous or nonhazardous material use and storage would be generally the same as those under the no-action alternative. Effects from material transportation would be the same as those under the no-action alternative but would continue for approximately 7 more years.	No. Effects from hazardous or nonhazardous material use and storage would be generally the same as those under the no-action alternative but would extend onto National Forest System lands. Effects from material transportation would be the same as those under the no-action alternative and alternative 1 but would occur for approximately 19 more years or 12 more years, respectively.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Land Use and Ownership (see section 3.12.4)	Yes	No. There would be no change in ownership. No new disturbance of Forest System Lands would occur, and impacts related to conversion of land use would be limited to the Pinto Valley Mine project boundary.	No. There would be no change in ownership. No new disturbance of Forest System lands would occur but current uses by the Pinto Valley Mine would continue for approximately 7 more years compared to the no-action alternative. Impacts related to conversion of land use would be limited to the Pinto Valley Mine project boundary.	No. There would be no change in ownership. The Forest Service would authorize use of an additional 526 acres of National Forest System lands for mining-related use by Pinto Valley Mining Corp., although only 229 acres of this area are expected to be disturbed based on preliminary facility designs. There is no indication that the change in land use in the expanded boundary would disproportionately affect low-income or minority communities.
Livestock Grazing (see section 3.13.4)	Yes	No. Mining-related surface disturbance could result an estimated loss of up to 9 animal unit months in livestock grazing allotments; however, because the allotments are capable of supporting more animal unit months than currently permitted, the potential loss of animal unit months is not expected to reduce the level of grazing authorized within the allotments. There is no indication that the loss of these animal unit months would disproportionately affect low-income or minority communities.	No. Continuation of active mining operations for approximately 7 more years and expansion of mining facilities on private land under alternative 1 could result in an estimated loss of up to 44 animal unit months (0.9 percent of existing animal unit months) in the analysis area through the end of the mine life. Although the potential loss of animal unit months is not expected to reduce the level of grazing authorized within the allotments, the loss of animal unit months could change livestock distribution patterns to a greater degree than under the no-action alternative. There is no indication that the loss of these animal unit months would disproportionately affect low-income or minority communities.	No. Expansion of mining facilities under the proposed action could result in an estimated loss of up to 59 animal unit months (1.2 percent of existing animal unit months). Extension of the mine life an additional 12 years would extend the timeframes where this land would be unavailable for livestock grazing in the analysis area. Although the potential loss of animal unit months is not expected to reduce the level of grazing authorized within the allotments, the loss of animal unit months could change livestock distribution patterns to a greater degree than both the no-action alternative and alternative 1 due to the larger area of disturbance. There is no indication that the loss of these animal unit months would disproportionately affect low-income or minority communities.
Noise (see section 3.14.4)	Yes	No. Project-related noise would attenuate to insignificant levels before reaching the nearest residences in Superior and Miami. Project-related traffic in communities along U.S. Highway 60 would not affect noise levels.	No. Same as no-action alternative.	No. Same as no-action alternative.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Public Health and Safety (see section 3.15.4)	Yes	No. Residents along hazardous material haul routes could be exposed to risks while hazardous materials are being transported to licensed waste disposal sites via U.S. Highway 60. Although the communities of Superior, Miami, Claypool, and Globe sit along U.S. Highway 60, there are no changes to the planned transportation routes that indicate risks would disproportionately affect low-income or minority communities. The risk to public and employee heath from hazardous and nonhazardous materials used and stored at the project site would continue to be minimized through preventive measures taken by the mine operator. See air quality, noise, traffic and transportation, and water resources for additional information on potential effects associated with these resources.	No. Effects from transportation, storage, and use of hazardous and nonhazardous materials would be the same as those under the no-action alternative but would continue for approximately 7 more years.	No. Effects from transportation, storage, and use of hazardous and nonhazardous materials would be the same as those under the no-action alternative and alternative 1 but would continue for 19 more years or 12 more years, respectively.
Recreation and Wilderness (see section 3.16.4)	Yes	No. Ongoing industrial mining activities in the project area likely limit the value of the area for recreation, and no new substantial impacts on recreation opportunities and access are anticipated. Any temporary adverse impacts would affect all potential users of the area and would not disproportionately affect low-income or minority communities.	No. Same as no-action alternative, except effects on recreation opportunities and access would continue for approximately 7 more years.	No. Same as no-action alternative in the existing mine and facilities project, except effects on recreation opportunities and access would continue for approximately 19 more years. In addition, the proposed action would result in approximately 229 acres of new surface disturbance on National Forest System lands that would not occur under the no-action alternative and alternative 1. While the disturbance of additional acres under the proposed action could result in adverse impacts on recreational use in the expansion area, these effects would accrue to all potential users of the area and would not disproportionately affect low-income or minority communities.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Socioeconomic Conditions (see section 3.17.4)	Yes	Yes. Nearby communities may experience out-migration, increased vacancy rates, and decreased housing values as staffing levels are substantially reduced within 3 months of the record of decision. Identified minority and low-income communities in Superior, Miami, Claypool, and Globe, where many mine employees reside and that experience economic activity resulting from active mining operations, could experience disproportionately adverse effects from the commencement of mine closure approximately 2 months after the record of decision is issued.	No. There is no anticipated change in workforce, and therefore no anticipated social or economic effects on populations, housing costs, or other impacts that would disproportionately affect low-income and minority communities. Reductions in employment from mine closure would occur approximately 7 years later than under the no-action alternative, providing additional opportunities for individuals and communities associated with the mine to plan for and adjust to closure.	No. There is no anticipated change in workforce, and therefore no anticipated social or economic effects on populations or housing costs, or other impacts that would disproportionately affect low-income and minority communities. Reductions in employment from mine closure would occur approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1, providing additional opportunities for individuals and communities associated with the mine to plan for and adjust to closure.
Soils (see section 3.18.4)	Yes	No. Approximately 367 acres of new ground disturbance on private land would occur, including removal of vegetation, and the subsequent exposure of the soil could lead to increased susceptibility to erosion and loss of soil productivity. Impacts on soils would be limited to the Pinto Valley Mine project boundary and would not disproportionately affect low-income or minority communities.	No. The effects would be the same as those under the no-action alternative, except 909 acres of additional new ground disturbance on private land would occur. Impacts on soils would be limited to the Pinto Valley Mine project boundary and would not disproportionately affect low-income or minority communities.	No. The effects would be the same as those under the no-action alternative, except 1,087 acres of additional new ground disturbance on private land and 229 acres of surface disturbance on National Forest System lands would occur. Impacts on soils would be limited to the Pinto Valley Mine project boundary and expansion area. While the disturbance of additional acres under the proposed action could result in adverse impacts on soil resources in the expansion area, these effects would accrue to all potential users of National Forest System lands and would not disproportionately affect low-income or minority communities.

Resource	Would Adverse Impacts Occur?	Would Impacts Be Disproportionate on Low-income and Minority Communities?		
		No-action Alternative	***Alternative 1***	***Proposed Action***
Traffic and Transportation (see section 3.19.4)	Yes	No. Project-related traffic volumes and associated impacts (such as traffic accidents and road deterioration) would be similar to existing conditions, then decline after the 6-month transition period to mine closure. Gila County and the towns and census-designated places near the mine have greater traffic proximity than the national average (table 3-43) and mine-related traffic would pass through Superior, Miami, Claypool, and Globe along U.S. Highway 60. Traffic along this route would affect all communities and would not disproportionately affect low-income and minority communities. In addition, as noted in section 3.19, "Traffic and Transportation," planned road maintenance in the analysis area would result in conditions that remain within an acceptable level of service.	No. The effects would be the same as those under the no-action alternative, except continued operation of the mine for approximately 7 more years would extend mine-related traffic in Superior and Miami.	No. The effects would be the same as those under the no-action alternative, except continued operation of the mine for approximately 19 more years would extend mine-related traffic in Superior and Miami.
Visual Resources (see section 3.20.4)	Yes	No. There would be minimal changes to both scenery and views. Any visual impacts would affect all users equally along travel routes and areas adjacent to the mine. The mine site and facilities are not visible from any of the communities with identified minority or low-income populations, and disproportionately high and adverse impacts on these communities would not occur.	No. The effects would be similar to those under the no-action alternative, except that a slightly larger project disturbance footprint and continued operation of the mine for approximately 7 more years would extend visual impacts along travel routes and areas adjacent to the mine.	No. The effects would be similar to those under the no-action alternative, except that a slightly larger project disturbance footprint and continued operation of the mine for approximately 19 more years would extend visual impacts along travel routes and areas adjacent to the mine.
Water Resources (see section 3.21.4)	Yes	No. Most of the disturbed areas at the Pinto Valley Mine currently fall within the non-discharging boundary. There would be an increase in surface disturbance within the portion of the watershed discharging to Pinto Creek, but impacts would not be measurable. Impacts on water resources are therefore not anticipated to disproportionately affect low-income or minority populations.	No. Alternative 1 would increase the amount of surface-disturbing activities in the portion of the watershed discharging to Pinto Creek compared to the no-action alternative; however, impacts on water resources would be negligible. Impacts on water resources are therefore not anticipated to disproportionately affect low-income or minority populations.	No. The proposed action would increase the amount of surface-disturbing activities in the portion of the watershed discharging to Pinto Creek compared to the no-action alternative and alternative 1; however, impacts on water resources would be negligible. Impacts on water resources are therefore not anticipated to disproportionately affect low-income or minority populations.

3.7.4.2.2 Environmental Risk Exposure

Gila County's average environmental indicators are better than or are similar with national averages in all categories except for ozone, traffic proximity and volume, and wastewater discharge (table 3-43).

As described in section 3.2, "Air Quality," none of the alternatives are anticipated to lead to a significant increase in ozone levels. As a result, the alternatives would generally not increase environmental risk exposure to ozone compared to existing conditions.

As described in section 3.19, "Traffic and Transportation," and section 3.14, "Noise," alternative 1 and the proposed action would extend the period during which mine-related vehicle traffic would utilize local and regional roads; however, the proximity to noise sources for residents and the volume of traffic would generally be the same as existing conditions. Under alternative 1 and the proposed action, noise modeling indicated the sound pressure level (1-hour average) at residences closest to the mine would not be affected by changes in vehicle trips associated with the Pinto Valley Mine. Similar to the no-action alternative, residences along U.S. Highway 60 are projected to experience noise in excess of 65 A-weighted decibels (day-night average), which could exceed the U.S. Department of Housing and Urban Development noise compatibility standards. However, similar to the no-action alternative, these potential exceedances would not be the result of mine-related traffic or activities under alternative 1 or the proposed action and would generally be associated with increased traffic and public use over the next several decades. As a result, the alternatives are not anticipated to increase environmental risk exposure associated with traffic proximity and volume.

As described in section 3.21, "Water Resources and Hydrogeochemistry," alternative 1 and the proposed action would increase the operational life of the mine and increase the duration during which operational activities could affect wastewater discharge and water quality. Wastewater discharges from Pinto Valley Mine occur from industrial outfalls permitted by the Arizona Department of Environmental Quality. See section 3.21, "Water Resources and Hydrogeochemistry," for more information.

3.7.4.3 **Cumulative Impacts**

The cumulative impact analysis area for environmental justice consists of Gila County (including the Town of Miami, City of Globe, and Claypool census-designated place) and populated townships (Town of Superior and Top of the World census-designated place) in which any potential low-income and minority communities might experience disproportionately high and adverse impacts as a result of the proposed action for the Pinto Valley Mine—the same area used to analyze direct and indirect effects in section 3.7.4, "Environmental Consequences." The temporal boundaries for the analysis including the ongoing operation of Pinto Valley Mine through mine closure and final reclamation.

Section 3.7.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative environmental justice effects. The communities of Miami and Superior, the Claypool Census-Designated Place, and the city of Globe were identified as potentially having "meaningfully greater" minority or low-income populations than the reference area of Gila County and are therefore the focus of the environmental justice analysis. As described in section 3.7.4.2, "All Alternatives – Direct and Indirect Impacts," potential adverse effects of the proposed action are not anticipated to disproportionately affect low-income and minority communities. Similarly, the proposed action is not anticipated to increase environmental risk exposure to ozone or traffic proximity and volume compared to existing conditions. As described in section 3.21, "Water Resources and Hydrogeochemistry," the proposed action would increase the operational life of the mine and the duration during which operational activities could affect wastewater discharge and water quality. As a result, the proposed action could increase environmental risk exposure due to wastewater discharge and changes in water quality.

Present and reasonably foreseeable actions that could contribute to cumulative environmental justice impacts in the future are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because the timeframe of the project impacts would not overlap the timeframe of impacts from the proposed action or the alternatives.

The differences in cumulative impacts on environmental justice among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in section 3.7.4.2, "All Alternatives – Direct and Indirect Impacts." Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Under the no-action alternative, nearby communities may experience out-migration, increased vacancy rates, and decreased housing values as staffing levels are substantially reduced within 3 months of the record of decision due to loss of jobs from mine closure. Identified minority and low-income communities where many mine employees reside and that experience economic activity resulting from active mining operations could experience disproportionately adverse effects from mine closure within 3 months after the record of decision is issued.
- Under the no-action alternative, identified minority and low-income communities where many mine employees reside and that experience economic activity resulting from active mining operations could experience disproportionately adverse effects from mine closure within 3 months after the record of decision is issued.
- The proposed action would increase the operational life of the mine by 19 years compared to the no-action alternative and by 12 years compared to alternative 1, resulting in an extended period during operational activities could affect wastewater discharge and water quality. However, wastewater discharges would occur in accordance with permits and these impacts are not expected to disproportionately affect minority or low-income communities.

Based on the factors listed above, the no-action alternative could potentially result in disproportionate adverse effects on minority and low-income communities in the Town of Miami and the Town of Superior, the Claypool Census-Designated Place, and the city of Globe. Residents of those communities may experience out-migration, increased vacancy rates, and decreased housing values as staffing levels are substantially reduced from initiation of mine closure following the record of decision. Neither alternative 1 nor the proposed action would result in disproportionate adverse effects on minority and low-income communities that would contribute to cumulative effects. Under the no-action alternative, reasonably foreseeable development of new mines such as the Resolution Copper Project and Land Exchange could relieve some adverse effects through the creation of new jobs in the mining industry within the region, while ongoing wind-down and closure of Carlota Copper Mine and the Freeport-McMoRan Miami Copper Mine could contribute to adverse effects of additional loss of jobs in the mining industry.

3.8 Fire and Fuels Management

Fire and fuels management encompasses a broad range of activities ranging from planning, prevention, fuels or vegetation modification, prescribed fire, hazard mitigation, fire response, rehabilitation, monitoring, and evaluation. "Fuel" refers to any combustible material, primarily petroleum-based products and vegetation, including grasses, shrubs, and trees. The description of the affected environment and environmental consequences for fire and fuels management focuses on potential effects of the project on fuel loading and wildfire ignition, behavior, and suppression.

The analysis area for direct and indirect effects on fire and fuels management is the Pinto Valley Mine project boundary. Where needed to provide additional context, the analysis considers fire history and vegetation conditions within a 1-mile buffer of the Pinto Valley Mine project boundary. The temporal boundary for analyzing the direct and indirect effects on fire and fuels management includes the ongoing operations at Pinto Valley Mine and extends through mine closure and final reclamation. These spatial and temporal boundaries encompass the extent of potential changes to fire and fuels management resulting from the proposed action.

3.8.1 Relevant Laws, Regulations, and Policy

3.8.1.1 **Federal Authorities**

3.8.1.1.1 National Forest Management Act of 1976

The National Forest Management Act is the primary statute governing the administration of National Forest System lands and develops management plans for national forests based on multiple-use principles, sets standards for timber sales, and creates policies to regulate timber harvesting including fuels.

3.8.1.1.2 Healthy Forest Restoration Act of 2003

The Healthy Forest Restoration Act aims to expedite the preparation and implementation of hazardous fuels reduction projects on Federal land and restoration of healthy forest and watershed conditions on State, private, and tribal lands.

3.8.1.2 **Forest Service Regulations, Policies, and Guidance**

3.8.1.2.1 Title 36, Part 223.12 of the Code of Federal Regulations, "Permission to Cut, Damage, or Destroy Trees without Advertisement"

This policy grants permission to cut, damage, or destroy trees or fuels on National Forest System lands without advertisement when necessary for the occupancy of a right-of-way or other authorized use of National Forest System land.

3.8.1.2.2 Federal Wildland Fire Management Policy of 1995 and Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001)

The Federal Wildland Fire Management Policy is an interagency wildland fire policy document developed to set forth direction for consistent implementation of the Federal fire policy.

3.8.1.2.3 Guidance for Implementation of Federal Wildland Fire Management Policy

This guidance provides for consistent implementation of the 1995/2001 Federal Fire Policy, as directed by the Wildland Fire Leadership Council.

3.8.1.2.4 Title 36, Part 228, Subpart A of the Code of Federal Regulations – Forest Service Locatable Mineral Regulations

Locatable mineral regulations at 36 CFR 228, subpart A set forth rules and procedures for preventing and responding to fires associated with locatable mineral operations on National Forest System lands.

3.8.1.2.5 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for fire and fuels management (Forest Service 1985):

- "Actively participate with all interested and potentially affected parties to develop strategic Interface management measures to reduce Wildland Fire threats to life, property and resources, address issues of Forest health, and provide for community partnerships including treatments of vegetation and fuels, and access needs."
- "All reported wildland fires will receive a strategic fire size-up. Wildland fires meeting locally developed operating guidelines listed below may be managed for multiple objectives including resource benefit." Refer to pages 89-1 and 90 of the Tonto National Forest Plan for specific operating guidelines for managing wildland fires for multiple objectives including resource benefit.

The Tonto National Forest Plan identifies the desired condition of fire and fuels generally as allowing fire to resume its natural role in fire-dependent ecosystems while protecting public and firefighter safety, property, and natural and cultural resources (Forest Service 1985).

3.8.1.3 **State and Local Laws, Regulations, and Policies**

3.8.1.3.1 Suppression of wildfires; powers and duties of state forester, entry of private lands (Arizona Revised Statute Title 37, Chapter 2.1, Article 1, Section 37-623)

This State law provides the state forester the authority to prevent, manage, or suppress any wildfires on State and private lands located outside incorporated municipalities.

3.8.1.3.2 Burning of wildlands; exceptions; classification (Arizona Revised Statute Title 37)

This State law defines the parameters around the unlawfulness of a person to set or cause a wildland fire.

3.8.1.3.3 Emergencies; prohibiting fireworks; liabilities and expenses; fire suppression revolving fund (Arizona Revised Statute Title 37-623.02)

This State law provides the framework for fire management during emergencies and fire-suppression activity.

3.8.1.4 **Other Guidance and Recommendations**

3.8.1.4.1 Guidance for Implementation of Federal Wildland Fire Management Policy

Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

3.8.2 Resource Indicators

Table 3-45 below provides the resource indicators and measures for assessing potential effects on fire and fuels management.

Table 3-45. Resource indicators and measures for assessing effects on fire and fuels management

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Fuel loading	Presence, density, and type of vegetation	Acres of new surface disturbance and miles of new linear infrastructure that would result in vegetation clearing and increase risk of introducing invasive plants. Vegetation condition class and fire regime condition class of disturbed vegetation.	No	Project description and geospatial data, LANDFIRE vegetation condition class and fire regime condition class data
Fuel breaks or barriers	Changes in fuel characteristics or continuity that allow fires to be more readily controlled	Number of new facilities and long-term surface disturbance.	No	Project description and geospatial data
Wildfire response	Access for fire management personnel	Miles of road.	No	Project description and geospatial data
Unplanned ignitions	Risk of unplanned ignitions due to equipment failures, storage and transportation of flammable materials, human activities, lightning	Additional risk of unplanned ignitions posed by mining activities such as blasting, miles of new roads, mine life.	No	Project description and geospatial data

3.8.3 Affected Environment

Table 3-46 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-46. Resource indicators and measures for the existing condition for fire and fuels management

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Fuel loading	Amount and characteristics of vegetation	Acres of new surface disturbance that would result in vegetation clearing and increase risk of introducing invasive plants	• 3,915 acres of existing surface disturbance • 13 invasive plant species identified

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Fuel breaks or barriers	Changes in fuel characteristics or continuity that allow fires to be more readily controlled	Number of new facilities and long-term surface disturbance	• 3,915 acres of existing surface disturbance • 29.8 miles of existing National Forest System roads • 15.2 miles of existing access roads on National Forest System lands • 26.8 miles of existing electric power line • 35.6 miles of water pipeline rights-of-way outside of road alignments
Wildfire response	Access for fire management personnel	Miles of road	• 29.8 miles of existing National Forest System roads • 15.2 miles of existing access roads on National Forest System lands
Unplanned ignitions	Risk of unplanned ignitions due to equipment failures, storage and transportation of flammable materials, human activities, lightning	Additional risk posed by mining activities such as blasting, miles of new roads, mine life	• Risks from blasting, equipment failures, vehicle traffic, storage and transportation of flammable materials

Most wildfires in the Tonto National Forest have occurred between the months of June and August, but wildfires have been recorded each month from April to October. From 2000 to 2019 there were approximately 3,900 wildfires recorded in the Tonto National Forest that burned an estimated 909,069 acres (Forest Service 2020a). From 2000 to 2019, the Tonto National Forest averaged approximately 65 wildfires per year with an estimated burn area of 19,000 acres per year (Forest Service 2020a). The largest reported wildfire in Tonto National Forest, known as the Cave Creek Complex Fire, occurred in June 2005 and burned approximately 248,901 acres. Between 1970 and 2017, approximately 62 percent of all wildfires were caused by lightning and the remaining 38 percent were caused by human activities, including equipment use, smoking, campfires, arson, and other miscellaneous causes (Forest Service 2018c).

Prior to June 2019, no wildfires had been recorded on National Forest System lands within the analysis area. The Gunsight Fire, which burned 293 acres in August 1973, was the only wildfire reported within 1 mile of the Pinto Valley Mine project boundary; however, 64 ignitions have been reported within the same area, primarily from lightning and equipment use (Forest Service 2018c). However, in June and July of 2019, the Woodbury Fire burned approximately 123,875 acres within the Tonto National Forest, in and around the Superstition Wilderness. The Woodbury Fire burned large and contiguous areas of wildlife habitat and vegetation in the analysis area, resulting in short-term and long-term effects on the affected environment. Although the wildfire did not physically affect mine infrastructure or operations, operations at Pinto Valley Mine were temporarily curtailed to ensure the health and safety of mine employees. In addition, in August 2020 the Salt Fire burned approximately 21,670 acres near the Pinto Valley Mine but outside the analysis area. No wildfires on National Forest System lands have ever been known to be caused in association with operations at Pinto Valley Mine.

3.8.3.1 Fuel Loading

Past and present mining activities have resulted in the incremental removal of vegetation that could serve as fuels for wildland fire from approximately 3,915 acres at Pinto Valley Mine. Some inactive facilities have revegetated over time due to natural or planned reclamation; however, vegetative fuels are sparse or absent on lands within the analysis area supporting active mining operations. The area surrounding the Pinto Valley Mine supports a variety of vegetation communities, most notably interior chaparral biotic community. Plant surveys and other incidental observations have identified 13 invasive plant species within the analysis area (see section 3.3.3.1, "Vegetation"), some of which (such as brome grasses) may cause fires to spread faster and burn at higher intensities than native vegetation communities. Invasive plants were observed predominantly in previously disturbed areas, including along roads and utility corridors.

General patterns in the frequency, season, and size of wildland fires over long periods define fire regimes. The combined effect of fire suppression and exclusion policies, ecological changes due to grazing and human development, and increases in temperature and drought have caused a shift in fire regime toward less frequent but larger and more severe wildfires since the late 1800s (Marlon et al. 2012). The mean fire return interval—the average period between fires under the presumed historical fire regime—for upland vegetation types around the Pinto Valley Mine is estimated to be between 46 and 60 years, and 501 to 1,000 years in riparian areas. LANDFIRE data classify vegetation communities within the analysis area as shown in table 3-47. The majority of lands surrounding Pinto Valley Mine are within vegetation condition class I.B, indicating low to moderate departure of vegetation from historic reference conditions. Small areas with higher departure exist in several areas, most notably an area classified as vegetation condition class II northwest of Tailings Storage Facility No. 3. Based on these vegetation condition classes, wildfires are expected to have similar size, intensity, and severity relative to historical conditions under most circumstances, although the potential for more extreme wildfires exists under certain circumstances (such as high winds or drought).

Table 3-47. Vegetation condition class within Pinto Valley Mine Project boundary and a 1-mile buffer

Vegetation Condition Class	Description	Acres by Land Ownership			Total Acres
		Forest Service	*Bureau of Land Management*	*Private*	
Vegetation Condition Class I.A	Very Low Vegetation Departure: 0–16 percent	233	4	25	262
Vegetation Condition Class I.B	Low to Moderate Vegetation Departure: 17–33 percent	19,499	363	3,801	23,663
Vegetation Condition Class II.A	Moderate to Low Vegetation Departure: 34–50 percent	2,857	15	423	3,295
Vegetation Condition Class II.B	Moderate to High Vegetation Departure: 51–66 percent	2	0	0	2
Vegetation Condition Class III.A	High Vegetation Departure: 67–83 percent	11	0	2	13

Vegetation Condition Class	Description	Acres by Land Ownership			Total Acres
		Forest Service	*Bureau of Land Management*	*Private*	
Other[59]	Barren, Burnable Agriculture, Burnable Urban, Non burnable Agriculture, Non burnable Urban, Sparsely Vegetated, Water	792	8	3,503	4,303
	Total	**23,394**	**390**	**7,754**	**31,538**

Source: Tonto National Forest 2007

3.8.3.2 Fuel Breaks and Barriers

Project facilities and linear components such as buildings, utility corridors, and access roads create fuel breaks or barriers that can impede the spread of wildland fires. Vegetative fuels are largely absent or sparse across 3,915 acres of existing facilities at Pinto Valley Mine and there are currently 29.8 miles of National Forest System roads, 15.2 miles of access roads on National Forest System lands, 26.8 miles of electric power line corridors, and 35.6 miles of water pipeline corridors within the analysis area. The effectiveness of these project features to serve as fuel breaks depends on their width, the intensity of the fire, and wind conditions.

3.8.3.3 Wildfire Response

A 650,000-gallon emergency water storage tank for fire suppression is located within the authorization area for the 19 Dump. The fire and service water tank is engineered so that service water is only extracted from the upper half of the tank, always leaving the lower half in reserve for emergency fire suppression. National Forest System roads and access roads in the analysis areas can serve as access routes for land-based fire prevention and suppression activities for fire management personnel. For example, roads can decrease the time and effort required to get firefighters and their equipment into a position to suppress or control wildland fire. As stated above, there are currently 29.8 miles of National Forest System roads and 15.2 miles of access roads within the analysis area.

3.8.3.4 Unplanned Ignitions

Fires can be caused by unplanned ignitions from natural causes, such as lightning, or human activities, such as blasting, equipment failures, vehicle traffic, storage and transportation of flammable materials, electrical power lines, or human errors associated with mining, recreation, or other land uses. From 2000 to 2019 there were approximately 3,900 wildfires recorded in the Tonto National Forest that burned an estimated 909,069 acres (Forest Service 2020a). Although roads can provide access for fire management personnel responding to wildland fires or conducting fuel treatments, they also increase the risk of accidental ignitions, especially where roads traverse areas with high fuel loading.

Flammable or combustible materials stored or transported through Pinto Valley Mine could serve as fuels for unplanned ignitions; however, these risks are minimized through safety protocols implemented by Pinto Valley Mining Corp., including personnel training, maintenance of water trucks and extinguishers on site, and wildfire prevention measures (pending Pinto Valley Mining Corp. submittal of a fire management plan). No wildfires on National Forest System lands have ever been known to be caused in association with operations at Pinto Valley Mine.

[59] Most existing facilities at Pinto Valley Mine are classified as non-burnable urban.

3.8.4 Environmental Consequences

3.8.4.1 Analysis Methodology and Assumptions

The analysis of impacts on fire and fuels management applies the following methods:

- Impacts associated with fuel loading and fire risk are quantitatively assessed using projected surface disturbance and miles of new road disturbance.
- Impacts associated with fuel loading and fire risk are qualitatively assessed based on the types and locations of mining activities.

The analysis of impacts on fire and fuels management includes the following assumptions:

- In general, fires are either considered planned or unplanned. Planned fires are typically used for vegetation treatment, thinning, fire prevention, and other planned activities and unplanned fires are typically accidentally caused by lightning strikes, inadvertent ignition, or other sources.
- Surface disturbance could decrease the risk of wildfires in the short term by creating fire breaks but would increase the potential for the spread of invasive plant species, which can increase fire risk in the long term.
- In general, invasive plant species increase fire intensity, frequency, and seasonality because they change the fuel properties and conditions.
- Fire-suppression activities would be implemented to prevent loss of life and property, ensure public safety, and protect high-priority resource values.
- In general, an increase in human activity and presence and project-related mining activity can increase fire ignition sources and fire risk.

3.8.4.2 No-action Alternative – Direct and Indirect Impacts

3.8.4.2.1 Fuel Loading

Under the no-action alternative, the vegetation condition classes, wildfire size, intensity, and severity relative to historical conditions would be essentially the same as the existing conditions described in section 3.8.3.1 until closure and reclamation of most facilities at Pinto Valley Mine begin after the 6-month transition period.

Continuation of mining operations during the first 2 months of the 6-month transition period and expansion of mining facilities acquisition of borrow materials on an additional 367 acres of private lands under the no-action alternative would result in additional vegetation clearing around the periphery of existing facilities that would decrease the total amount of vegetative fuels in the analysis area in the short term.

Approximately 83 percent of new disturbance would occur in areas classified as vegetation condition class I.B, indicating low to moderate departure from historic reference conditions. Although vegetation clearing would decrease the risk of wildfires in localized areas where clearing occurs, it would increase the potential for introduction and spread of invasive plants that would increase fuel loading and fire hazard of the surrounding area. During reclamation and closure, vegetation would reestablish across much of the mine site (except within the Open Pit) in accordance with the active Mined Land Reclamation Plan for private land (SRK Consulting, Inc. 2016a) and the reclamation plan for National Forest System lands. After several decades of reclamation and revegetation, total fuel loading in the analysis area may be greater than existing conditions at the mine.

3.8.4.2.2 Fuel Breaks and Barriers

Limited future use of approximately 29.8 miles of existing National Forest System roads, 15.2 miles of access roads on National Forest System lands, 26.8 miles of electric power line corridors, and 35.6 miles of water pipeline corridors would not change the potential for these linear facilities to serve as fuel breaks for wildland fire in the short term. Installation, reinstallation, and removal of several water pipeline segments could alter the distribution of fuel breaks or potential for wildfire spread. Following mine closure, fuel breaks associated with most of these linear features would be reclaimed unless roads and utility rights-of-way are necessary for closure and post-closure operations or are maintained for other uses. National Forest System roads would generally remain after closure, continuing to function as fuel breaks.

3.8.4.2.3 Wildfire Response

Fire suppression requirements would limit the Forest Service's ability to allow fire to resume its natural role in the fire-dependent ecosystem within which Pinto Valley Mine is located, resulting in further departure from the natural fire regime. Limited future use of approximately 29.8 miles of existing National Forest System roads and 15.2 miles of access roads would not change the potential for these linear facilities to provide access for fire management and response activities.

Under the no-action alternative, closure of facilities and reclamation of disturbed areas, including existing encroachments, would generally begin following the 6-month transition period unless facilities and infrastructure are necessary for closure and post-closure operations. National Forest System roads would generally remain after closure, continuing to function as fuel breaks. Reclamation activities are anticipated to last for approximately 12 years with additional post-closure monitoring activities continuing for up to 30 years. After mine closure, and subject to a variety of public safety and resource considerations, the Forest Service could consider the use of wildland fire as a management tool on National Forest System lands in the vicinity of Pinto Valley Mine.

3.8.4.2.4 Unplanned Ignitions

Operation of the Pinto Valley Mine would result in continued risk of unplanned ignitions from blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, electrical power lines and other activities conducted in association with mine operation, as described for the existing conditions. Pinto Valley Mining Corp. would continue to minimize the risks of unplanned ignitions through implementation of fire safety measures during the 6-month transition period. Risk of unplanned ignitions from project-related activities would decrease substantially during the closure and final reclamation phases of the project due to the cessation of active mining operations, removal of combustible materials, and decreased human activity associated with the mine.

3.8.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.8.4.3.1 Fuel Loading

Expansion of mining facilities onto private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in approximately 909 acres of additional surface disturbance on private land, an increase of 542 acres compared to the no-action alternative. Similar to the no-action alternative, additional vegetation clearing would decrease the total amount of vegetative fuels in the analysis area and have the same low to moderate departure from historic reference conditions. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 7 years later than under the no-action alternative.

3.8.4.3.2 Fuel Breaks and Barriers

Under alternative 1, the potential for existing linear facilities (National Forest System roads, access roads, power lines ,and pipelines) to serve as fuel breaks for wildland fire would be the same as for the no-action alternative. However, fuel breaks associated with linear features would exist for approximately 7 more years under alternative 1. National Forest System roads would generally remain after closure, continuing to function as fuel breaks.

3.8.4.3.3 Wildfire Response

Under alternative 1, fire suppression on surrounding National Forest System lands to protect public safety and capital investments associated with Pinto Valley Mine and nearby communities would be the same as under the no-action alternative. Similar to the no-action alternative, the continued use of existing National Forest System roads and access roads would not change the potential for linear facilities to provide access for fire management and response activities under alternative 1.

Reclamation activities and reclamation success would generally be the same as described under the no-action alternative except that reclamation of facilities and disturbance not required for post-closure operations would start approximately 7 years later than under the no-action alternative. As a result, the Forest Service could consider the use of wildland fire as a management tool on National Forest System lands in the vicinity of Pinto Valley Mine approximately 7 years later than under the no-action alternative.

3.8.4.3.4 Unplanned Ignitions

The continued risk of unplanned ignitions from blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, and other activities conducted in association with mine operation would be similar as described for the no-action alternative. While Pinto Valley Mining Corp. would continue to minimize the risks of unplanned ignitions through implementation of fire safety measures, extension of active mining operations at the Pinto Valley Mine would increase the period of risk for unplanned ignitions from mine operations by approximately 7 years compared to the no-action alternative.

3.8.4.4 **Proposed Action – Direct and Indirect Impacts**

3.8.4.4.1 Fuel Loading

Expansion and reclamation of mining facilities under the proposed action would have the same types of impacts on fuel loading described for the no-action alternative and alternative 1, except to a greater degree because the proposed action would result in disturbance of 1,087 acres of private lands and 229 acres of National Forest System lands. This represents an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. Additional vegetation clearing compared to the no-action alternative and alternative 1 would decrease the availability of fuels that could burn in wildfires in the short term, but could increase the potential for the spread of invasive plant species and increase fire risk in the long term. Under the proposed action, the timeframes when vegetative fuel loads are cleared in the analysis area associated with ongoing mine operation would be extended by approximately 19 years compared to the no-action alternative and an additional 12 years compared to alternative 1. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.

3.8.4.4.2 Fuel Breaks and Barriers

The proposed action would result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands). This represents an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 405 acres of surface disturbance on private land compared to alternative 1 (45-percent increase), and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. The increased surface disturbance under the proposed action would generally increase the potential for disturbed areas to serve as fuel breaks for wildland fire in the short term, but could alter the distribution of fuel breaks or potential for wildfire spread in the long term to a greater extent than the no-action alternative or alternative 1. Similar to the no-action alternative and alternative 1, continued use of existing National Forest System roads under the proposed action, including potential minor realignments of National Forest System Road 287, would not change the potential for these roads to serve as fuel breaks for wildland fire. New and realigned access roads around the perimeters of the Open Pit and Tailings Storage Facility No. 4 would create fuel breaks around these facilities, limiting the potential for fire to enter or escape these facilities. Construction of a new electric power line on National Forest System lands to support the operation of Tailings Storage Facility No. 4 would create an additional fuel break compared to the no-action alternative and alternative 1. Under the proposed action, extension of the mine life by an additional 19 years compared to the no-action alternative and by an additional 12 years compared to alternative 1 would delay reclamation and revegetation of linear fuel breaks and barriers, increasing the timeframe that these breaks would be present. National Forest System roads would generally remain after closure, continuing to function as fuel breaks.

3.8.4.4.3 Wildfire Response

The Forest Service's requirement to suppress fire to protect public safety and capital investments associated with Pinto Valley Mine would continue for approximately 19 more years compared to the no-action alternative and 12 years compared to alternative 1 due to extension of mine operation. Continued fire suppression could increase the age and density of vegetation in the vicinity of Pinto Valley Mine, resulting in further departure from the natural fire regime. As under the no-action alternative and alternative 1, the Forest Service could consider the use of prescribed wildland fire as a management tool in the vicinity of Pinto Valley Mine after mine closure, provided its use would be consistent with public safety and resource considerations.

Continued use of existing National Forest System roads and access roads would provide similar access for fire management and response activities as described under the no-action alternative and alternative 1. Several proposed realignments or construction of new roads around expanded facilities would not notably alter which locations within the analysis area are accessible by road.

3.8.4.4.4 Unplanned Ignitions

Expansion of mining facilities onto National Forest System lands and operation of Pinto Valley Mine for approximately 19 more years than the no-action alternative and 12 more years than alternative 1 would extend the duration of blasting, construction activities, equipment failures, vehicle traffic, storage and transportation of flammable materials, and other human activities conducted in association with mine operation that pose risks for unplanned ignitions. However, Pinto Valley Mining Corp. would continue to minimize the risks of unplanned ignitions through implementation of fire safety measures. Risk of unplanned ignitions would decrease substantially during the closure and final reclamation phases of the project due to the cessation of mining activities, removal of most combustible materials, and decrease in human visitation.

3.8.4.5 **Cumulative Impacts**

The cumulative impacts analysis area for fire and fuels management is the Globe Ranger District of the Tonto National Forest. The cumulative impacts analysis area encompasses the area where wildfires affecting Pinto Valley Mine or ignited by activities at Pinto Valley Mine would be most likely to occur due to fuel continuity and loading. The cumulative impacts analysis area encompasses approximately 736 square miles (471,091 acres). The cumulative impacts timeframe for fire and fuels management encompasses the operational life of the mine under the alternatives and a 60-year post-mining period, which coincides with estimated mean fire return interval for upland areas around the Pinto Valley Mine as described in section 3.8.3.1, "Fuel Loading."

Section 3.8.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on fire and fuels management. Within the cumulative impacts analysis area, the following past and present activities have contributed to cumulative impacts and the existing condition of fire and fuels management described in section 3.8.3, "Affected Environment":

- Past wildfires within the Globe Ranger District, including the Woodbury Fire in 2019 (123,875 acres) and the Salt Fire in 2020 (21,670 acres), which occurred in close proximity to Pinto Valley Mine
- Past and ongoing fuels and vegetation treatments designed to minimize the potential for large wildfires, including the Highway Tanks Tribal Forest Protection Act Project
- Past and ongoing fire suppression to protect public safety, residences, structures, and other public and private assets on lands within the Globe Ranger District
- Past and ongoing mining activities at Carlota Copper Mine and Freeport-McMoRan Miami Copper Mine
- Ongoing recreational use of National Forest System lands within the Globe Ranger District because wildfires are sometimes inadvertently started by campfires and other unplanned ignitions from recreationists and other public land users

Existing surface disturbance within the fire and fuels cumulative impacts analysis area encompasses an estimated 11,104 acres, which represents approximately 2 percent of the 471,091 acres in the cumulative impacts analysis area. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. The Resolution Copper Project and Land Exchange (3,497 acres of estimated disturbance) and Highway Tanks Tribal Forest Protection Act Project (unpredictable amount of estimated disturbance) would contribute to future cumulative surface disturbance in the cumulative impacts analysis area. As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 15,918 acres, which is approximately 3 percent of the cumulative impacts analysis area.

This cumulative analysis considers the present effects of past actions described in section 3.8.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect fire and fuels management in the future as identified in table 3-3.

3.8.4.5.1 Fuel Loading

Present effects of the relevant past and present actions have resulted in the fuel loading conditions presented in section 3.8.3, "Affected Environment." Present and reasonably foreseeable actions that could contribute to cumulative fuel loading impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on fuel loading are the Resolution Copper Project and Land Exchange and the Highway Tanks Tribal Forest Protection Act Project. Vegetation removal from past, ongoing, and reasonably foreseeable development or expansion of mines and associated facilities within the Globe Ranger District would decrease fuel loads in the immediate areas of disturbance, such that these areas would no longer have adequate vegetative cover to facilitate the ignition or spread of wildfires. However, new disturbances from mining and other development activities would continue to introduce and facilitate the spread of invasive plants into adjacent vegetation communities in a manner that could alter their composition and cause fires to spread faster and burn at higher intensities than native vegetation communities. The Highway Tanks Tribal Forest Protection Act Project would apply a variety of treatments intended to restore fire-adapted ecosystems and minimize the potential for large wildfires. The reduced risk of large wildfires could have widespread benefits on fire and fuel management within the Globe Ranger District and would have a countervailing effect on the trend in increasing wildfire size and intensity.

Other present and reasonably foreseeable actions involving fire suppression on public and private lands within the analysis area to protect public safety, residences, structures, and other public and private assets on lands within the Globe Ranger District would result in further changes in the structure and composition of vegetation. These changes, along with increases in temperature and drought due to climate change, could intensify cumulative effects from observed regional trends of increasing wildfire size and intensity.

The differences in cumulative impacts on fuel loading among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.8.4.2 through 3.8.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Expansion and reclamation of mining facilities under the proposed action would result in an additional 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The timeframes when vegetative fuel loads are cleared in the analysis area under the proposed action would be extended by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on fuel loading compared to the other alternatives.

3.8.4.5.2 Fuel Breaks and Barriers

Present effects of the relevant past and present actions have resulted in the fire breaks and barriers conditions presented in section 3.8.3, "Affected Environment," including facilities and linear components that have created impediments to the spread of wildland fires. The proposed action would result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National

Forest System lands) and contribute to an increase in the potential for disturbed areas to serve as fuel breaks for wildland fire in the short term, but could alter the distribution of fuel breaks or potential for wildfire spread in the long term as described in sections 3.8.4.2 through 3.8.4.4. Present and reasonably foreseeable actions that could contribute to cumulative fuel breaks and barriers impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable action that could contribute to cumulative fuel breaks and barriers impacts are the Resolution Copper Project and Land Exchange and the Highway Tanks Tribal Forest Protection Act Project. These present and reasonably foreseeable actions would contribute to the creation of artificial fire breaks due to vegetation clearing, which may limit wildfire spread.

The differences in cumulative impacts on fuel loading among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.8.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Expansion and reclamation of mining facilities under the proposed action would result in an additional 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The timeframes when fuel breaks and barriers are present under the proposed action would be extended by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on fire breaks and barriers compared to the other alternatives. However, the proposed action would have a limited incremental contribution to the presence of artificial fuel breaks due to the predominantly peripheral nature of the proposed expansion, which would generally serve to expand the area of existing artificial fuel breaks rather than create new fuel breaks that would physically separate previously contiguous vegetated areas.

3.8.4.5.3 Wildfire Response

Present effects of the relevant past and present actions have resulted in the wildfire response conditions presented in section 3.8.3, “Affected Environment,” including past wildfires, facilities (emergency water storage tank for fire suppression), and roads that supported the prevention and suppression activities of fire management personnel. The Forest Service’s requirement to suppress fire to protect public safety and capital investments associated with Pinto Valley Mine would continue under the proposed action, as would the continued use of existing National Forest System roads and access roads to provide access for fire management and response activities (described in section 3.8.4.2, “No-action Alternative – Direct and Indirect Impacts”). Continued fire suppression could increase the age and density of vegetation in the vicinity of Pinto Valley Mine, resulting in further departure from the natural fire regime.

Present and reasonably foreseeable actions that could contribute to cumulative wildfire response impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on wildfire response are the Resolution Copper Project and Land Exchange and the Highway Tanks Tribal Forest Protection Act Project. Development or expansion of mines and associated facilities would place additional personnel and structures within the wildland-urban interface, limiting options to use prescribed or managed fire as a vegetation management tool and requiring use of full suppression.

The differences in cumulative impacts on wildfire response among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.8.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The timeframes required to suppress fire to protect public safety and capital investments associated with Pinto Valley Mine under the proposed action would be extended by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on wildfire response compared to the other alternatives.

3.8.4.5.4 Unplanned Ignitions

The cumulative impacts on unplanned ignitions would generally be the same as those described in sections 3.8.4.2 through 3.8.4.4. Operation of the Pinto Valley Mine would result in continued risk of unplanned ignitions from blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, electrical power lines, and other activities conducted in association with mine operation, as described for the existing conditions in section 3.8.3, “Affected Environment.”

Reasonably foreseeable actions that could result in additional impacts on unplanned ignitions would be the same as those discussed above under section 3.8.4.5.3, “Wildfire Response,” including development and activities that would increase the risk of unplanned ignitions due to increased human activity, the presence of flammable or combustible materials, and the use of vehicles and other equipment that could serve as ignition sources.

The differences in cumulative impacts on unplanned ignitions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.8.4.2 through 3.8.4.4. All alternatives would have similar impacts on unplanned ignitions, the potential for which from mining activities is anticipated to be low with application of standard operating procedures and safety measures. However, the potential for unplanned ignitions could persist for a longer duration under the proposed action compared to the no-action alternative and alternative 1 (19 more years or 12 more years, respectively).

Based on these factors, the proposed action is anticipated to result in greater cumulative impacts on unplanned ignitions compared to the other alternatives.

3.8.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on fire and fuels management. This section provides a summary of the monitoring and mitigation measure for fire and fuels. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.6, “Fire and Fuels Management,” for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measure FF-1: Fire Plan.** This measure addresses the potential for unplanned wildfire ignitions from Pinto Valley Mining Corp.'s activities on and adjacent to National Forest System lands during operations, closure, and post-closure in addition to documentation of measures to avoid and respond to fires if they do occur. Under this measure, Pinto Valley Mining Corp. will prepare a fire plan for the project that would include, but not be limited to, identification of applicable fire restrictions, measures taken to reduce the potential for unplanned ignitions, fire response activities, water supply for fire response, and a description of how Pinto Valley Mining Corp. will coordinate with Federal, State, and local entities on fires and fire response. The fire plan would also include annual meetings between Pinto Valley Mining Corp. and the Forest Service to confirm fire response strategies and protocols for the following season.

3.9 Geology, Minerals, and Geotechnical Stability

This section addresses the geology, mineralization, and geotechnical stability associated with the proposed project. The baseline geology described in this section also provides background information for characterizing the hydrogeologic setting and rock geochemistry discussed in section 3.21, "Water Resources and Hydrogeochemistry."

The analysis area for evaluating direct and indirect impacts on geologic and mineral resources (including geotechnical stability) includes the Pinto Valley Mine project boundary and the area located outside but within 1 mile of the Pinto Valley Mine as shown on map 3-7 in appendix A. The analysis area was selected to encompass the area where all proposed activities would occur.

The temporal boundary for analyzing the direct and indirect effects on geology and mineral resources (including geotechnical stability) includes construction, operation, mine closure, and final reclamation phases. The analysis also evaluates long-term, post-closure geotechnical stability of the proposed facilities that would persist into the post-closure period.

3.9.1 Relevant Laws, Regulations, and Policy

3.9.1.1 Federal Authorities

3.9.1.1.1 Mining Law of 1872

The General Mining Law of 1872 (mining law) (30 U.S. Code 22–54) authorizes citizens to stake or "locate" mining claims on Federal lands in order to acquire mineral rights. The mining law consists of five basic elements: discovery of a valuable mineral, location of mining claims, recordation of claims, maintenance (performance of annual requirements on claims), and patenting of a claim, with possible transfer of the surface estate to the claimant.

3.9.1.1.2 Organic Administration Act of 1897

The Organic Administration Act of 1897 provides the main statutory basis for the management of forest reserves in the United States The role of the Tonto National Forest under its primary authorities in the Organic Administration Act is to ensure that mining activities minimize adverse environmental effects on National Forest System land surface resources.

3.9.1.1.3 Surface Resources Act of 1955

The Surface Resources Act of 1955, commonly referred to as the Multi-Use or Mining Act, amended the General Mining Act of 1872 and reaffirms the right to conduct mining activities on public lands, including mine processing facilities and the placement of mining tailings and waste rock. Although a right to conduct mining activities exists, proposals must comply with applicable Federal and State environmental protection laws, and the Forest Service can require reasonable measures, within its authority, to minimize impacts on surface resources (see 30 U.S. Code 612 and 36 CFR 228.1). This act also removed common varieties of minerals, such as sand and gravel, clay, building stone, and cinders, from the category of locatable minerals and provided for multiple uses of the lands and surface resources on mining claims.

3.9.1.1.4 Mining and Minerals Policy Act of 1970

Metals and other mineral resources on National Forest System lands are managed in accordance with the Mining and Minerals Policy Act of 1970, which states that the Federal Government should “foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs.”

3.9.1.2 **Forest Service Regulations, Policies, and Guidance**

3.9.1.2.1 36 CFR 228, subpart A

Administration of locatable mineral resources on National Forest System lands follows direction in regulations at 36 CFR 228, subpart A. The regulations describe what information is required for a proposal to explore, develop, and recover locatable minerals; guidance that impacts on National Forest System surface resources should be mitigated to the extent practicable; and how reclamation will be bonded and completed during the operation at the conclusion of activity. Mining claim location and demonstration of mineral discovery are not required for approval of locatable minerals operations subject to Forest Service regulations at 36 CFR 228 subpart A.

3.9.1.2.2 Forest Service Manual 2810

Forest Service Manual 2810 provides Forest Service guidance on applying the general mining laws and other authorities associated with the exploration, development, and production of locatable or hard rock minerals on National Forest System land and bonding and financial guarantees associated with locatable mineral operations.

3.9.1.2.3 2004 Forest Service Bonding Guide

This guide provides Forest Service guidance on appropriate processes and requirements for bonding and financial guarantees associated with locatable mineral operations on National Forest System land.

3.9.1.2.4 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for minerals management (Forest Service 1985):

- “Support environmentally sound energy and minerals development.”
- “Process notices of intent and operating plans”

3.9.1.3 State and Local Laws, Regulations, and Policies

3.9.1.3.1 Arizona Department of Environmental Quality Best Available Demonstrated Control Technology

The Arizona Department of Environmental Quality requires that an Aquifer Protection Permit applicant should follow Best Available Demonstrated Control Technology (Arizona Department of Environmental Quality 2004) for a specific facility and site in accordance with Arizona Revised Statute 49-243.B.1. Appendix E (Engineering Design Guidance) in Best Available Demonstrated Control Technology guidance specifies methodologies for completing stability analyses for various types of embankments and material piles at mine facilities and defining site-specific seismic hazards and earthquake design parameters for stability analyses.

3.9.1.3.2 Arizona Department of Water Resources Dam Safety Permit

The Arizona Department of Water Resources requires a dam safety permit for a jurisdictional dam, defined as an artificial barrier for the impoundment or diversion of water either 25 feet or more in height or having a storage capacity of more than 50 acre-feet (excluding mine tailings dams such as the Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 embankments). However, tailings dams are excluded from State of Arizona dam safety regulations per Arizona Revised Statute 45.2631; rather, their design and operation are guided by the Arizona Department of Environmental Quality Best Available Demonstrated Control Technology.

3.9.1.3.3 Arizona State Mine Inspector

The Arizona State Mine Inspector is responsible for overseeing the safety and regulation of active and inactive mines in the state of Arizona. It is an independent, constitutionally-mandated office, elected to a four-year term.

3.9.2 Resource Indicators

Table 3-48 below provides the resource indicators and measures for assessing potential effects on geology and minerals, including geotechnical stability.

Table 3-48. Resource indicators and measures for assessing effects on geology, minerals, and geotechnical stability

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Geology - topographic and geomorphic disturbance	Acres of disturbance (that permanently alter the topography or geomorphology)	Acres	No	Geospatial data
Mineral resources	Minerals to be mined	Tons	No	Pinto Valley Mining Corp.
Geotechnical stability	Stability of tailings storage facilities, the Open Pit, and waste rock dumps	Factor of safety	Yes	Pinto Valley Mining Corp. geotechnical reports (design and stability analyses)

3.9.3 Affected Environment

Table 3-49 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-49. Resource indicators and measures for the existing condition for geology, minerals, and geotechnical stability

Resource Element	Resource Indicator	Measure	Existing Condition
Geology - topographic and geomorphic disturbance	Acres of disturbance (that permanently alter the topography or geomorphology)	Acres	3,915 acres
Mineral resources	Minerals to be mined	Tons	473.8 million metric tons (proven and probable ore)
Geotechnical stability	Stability of tailings storage facilities, the Open Pit, and waste rock dumps	Factor of safety	Meets Best Available Demonstrated Control Technology design criteria

3.9.3.1 **Geology**

3.9.3.1.1 Regional Geology

The following summary of the regional geology is based on the information provided in Peterson 1962 (unless noted otherwise). The rocks within this region include metamorphic, igneous, and sedimentary rocks that range in age from Precambrian to Recent. The regional geologic conditions and description of the mapped units are presented on map 3-7 in appendix A and in table 3-50, respectively.

Table 3-50. Stratigraphic column for the Pinto Creek watershed area

Era	Period	Map Symbol	Unit	Material Description
Cenozoic	Recent	t, wr, ld	Mine waste	Tailings (t), waste rock (wr), and leach dump (ld).
	Quaternary	Qt	Talus/colluvium	Undifferentiated slope deposits that include talus, colluvium, and landslide deposits.
		Qal	Alluvium	Unconsolidated gravel, sand and silt.
		QTb	Basalt	Dark gray massive basalt flows.
	Tertiary	QTg	Gila Group (Conglomerate)	Poorly sorted, slightly stratified sedimentary rock composed of cobble to pebble-sized clasts (principal aquifer in the Globe-Miami Mining District).
		Td	Apache Leap Tuff (Dacite)	Uniformly light brownish-gray; texture typically consists of small phenocrysts (feldspar, quartz, and biotite) in a fine-grained glassy groundmass. Locally flow banded. Potential to neutralize acidic leachate.
		Tw	Whitetail Conglomerate	Poorly cemented, poorly sorted conglomerate containing limestone and igneous rocks (diabase) clasts, highly variable in thickness. Acid-neutralizing potential due to abundant clay and limestone clasts.
Mesozoic	Lower Tertiary or Upper Cretaceous	sg	Schultze Granite	The rock has a phaneritic texture of medium- to coarse-sized grains. Sulfide content is low, but has acid-generating potential because it does not contain neutralizing minerals.
		dp	Diorite Porphyry	Occurs as thin sills, dikes, and small irregular masses. Light to medium gray with visible hornblende.
		db	Diabase	Occurs as silts and dikes. Relatively soft and weathers readily. Locally contains 1 to 2 percent disseminated pyrite and traces of chalcopyrite.
		gp	Granite Porphyry	Occurs as dikes and sills, and small intrusive bodies. Distinguished by quartz phenocrysts in a microcrystalline groundmass.
		gd	Granodiorite	Light gray, medium-grained equigranular with biotite.

Era	Period	Map Symbol	Unit	Material Description
		qm	Quartz Monzonite	Two predominant textures: porphyritic with large phenocryst of orthoclase in a coarse-grained groundmass; and quartz monzonite porphyry with phenocryst of orthoclase, with smaller quartz, plagioclase, and biotite in fined-grained groundmass.
		wsg	Willow Springs Granodiorite	Slightly porphyritic, phaneritic, and inequigranular texture with medium-sized grains.
Paleozoic	Pennsylvanian	Pn	Naco Formation	Light gray, fine- to medium-crystalline beds ranging from 2 to 4 feet thick. The basal unit is composed primarily of cherts, marls, and interbedded calcareous sediments. Potential to neutralize acidic leachate.
	Mississippian	Me	Escabrosa Formation	Light gray, fine- to coarse-crystalline, massive to thin bedded, fossiliferous, contains occasional chert nodules. Potential to neutralize acidic leachate.
	Devonian	Dm	Martin Formation	Fine- to coarse-crystalline, massive to thin bedded, medium gray to grayish red, locally abundant fossils. Occasional quartz crystals occasional interbedded quartzite. The lower several feet contain conglomerate consisting of angular rock fragments composed of quartzite, schist, limestone, and granite in a coarse-grained matrix. Potential to neutralize acidic leachate.
	Cambrian	Ct	Troy Quartzite	Subdivided into thee subunits: the upper part is a fine- to very fine-grained quartz interbedded with thin layers of fissile shale; middle zone consist of interbedded siltstone, mudstone, arkose, and quartzite; and basal zone consists of coarse-grained sandstone that contains quartzite, granite, and schist pebbles.
Precambrian	Upper Precambrian	pCsu	Undifferentiated sedimentary rocks	Undifferentiated Precambrian-age sedimentary rocks (Apache Group).
		pCag	Apache Group	Includes from youngest to oldest: Mescal limestone (fine-grained limestone composed of calcite and chalcedony intruded by diabase); Dripping Spring quartzite (coarse- to medium-grained quartzite with shale interbeds); Barnes conglomerate; Pioneer Formation (fine- to medium-grained arkosic quartzite); and Scanlon conglomerate (less than 6-foot-thick bed of gray siltstone with pebbles of white quartz).
	Lower Precambrian	pCrg	Ruin Granite	Quartz monzonite porphyry that is locally intruded by thin bodies of diabase. This unit is the primary mineralization host rock; contains up to 3 percent pyrite and is potentially acid generating if exposed to weathering.
		pCmg	Manitou Granite	Phaneritic, medium-grained, equigranular granite.
		pCmd	Madera Diorite	Granodiorite intrusions that only occur within the Pinal Schists.
		pCs	Pinal Schist	Underlying rock unit rock for the Miami-Globe Mining District and Pinto Valley area. Highly deformed metamorphosed quartzitic sediments with lesser amounts of clay-rich sediments and intrusive rocks of various compositions.

Sources: Peterson et al. 1951, Peterson 1962, Capstone Mining Corp. 2016b, SRK Consulting, Inc. 2018a

The Precambrian Pinal Schist forms the regional underlying rock unit throughout the analysis area and has undergone a complex history of deformation and multiple igneous intrusion events, and uplift and erosion, prior to deposition of Upper Precambrian sedimentary rocks (Apache Group). Major intrusive rocks that invaded into the Pinal Schist during the lower Precambrian include the Madera Diorite, granite of the Manitou Hill, and Ruin Granite, which is typically a quartz monzonite composition. The Apache Group consists of a sequence (oldest to youngest) of conglomerate, quartzite, and limestone beds with a thin basalt cap. Late Precambrian diabase intrudes part of the Apache Group as sills and dikes related to the basalt cap. The contact between the Apache Group and the overlying Paleozoic sedimentary rocks is an erosional disconformity that indicates the older rocks were uplifted and eroded prior to deposition of the sedimentary rock sequence.

The Paleozoic rocks include (from oldest to youngest) the Cambrian Troy Quartzite, Devonian Martin Formation, Mississippian Escabrosa Formation, and Pennsylvanian to Permian Naco Formation. The thickness of the Paleozoic sedimentary rocks ranges from 1,400 to over 3,000 feet across the mining district. These rocks consist of mainly limestone, but the Troy Quartzite represents an episode of clastic deposition and is typified by extensive conglomerate beds.

All of the Mesozoic-era rocks were formed by a series of igneous intrusions that began in the Upper (or late) Cretaceous and continued until the Lower (or early) Tertiary. The Schultze Granite is widespread in the mining district and has variable composition. In the analysis area, the Upper Cretaceous to Lower Tertiary rocks include granite porphyry, a granodiorite, quartz monzonite, and porphyritic quartz monzonite. Intrusion of the Schultze granite stock may have provided conduits for the mineralization in the district (Peterson 1962).

The older Precambrian to early Tertiary-age metamorphic, sedimentary, and igneous intrusive rocks were uplifted, faulted, and deeply eroded prior to deposition of later Tertiary-age rocks that include (from oldest to youngest) the Whitetail Conglomerate, Apache Leap Tuff (dacite), and the Gila Group (locally known as Gila Conglomerate). The Whitetail Conglomerate represents the accumulation of detritus that developed during uplift and erosion of the older rocks in the area (Capstone Mining Corp. 2016b). The Whitetail Conglomerate is overlain by the Miocene Apache Leap Tuff, an ash-flow tuff that attains a thickness of 2,000 feet at the type section south of the analysis area. The type locality of the Apache Leap Tuff is south of Globe-Miami Mining District. Earlier investigations and reports that were developed prior to the naming of the Apache Leap Tuff (including Peterson 1962) mapped and described this pyroclastic rock as “dacite.”

Basin and Range Province faulting and uplift resulted in the erosion of older rocks that now form the Gila Group that unconformably overlies the dacite and older formation. The Gila Group ranges from 800 to 2,000 feet in the Globe-Miami Mining District but is not present in the Superior mining area, a few miles to the southwest (Peterson 1962; Peterson 1969).

Quaternary and Holocene deposits consist of alluvium, talus, and landslide deposits. Alluvium consists of pebbles, rock fragments, and abundant silt and clay derived from the Gila Group and other bedrock sources. Talus and landslide deposits consist of angular rock fragments or angular rock and soil that form surficial deposits that locally cover steep slopes.

3.9.3.1.2 Local Geology

The geology across the project site and locations of selected cross-sections are shown on map 3-8 in appendix A and are generally representative of the subsurface geology for the major mine features. Cross-sections associated with map 3-8 are depicted below in figure 3-11 through figure 3-13. The interpreted subsurface geology is presented on cross-sections A-A’, B-B’, and C-C’. Cross-section A-A’ (figure 3-11) is oriented north-south and extends from Pinto Creek at the southern end through the Cottonwood Tailings Impoundment, across the Open Pit and Main Dump and Leach Piles. Cross-section B-B’ (figure 3-12) is oriented from west to east, extending from Pinto Creek on the west through Tailings Storage Facility No. 2, Northside Dump 9.3, and across near the center of the Open Pit to Jewel Hill. Cross-section C-C’ (figure 3-13a and figure 3-13b) extends from northwest to southeast across the westernmost extent of the Peak Well field (on the west) across Pinto Creek, and southeast through near the centerline of Tailings Storage Facility No. 4. A series of additional geologic cross-sections through the mine area are provided in technical memoranda prepared to support the EIS analysis (SRK Consulting, Inc. 2018a, 2019b). Refer to appendix F, “Geotechnical Stability Appendix,” for cross-sections associated with the stability analysis of the expanded Tailings Storage Facilities No. 3 and No. 4 under the action alternatives.

Pit Geology. The dominant rock in the pit is the Ruin Granite (quartz monzonite porphyry), which is present in the pit floor and lower pit walls (SRK Consulting, Inc. 2018a). The Ruin Granite and diabase are present in the north pit wall and extend underneath the Leach Pile north of the pit on private land. Diabase and Apache Group rocks outcrop north of the Leach Pile. The upper-west wall of the pit contains Whitetail Conglomerate, Gila Group, and undifferentiated limestone. The granodiorite is present south of the south pit wall and diabase outcrops in the east wall.

Precambrian rocks north of the Open Pit have been intruded by Lost Gulch Quartz Monzonite and diabase and covered with Apache Leap Tuff (SRK Consulting, Inc. 2018a). South of the pit, Pinal Schist has been intruded by Laramide igneous rocks. These rocks in turn are covered by Apache Leap Tuff, Gila Group, and basalt. Occasional fault-bounded outcrops of Whitetail Conglomerate are present in the area. Of note is the condition of the Pinal Schist in the southern portion of the pit. Here the schist is highly weathered and sheared which contributes to a condition of chronic pit wall instability.

Local Fault Structures. Three major fault zones occur in the mine area: Gold Gulch fault system, Jewel Hill fault system, and South Hill fault (Capstone Mining Corp. 2016a; Breitrick and Lenzi 1987; SRK Consulting, Inc. 2018a) (map 3-8 in appendix A). The faults are believed to be post-mineralization and related to Basin and Range Province extension. The faults are not considered to be active or potentially active.

The Gold Gulch fault system is composed of the east and west branches of the Gold Gulch fault, the Gold Gulch Northwest fault, the West End Fault, the Gotchi fault, and the 127 fault. The Pinto Valley ore deposit occurs in a horst (a block that has been uplifted in relation to adjacent fault-bounded blocks) bounded on the west by the Gold Gulch fault system (SRK Consulting, Inc. 2014). The horst block is referred to as Porphyry Mountain or the Castle Dome horst block (WestLand Resources, Inc. 2016a).

The Jewel Hill fault system trends northwest and dips steeply toward the east. This fault bounds the Castle Dome horst block on the east and has displaced diabase and Paleozoic and Tertiary formations against the quartz monzonite porphyry (SRK Consulting, Inc. 2014).

The South Hill fault forms the southern boundary of the quartz monzonite porphyry (Ruin Granite). The fault strikes northeast-southwest and dips steeply to the north, and has displaced Pinal Schist against the Ruin Granite (SRK Consulting, Inc. 2014). The fault movement presumably occurred during Precambrian time and there is no evidence of recent movement (SRK Consulting, Inc. 2014).

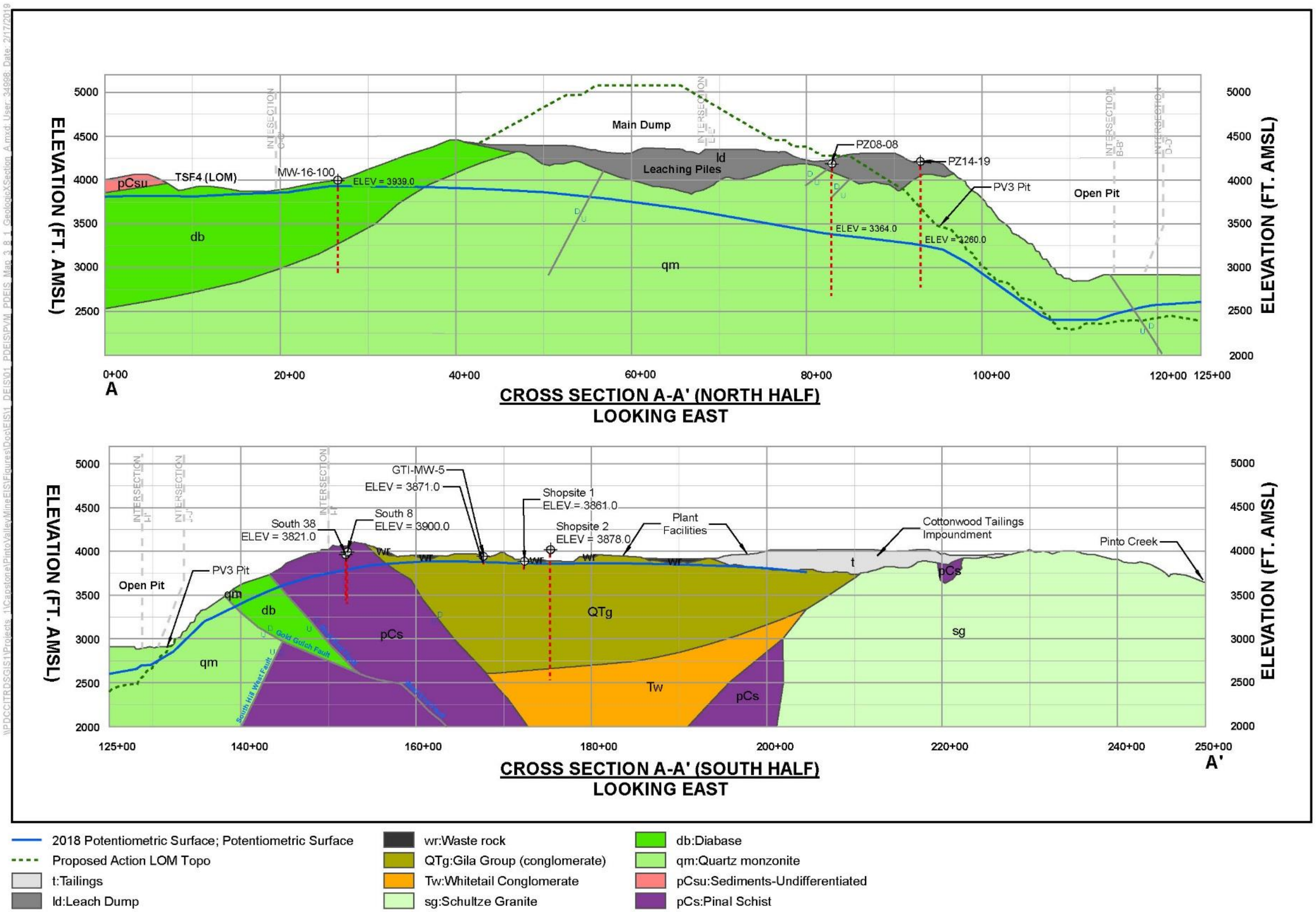

Figure 3-11. Geologic cross-section A-A'

Source: Figure 6, SRK Consulting, Inc. 2018a

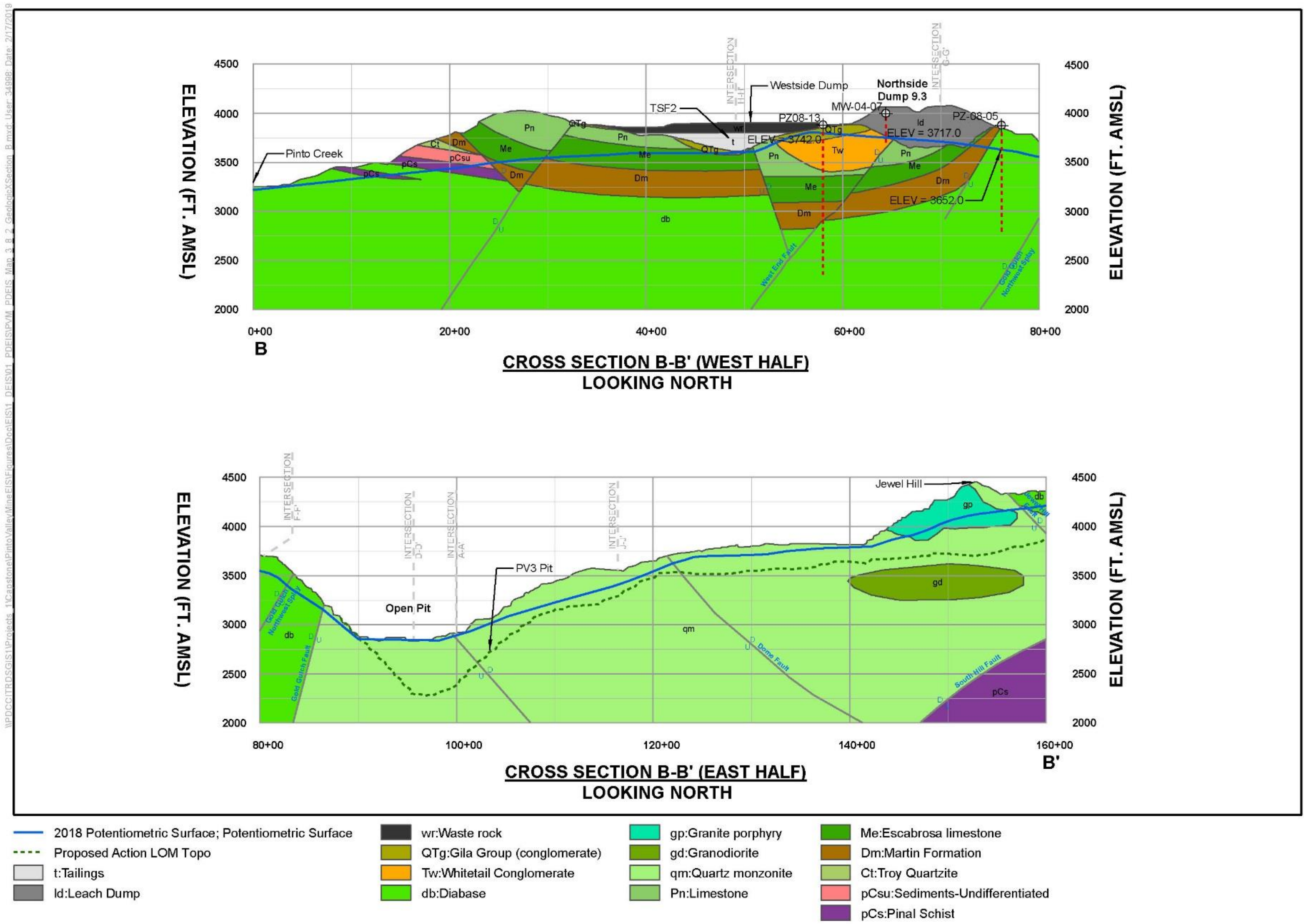

Figure 3-12. **Geologic cross-section B-B'**

Source: Figure 7, SRK Consulting, Inc. 2018a

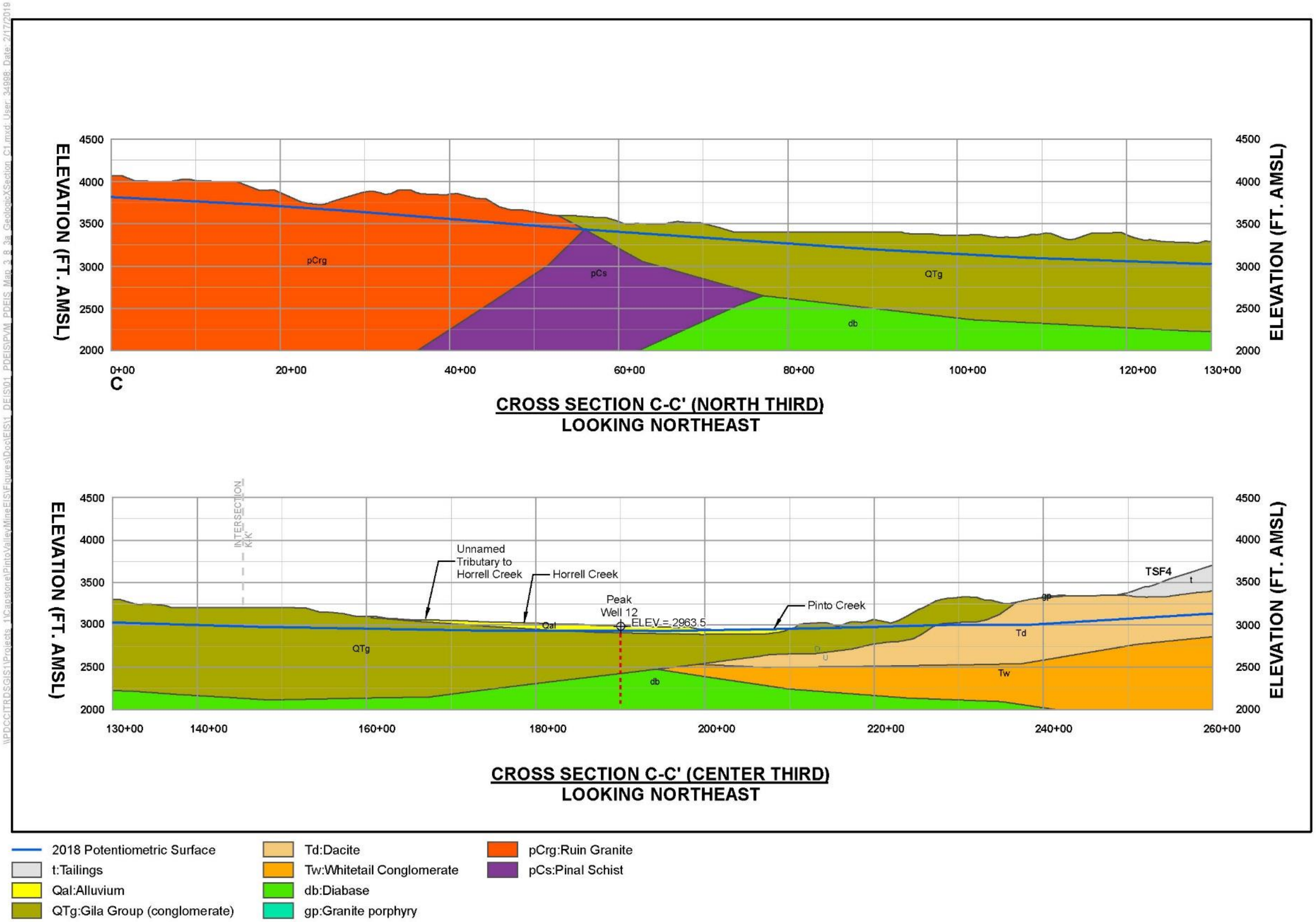

Figure 3-13a. Geologic cross-section C-C'

Source: Figure 8, SRK Consulting, Inc. 2018a

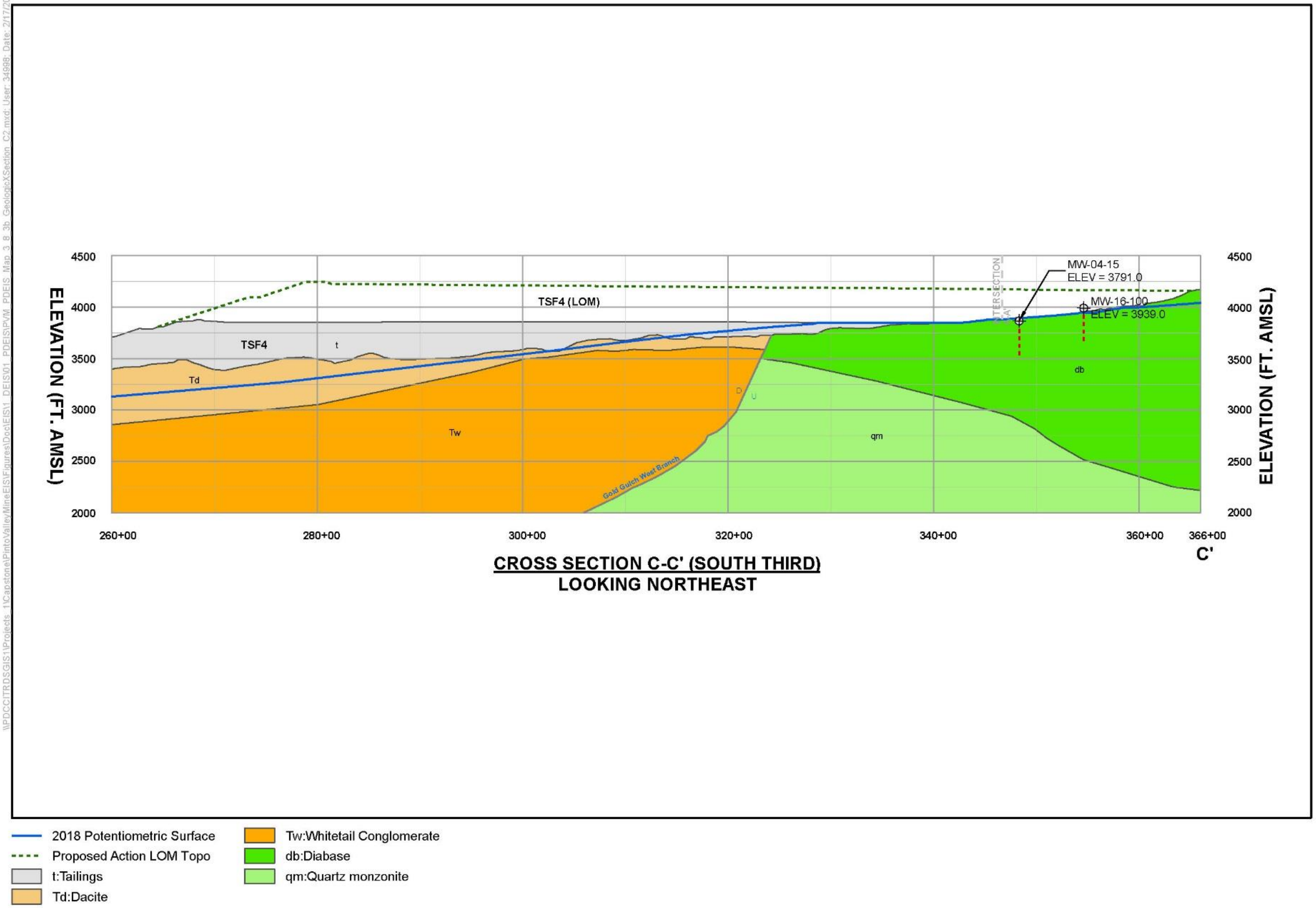

Figure 3-13b. Geologic cross-section C-C' (continued)

Source: Figure 8, SRK Consulting, Inc. 2018a

3.9.3.1.3 Pre-Mining Topographic Setting and Physiography

The Pinto Valley Mine is within the Central Highlands transition zone, which lies between the Basin and Range and the Colorado Plateau Provinces. It is characterized by rugged mountains of igneous, metamorphic, and sedimentary rocks (Arizona Department of Water Resources 2009). The topography in the analysis area is characterized by high relief dominated by steeply sloping mountains and ridges and incised drainages. Peterson (1962) considered the area as part of the northern extension of the Pinal Mountains.

The Pinto Valley Mine is situated within the Pinto Creek watershed, which is part of the Upper Salt River drainage basin (Hydrologic Unit Code 15060103). The Pinto Creek watershed (Hydrologic Unit Code 1506010307) is drained by Pinto Creek, a north-flowing perennial, intermittent, and ephemeral stream that is a tributary to Theodore Roosevelt Lake (also called Roosevelt Lake). Elevations across the Pinto Creek watershed area range from approximately 6,500 feet above mean sea level in the headwaters of the Pinal Mountains near the southern boundary to approximately 2,200 feet above mean sea level along the northern boundary near where Pinto Creek flows into Roosevelt Lake. In its upper reaches, Pinto Creek flows through a deeply incised, V-shaped channel with little alluvium. The middle reach of the stream begins at the confluence of West Fork Pinto Creek with Pinto Creek, where the stream widens into an alluvial basin about 0.5-mile wide and over a mile long.

Three tributaries drain into Pinto Creek along the western side of the alluvial basin. North of the alluvial basin, the valley floor varies in width from a few feet in the Box Canyon below the Henderson Ranch to a maximum width of about 500 feet. Near the confluence with Roosevelt Lake, Pinto Creek is characterized as braided (Forest Service 1991). Within the Pinto Valley Mine project boundary, the topography and geomorphology have been largely altered by historical mining activities. The elevation across the Pinto Valley Mine project boundary ranges from approximately 4,900 feet above mean sea level on a ridge on the east side of the mine site to approximately 3,000 feet above mean sea level where Pinto Creek exits the northern boundary (Capstone Mining Corp. 2016a). The pre-mining topography within the project boundary is characterized as steep and rugged with poor soil cover (SRK Consulting, Inc. 2019b).

Prior to mine disturbance, the project area was dissected by a dendritic drainage system of primarily ephemeral and intermittent canyons and gulches with relatively steep gradients flanked by moderate to steep slopes. Major drainages that dissect the project area include two named northwest-oriented drainages (Eastwater Canyon and Gold Gulch) and several other unnamed tributary washes that drain into Pinto Creek. Eastwater Canyon and Gold Gulch have moderate to steep gradients (ranging from approximately 350 to 420 feet per mile) that flow toward the northwest and are flanked by rugged mountain slopes (range up to 1.3 horizontal to 1.0 vertical).

3.9.3.1.4 Post-Mining Topography and Geomorphic Disturbance

Historical mining associated with the Pinto Valley Mine has altered the natural topography and geomorphology within the project boundary. Historical mining includes the existing Open Pit, waste rock facilities, tailings storage facilities, and Leach Piles that account for a total estimated disturbance acreage of approximately 3,349 acres. Other facilities (such as power line corridors, roads, the mill and concentrator plant site, water supply distribution, and use and treatment facilities) also cause localized disturbance. However, many of these localized features may eventually be dismantled, removed, or reclaimed and, therefore, less likely to result in large-scale permanent alteration of the natural topography or geomorphic features in the area.

Open pit mining has essentially removed mountainous topography including Porphyry Mountain that originally rose to an elevation of approximately 4,800 feet above mean sea level. The existing Tailings Storage Facilities No. 3 and No. 4 and the Cottonwood Tailings Facility were deposited in the Gold Gulch, Eastwater Canyon, and an unnamed drainage, respectively. These tailing facilities have partially filled the drainage, flattened the topography, and brought the surface of the drainage to a higher elevation. Natural undulating topography in these drainages where the tailings were deposited has been replaced with a monolithic flat-topped bench or terrace that terminates downstream at the face of the tailings dam. Waste rock facilities have also covered the pre-mine topography and several prior mine facilities, resulting in a higher, flatter, and more homogeneous topography.

3.9.3.2 Mineral Resources

The Pinto Valley Mine is located in the Globe-Miami Mining District and the commodities that are extracted in the district include copper, zinc, lead, manganese, molybdenum, gold, and silver (Peterson 1962). The primary mineralization occurs in porphyry copper deposits that were associated with early Paleogene intrusions and associated hydrothermal solutions.

The Pinto Valley deposit is classified as a copper-molybdenum porphyry system (Capstone Mining Corp. 2016b). Porphyry deposits occur by the intrusion of magmas that do not reach the surface, but have a complex cooling history. Porphyry is a term that describes the texture of the cooled rock with one or more distinct grain sizes. The ore body is generally bounded on the west by the Gold Gulch fault, on the east by the Jewel Hill fault, and on the south by the South Hill fault (Breitrick and Lenzi 1987). The primary host rock for the deposit is the Precambrian Ruin Granite that was intruded by small stocks and dikes about 61.2 million years ago; mineralization occurred about 59.1 million years ago (Paleocene).

The ore body at Pinto Valley is a hypogene deposit. Hypogene deposits occur at relatively deep levels within a magma chamber. Radiating outward from the center of the ore body are zones of decreasing intensity of hydrothermal alteration. The configuration of copper mineralization has been characterized as an “inverted dome” with the long axis striking north 80 degrees east (Breitrick and Lenzi 1987). The higher-grade ore surrounds a core of lower-grade. Sulfide mineralization “consists of pyrite, chalcopyrite, and minor molybdenite that occur in veins and microfractures, and less abundantly as disseminated grains” (Breitrick and Lenzi 1987). Although molybdenum values are very low, the values generally vary with copper. Higher-grade copper is often accompanied by higher grades of molybdenum.

There have been three phases of alteration of host rock by hydrothermal events. The first phase was very mild and consisted of biotite and plagioclase that were partly altered to sericite, epidote, clinozoisite, chlorite, and calcite. The second phase was more intense argillic alteration whereby the host rock is partially converted to clay minerals (plagioclase to montmorillonite) (Breitrick and Lenzi 1987). The third phase was intense alteration that consisted of replacement of wall rock with mainly quartz, sericite, and minor amounts of pyrite and adularia (Peterson et al. 1951).

An estimate of the mineral resources remaining at the Pinto Valley Mine were provided by Capstone Mining Corp. (2016b). Capstone Mining Corp. (2016b) estimated the proven and probable mineral resources remaining after January 1, 2016, in millions of metric tons. They estimated that after January 1, 2016, there were 350.1 million metric tons of proven ore and 123.7 million metric tons of probable ore (or a total of 473.8 million metric tons of proven and probable ore) at an average of 0.3 percent total copper grade with a variable cutoff of 0.17 to 0.18 percent total copper at the mine. This estimated ore reserve has been reduced by active mining at the project site over the past 5 years (2016–2020). For additional information on Pinto Valley Mining Corp.’s assessment of mineral reserves, refer to: https://capstonemining.com/operations/pinto-valley/default.aspx.

3.9.3.3 **Geotechnical Stability**

The Pinto Valley Mine is located in a region that has historically experienced a low to moderate level of seismic activity. A search of the U.S. Geological Survey earthquake database indicates that two earthquakes with a Richter magnitude 5.0 or greater have been recorded within a 150-mile radius of the Pinto Valley Mine between 1900 and January 2019 (U.S. Geological Survey 2019a). These include the magnitude 5.3 earthquake that occurred on June 28, 2014, approximately 121 miles to the southeast of the mine, and the magnitude 5.1 earthquake that occurred on March 2, 2005, approximately 91 miles north of the mine.

The most significant slope failure event to affect the Pinto Valley Mine facilities occurred in October 22, 1997, when an inactive tailings facility experienced a slope failure that released an estimated 276,000 cubic yards of tailings and 96,000 cubic yards of waste rock that affected the Pinto Creek stream corridor for several miles downstream from the facility. The slope failure occurred during placement of a thick lift (over 50 feet) of mine waste rock over the inactive tailings impoundment. Placement of the waste rock evidently triggered static liquefaction (loss of shear strength) of the tailing deposits, resulting in the development of a flow slide (Davies et al. 2002). The static liquefaction was triggered by rapid loading of the tailings surface by placement of large lifts of waste rock.

By September 1998, most of the cleanup and restoration work was completed at a projected cost of over $30 million dollars (U.S. Geological Survey 1999). It is important to note that the 1997 tailings failure occurred prior to the Pinto Valley Mining Corp.'s acquisition of the property in 2013, and the conditions leading to the failure are not expected to be replicated during currently authorized or proposed future mining activities.

3.9.3.3.1 Tailings Storage Facilities No 3. and No. 4

This section summarizes available geotechnical information and stability of the existing Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. The dam crest elevation, dam height, and storage capacity for existing (2020) Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 are summarized in table 3-51. Additional information regarding the geotechnical design of these facilities (including maps and representative stability cross-sections) is provided in appendix F, "Geotechnical Stability Appendix," and in the technical documents referenced in this section and in appendix F.

Recent penetrometer testing of the in-place tailings indicate that some layers in Tailings Storage Facilities No. 3 and No. 4 may be susceptible to cyclic mobility and flow liquefaction as a result of loss of strength if a seismic event of sufficient magnitude occurs or if the tailing embankment is constructed too quickly.

Tailings Storage Facility 3. Tailings Storage Facility No. 3 is primarily located on private land and is formed by two embankments, one trending in the east-west direction, known as the No. 3 dam, and the other trending north-south, known as the No. 2½ dam. The facility was placed in service in 1973 and operated until early 2009, with several non-operating periods. The No. 3 starter dam, built in 1973–1974, was a 55-foot-high embankment constructed with native soils borrowed from the general vicinity of the site. At the maximum section, the starter dam crest was 35 feet wide at an elevation of 3,344 feet. The starter dam downstream slope ratio was approximately 2.5 horizontal to 1 vertical and equipped with a 100-foot-wide and 3-foot-thick drainage blanket extending through the dam to 175 feet upstream of the dam.

Tailings materials were deposited into the Tailings Storage Facility No. 3 impoundment through cyclones or by spigotting. The facility was built using the upstream construction method, by which successive raises of the outer containment dam embankment are built upon previously placed tailings that have dried out and consolidated enough to form a competent foundation for placement of additional tailings. The original perimeter embankment for Tailings Storage Facility No. 3 ultimately reached a crest elevation of 3,742 feet, with a maximum height of 453 feet and a downstream slope ratio of 2.9 horizontal to 1 vertical. In 2011 and 2012, the configuration of the facility was altered by shifting the active deposition inward from the original dam crest. The inset Tailings Storage Facility No. 3 starter embankment was offset about 560 to 750 feet from the outer dam crest. The inset dam has been subsequently raised to a crest elevation of 3,785 feet. A boundary dam was constructed in late 2013, and tailings that had crossed into the adjacent National Forest System land in mid-2013 were removed. The boundary dam has been raised in conjunction with the main inset dam raise to an existing (2020) elevation of 3,785 feet above mean sea level.

Tailings Storage Facility 4. Tailings Storage Facility No. 4 was placed in operation in 1977 and is located primarily on private land. The starter dam for the impoundment was constructed as a zoned earth and rock dam approximately 120 feet high, with a crest elevation of 3,355 feet. A secondary dam, referred to as the “Slimes Dam,” was constructed about 1,500 feet upstream of the starter dam to store the cyclone underflow slimes during startup of the facility. The facility was built using the upstream construction method, by which successive raises of the outer containment dam embankment are built upon previously placed tailings slurry. Embankment raises above the starter dam crest were accomplished using both cyclone tailings sand and borrow materials. Coarse tailings (underflow) were initially deposited behind the starter dam using a cyclone system, with the slimes (overflow) being deposited behind the slimes dam.

The overall downstream slope ratio of the original dam embankment was about 3 horizontal to 1 vertical. The slimes dam was subsumed by the deposited tailings in approximately 1982. Once the starter dam and subsequent raises reached 3,455 feet in elevation, the cyclone system was abandoned and whole tailings were spigotted from the dam crest until the impoundment reached an elevation of about 3,540 feet. The tailings deposition operation was switched back to cycloning in 1988. Deposition into Tailings Storage Facility No. 4 was halted in 1997 to facilitate placement of a new tailings pipeline. Pinto Valley Mine curtailed operations in February 1988. However, water continued to be stored in the tailings pond from runoff and for temporary storage of contact water from other sources. In May 1998, the dam crest elevation varied between 3,778 and 3,785 feet.

In April 2007, Pinto Valley Mine restarted operations and tailings deposition was resumed for 15 months from October 2007 through mid-January 2009 at a relatively low mill throughput, bringing the dam crest elevation to 3,795 feet. Full operations resumed in late 2012 and tailings were deposited in Tailings Storage Facility No. 4 beginning in early 2013. The east abutment of the dam was reconstructed in 2014 to realign the embankment crest and to extend cycloning operations across the full length of the dam crest. The present (2020) crest of Tailings Storage Facility No. 4 is at an elevation of 3,945 feet above mean sea level. The raise of Tailings Storage Facility No. 4 is currently constrained by the Pinto Valley Mine land boundary with National Forest System land. Boundary dams are required along the eastern edge of the facility to maintain tailings deposition within this boundary and off of National Forest System land. Boundary dam construction began in August 2015.

Table 3-51. Physical data for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

	Tailings Storage Facility No. 3	Tailings Storage Facility No. 4
Existing (2020)		
Dam Crest Elevation (feet above mean sea level)	3,742 outer perimeter embankment crest 3,785 inset embankment crest[60]	3,945[61]
Dam Height (feet)	453/484	702
Tailings Storage Capacity (million tons)	90[62]	335 (212.4)[63]
Total National Forest Service Land (acres)	6	0
No-action Alternative (2021)		
Dam Crest Elevation (feet above mean sea level)	Same as existing	3,958[64]
Dam Height (feet)	Same as existing	754
Increased Tailings Storage Capacity (million tons)	0.0	75
Total Tailings Storage Capacity (million tons)	90	410
Total National Forest Service Land (acres)	6	0
Alternative 1 (2027)		
Dam Crest Elevation (feet above mean sea level)	Same as existing[65]	4,090[66]
Dam Height (feet)	453/484	885
Increased Tailings Storage Capacity (million tons)	7.2[67]	225
Total Tailings Storage Capacity (million tons)	97	560
Total National Forest Service Land (acres)	6	0
Proposed Action (2039)		
Dam Crest Elevation (feet above mean sea level)	3,742 outer perimeter embankment crest 3,860 inset embankment crest[68]	4,250
Dam Height (feet)	453/568	1,045

[60] Existing crest elevations from Wood (2019a): inset embankment crest elevation for Tailings Storage Facility No. 3 (Pinto Valley Mining Corp 2020a)
[61] Existing crest elevations from Wood (2019a): existing crest elevation for Tailings Storage Facility No. 4: (Pinto Valley Mining Corp 2020a)
[62] Tailings Storage Facility No. 3 existing storage volume from Wood (2019b), Physical Aspects of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4, table A, footnote (5).
[63] AMEC (2014b). Design Report, Prefeasibility Study, Tailings Storage Facility Expansions, August 21, 2014; appendix B, drawing CI-002_TSF4; 212.4 million tons total storage corresponds to elevation 3,800; storage at 2018 existing elevation 3,906 estimated from drawing at 335 million tons; increased tailings storage volumes for the no-action alternative, alternative 1, and proposed action are extrapolated from the chart are relative to year 2018 (existing) volume of 335 million tons.
[64] Tailings Storage Facility No. 4 no-action dam crest elevation from Pinto Valley Mining Corp 2020a
[65] Tailings Storage Facility No. 3 alternative 1 and proposed action dam crest elevation from Wood (2019b), table A; no-action alternative dam crest assumed equal to alternative 1.
[66] Tailings Storage Facility No. 4 alternative 1 and proposed action alternative crest elevations from Wood (2019b), table A.
[67] AMEC (2014b). Design Report, Prefeasibility Study, Tailings Storage Facility Expansions, August 21, 2014; appendix B, drawing CI-002.
[68] Tailings Storage Facility No. 4 alternative 1 and proposed action alternative crest elevations from Wood (2019b), table A.

	Tailings Storage Facility No. 3	Tailings Storage Facility No. 4
Increased Tailings Storage Capacity (million tons)	23	417
Total Tailings Storage Capacity (million tons)	113	752
Total National Forest Service Land (acres)	27	102

Sources: Wood 2019b, 2019c; AMEC 2014c

Tailings Dam Stability. As described in chapter 2, “Proposed Action and Alternatives,” Tailings Storage Facility No. 3 and No. 4 are regulated by the State of Arizona under the Aquifer Protection Program and other State regulations and programs. Under the jurisdiction of the State of Arizona, the primary regulatory authority agency in Arizona for tailings storage facilities, the guidance followed for design of tailings storage facilities is provided by the Arizona Department of Environmental Quality Best Available Demonstrated Control Technology (2004) and is provided in table 3-52. These criteria are accepted by the Arizona Department of Environmental Quality as meeting the requirements for permitting under the State of Arizona Best Available Demonstrated Control Technology review process and are considered applicable for purposes of geotechnical stability assessment in this final EIS as described below. In addition to Arizona Department of Environmental Quality Best Available Demonstrated Control Technology design criteria for tailings storage facilities, there are a variety of other guidance documents and programs that include higher design criteria for tailings storage facilities such as the National Dam Safety Program as organized under the Federal Emergency Management Agency guidance documents for dam classification and design criteria (Federal Emergency Management Agency 2004a, 2004b, 2005, 2013a) and dam safety risk management (Federal Emergency Management Agency 2015), and the International Council on Mining and Metals and associated Global Industry Standard on Tailings Management (ICMM 2020). The National Dam Safety Program guidelines, which apply to the Forest Service as a federal agency, are “not intended to supplant or otherwise conflict with State or local government responsibilities for safety of dams under their jurisdiction.”[69]

As described in section 2.4.3.4, “Higher Design Standards for Tailings Storage Facilities No. 3 and No. 4,” the Forest Service considered alternate design options and retrofitting options to meet higher design standards than the existing or planned facilities. Specifically, the Forest Service considered an alternative tailings storage facility configuration that would meet the maximum credible earthquake seismic event, probable maximum precipitation, and probable maximum flood storm event considering downstream hazard potential in terms of potential life loss, environmental and cultural losses, and infrastructure and economic losses in the event of a catastrophic failure of the tailings facilities. This approach is in line with the recommendations of the National Dam Safety Program guidelines.

Furthermore, as described in section 2.4.3.4, “Higher Design Standards for Tailings Storage Facilities No. 3 and No. 4,” the Forest Service determined that requiring higher design standards for these existing facilities is not feasible. Therefore, in consideration of the jurisdiction of the State of Arizona for ensuring tailings dam safety for facilities subject to its authority, and the economic and technical feasibility of requiring re-design, reconstruction, or retrofitting of the existing and operating tailings storage facilities that originate from and are located primarily on private land, the Forest Service determined that use of the existing design criteria under the State of Arizona Best Available Demonstrated Control Technology meets the “feasibility” intent of the Forest Service locatable minerals regulations as described in 36 CFR 228.8.

[69] The Federal Emergency Management Agency Federal Guidelines for Dam Safety indicate that “the definition of a dam specifically includes tailings dams, embankments built by waste products disposal and retaining a disposal pond” (Federal Emergency Management Agency 2004a).

Table 3-52. Geotechnical stability State of Arizona design criteria for design of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

Static Stability	Pseudo-static (Seismic) Stability	
Required Factor of Safety	***Design Basis Earthquake (Recurrence Interval)***	***Required Factor of Safety***
1.3[70] 1.5[71]	1 in 2,475 years (0.137 peak gravitational acceleration)[72]	1.0[73] 1.1[74]

Sources: Arizona Department of Environmental Quality 2004; AMEC 2018a; Wood 2019d

Slope stability factors of safety have been computed for various configurations of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. A computed slope stability factor of safety is not equivalent to an actual margin of safety, as there are always uncertainties in model input assumptions. Differences in assumed versus actual tailings properties and strength parameters, or deviations from impoundment operating assumptions that affect rate of loading and pore pressures, are examples of input variable uncertainties.

Slope stability for the existing conditions of Tailings Storage Facility No. 3 was evaluated using three different methods of analysis to evaluate varying assumptions of drained and undrained strength behavior of the in-place tailings materials. The range of minimum factors of safety computed for the different cases analyzed at cross-sections A and B (shown in appendix F) for the existing conditions are summarized in table 3-53. For the existing conditions, the slope stability factors of safety for both static and pseudo-static (seismic) loading conditions were shown to meet the State of Arizona design criteria for the minimum factors of safety.

Tailings Storage Facility No. 4 slope stability analyses for the existing conditions were provided in Wood (2019c). The range of results is summarized in table 3-53 for two representative cross-sections (P and R shown in appendix F). For the existing conditions, the slope stability factors of safety for both static and pseudo-static (seismic) loading conditions were shown to meet the State of Arizona design criteria for the minimum factors of safety.

In addition to static and pseudo-static slope stability analyses, the existing tailings materials in both Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 were evaluated to determine their liquefaction potential (AMEC 2015c). Liquefaction is the sudden loss of strength that occurs when layers of saturated, loose soil, typically granular material such as sand or silty sand, are loaded and cannot drain. Liquefaction may be triggered by increases in pore water pressures, stress increases (such as due to dam raise by upstream construction methods), vibrations (earthquakes, blasting, or equipment), and other factors. The analysis for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 indicate that liquefaction would not occur in the tailings of either Tailings Storage Facility No. 3 or Tailings Storage Facility No. 4 under an assumed earthquake having a one-in-975 annual exceedance probability. For the Pinto Valley Mine site, the one-in-975 annual exceedance probability event has a peak ground acceleration at the bedrock surface of 0.082 gravitational acceleration. Pseudo-static stability analyses were conducted for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 considering the one-in-2,475 annual exceedance probability event with a peak ground acceleration of 0.137 gravitational acceleration (table 3-52). The predicted peak ground acceleration of 0.137 gravitational acceleration is less than the level of shaking that was determined to cause liquefaction under existing conditions, which was on the order of 0.15 gravitational acceleration (AMEC 2015d).

[70] Intermediate construction stages, with consideration of pore pressures at impoundment build rates.
[71] End of construction stage, with steady-state pore pressure conditions.
[72] Peak ground acceleration is site specific.
[73] Intermediate construction stages, with consideration of pore pressures at impoundment build rates.
[74] End of construction stage, with steady-state pore pressure conditions.

Updated seismic deformation analyses were conducted for Tailings Storage Facility No. 4 in 2017 for the updated design basis earthquake (1 in 2,475 annual exceedance probability event) (AMEC 2017b). The conclusion from the updated dynamic analyses was that the Tailings Storage Facility No. 4 structure would experience limited deformation, on the order of about 4 inches, during and after the design-level earthquake ground shaking for the site, but this deformation would not result in a flow failure of the embankment. No liquefaction zones were predicted for the design basis earthquake event within the Tailings Storage Facility No. 4 embankment by the updated dynamic modeling (AMEC 2017b).

Table 3-53. Slope stability minimum factors of safety for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

Facility	Cross-Section[75]	Existing		No Action[76] Year 2021		Alternative 1 Year 2027		Proposed Action Year 2039	
		Static	*Pseudo-static*	*Static*	*Pseudo-static*	*Static*	*Pseudo-static*	*Static*	*Pseudo-static*
Tailings Storage Facility No. 3	A	1.44–1.55	1.16–1.22	Same as existing		1.39–1.50	1.11–1.17	1.36–1.58	1.08–1.24
	B	1.45–1.95	1.08–1.42	Same as existing		1.34–1.80	1.01–1.31	1.30–1.86	1.00–1.44
Tailings Storage Facility No. 4	P	1.55	1.30	1.55–1.75	1.30–1.37	1.75[77]	1.37[78]	1.34–2.18	1.09–1.74
	R	1.81	1.50	Not available		Not available		1.34–2.49	1.08–1.96

Sources: AMEC 2018a (table 5.9); Wood 2019d (table 3.4, table 3.5); Wood 2019c (table B); AMEC 2014c (table 5.4); AMEC 2017a (table 5.5, table 5.6)

Potential modes of dam failure other than slope instability also are possible, and these are not accounted for under the deterministic analyses and minimum calculated factors of safety that are required by the State of Arizona. Examples include failure modes such as internal erosion of embankment or foundation materials under hydraulic head gradients leading to concentrated leakage and dam breach, or overtopping due to extreme flood events. All potential failure modes, including those covered by deterministic analyses (such as slope stability calculations), and those which are not, can be evaluated in a risk analyses framework.

A qualitative risk analysis of dam failure was performed by Pinto Valley Mining Corp. and their contractors for the design of the Pinto Valley Mine tailings storage facilities in 2015 (AMEC 2015c) but as discussed in section 3.9.4.6, “Tailings Dam Breach Run-out Analysis,” a quantitative risk analysis of potential dam failure or failure mode effects analysis for the current design of the facilities has not been completed that would numerically quantify the risk of a dam failure. At the time of the 2015 risk assessment, the envisioned configurations of Tailings Storage Facilities No. 3 and No. 4 were different from both alternative 1 and the proposed action configurations. For example, the heights of Tailings Storage Facilities No. 3 and No. 4 under the alternative 1 and the proposed action are higher than those included in the 2015 risk assessment and the 2015 risk assessment did not consider expansion of these facilities onto National Forest System lands, which is currently included under the proposed action. In addition, at the time of the 2015 risk assessment, the downstream consequences had not yet been formally evaluated using dam break modeling.

The 2015 qualitative risk assessment involved evaluation of the likelihood and consequences of dam failure in a workshop setting, relying on professional judgment and opinions of a group of specialists and

[75] Cross-section locations are shown on figures provided in appendix F.

[76] Slope stability calculations were not available for the no-action (2021) alternative for Tailings Storage Facility No. 4. Ranges shown are approximate—intermediate between the existing (year 2018) and alternative 1 (year 2027) configurations.

[77] Analyses were for a dam crest elevation of 4,005 feet (dam height of 800 feet), which is 85 feet lower than the alternative 1 final crest elevation of 4,090 feet (dam height of 885 feet).

[78] Ibid.

people with first-hand knowledge of the facilities. The outcome of the process identified several credible potential failure modes, including overtopping due to precipitation events or operational problems, and slope instability due to elevated pore water pressures, among others. The consequences of dam failure were characterized qualitatively and it was recommended at the time that dam breach analyses be done to allow refinement of the risk assessment and emergency planning procedures. The dam breach analysis is presented below in section 3.9.4.6, "Tailings Dam Breach Run-out Analysis."

Pinto Valley Mining Corp. maintains a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). Pinto Valley Mining Corp. conducts daily inspections at these facilities of embankments, impoundments, storm water controls, pumps and piping, cyclone operation, and discharge. Abnormal conditions identified during daily inspections are reported and addressed as quickly as possible. In addition to daily inspections, Pinto Valley Mining Corp. also regularly monitors tailings storage facilities for loss of freeboard and insufficient beach distance. Pinto Valley Mining Corp. also increases inspections and surveillance of Tailings Storage Facilities No. 3 and No. 4 in the event of floods, earthquakes, and other unusual conditions (such as observed cracks, abnormally high piezometric levels in the embankments, and damage to any component of the tailings storage facility).

3.9.3.3.2 Cottonwood Tailings Impoundment

The Cottonwood Tailings Impoundment consists of an unlined tailings impoundment, embankment, and ancillary facilities. Approximately 44 acres of the Cottonwood Tailings Impoundment are located on private lands and 278 acres are located on National Forest System lands. Cottonwood Tailings Impoundment has an existing (2020) elevation of approximately 4,023 feet above mean sea level.

The Cottonwood Tailings Impoundment received tailings from ore processing at the Pinto Valley Mine until 1984, and was capped with an approximately 6-inch layer of inert material and seeded with grasses in 1988. There are no plans to place additional tailings or for further reclamation that would change the geometry of the facility.

An updated slope stability analysis was conducted to evaluate the maximum cross-section of the existing Cottonwood Tailings Impoundment (Wood 2018). The analysis was based on available updated assumptions representing the current phreatic level conditions in the embankment and tailings. The analysis also defines the assumed shear strength based on site-specific sampling and laboratory testing. The seismic loading for the pseudo-static analysis is based on a design earthquake event with a 2,475-year recurrence interval. The stability analysis calculated factors of safety for types of failure surfaces (slip planes): a shallow toe circle–type slip plane, a deep-seated slip plane, and a slip plane that extends the partial height of the tailings storage facility to the toe of the facility. The results of the analysis indicated that the most critical slip plane for the design of the facility is the shallow toe circle, with a calculated factor of 1.51 under static conditions and 1.26 under pseudo-static (seismic loading) conditions. The results of the stability analysis meet the 1.3 static safety factor and 1.0 pseudo-static safety factor criteria required under the Arizona Department of Environmental Quality's Best Available Demonstrated Control Technology criteria for a tailings storage facility.

3.9.3.3.3 Open Pit

The Open Pit is an existing, active facility encompassing approximately 746 acres of private land and has an approximate existing (2020) pit bottom elevation of approximately 2,600 feet above mean sea level (Pinto Valley Mining Corp. 2020a).

The Open Pit has experienced several instabilities through the mine's history as documented in the "Open Pit Wall Stability and Mitigation Plan" provided in appendix H. Two of these, the Schist Hill Gravity Slide and the Castle Dome Slide, have resulted in expansion of the pit onto Pinto Valley Mining Corp's. unpatented claims on National Forest System lands. The Schist Hill Gravity Slide developed in 1985 in the southwestern portion of the pit wall and has resulted in less than one 1 acre of encroachment onto National Forest System lands. The Castle Dome Slide developed in 2015 in the southeastern portion of the pit and was remediated by removal of approximately 415,000 tons of material on private land. The subsequent remedial actions have resulted in less than 1 acre of encroachment onto National Forest System lands. Another area of slope instability identified as the "Schist Hill Creep Monitoring Zone" encompasses the southwestern portion of the pit (including the Schist Hill Gravity Slide described above) and extends onto natural slopes on private land and National Forest System lands. Mitigation efforts to control slope movement to date have focused on reducing pore pressures by installing horizontal drains at the toe of the slope.

3.9.3.3.4 19 Dump

The 19 Dump was approved in May 1984 by Tonto National Forest for waste rock storage; the facility has been inactive since 1993. The waste rock storage facility has a top elevation of approximately 4,425 feet above mean sea level.

The 19 Dump is composed of run-of-mine waste rock with sand to boulder particle sizes. The facility has a maximum height of 300 feet and slope ratio of 1.4 horizontal to 1 vertical, or approximately 36 degrees. A slope stability analysis was performed for the existing 19 Dump (AMEC 2013). Static factor of safety values were calculated for two critical surfaces. The pseudo-static analysis used a seismic coefficient of 0.10 gravitational acceleration. The results of the stability analysis indicated a factor of safety of 1.53 under static conditions and 1.29 under pseudo-static conditions. These results exceed the minimum required factor of safety design criteria of 1.5 and 1.1 for rock storage facilities (without testing) prescribed in the Best Available Demonstrated Control Technology guidance manual (Arizona Department of Environmental Quality 2004).

Although the factor of safety for both static and seismic conform to accepted levels for stability, it is important to note that the steep slope angles that remain after closure do not conform with previous Plan of Operation conditions for reclamation of the 19 Dump or the Forest Service standards of practice for reclamation identified in 36 CFR 228, subpart A, which indicates that an operator shall reclaim the surface disturbed in operations to prevent on-site and off-site damage to the environment and Forest Service resources. Without reclamation that would include flattening existing slope angles, revegetation, and other measures to control surface runoff, the 19 Dump will likely continue to erode and have sparse vegetation cover. As described in appendix D-3 of the proposed mining plan of operations (Capstone Mining Corp. 2016a), a portion of the southwest lobe of 19 Dump will be used as reclamation material. This portion of the dump will then be regraded and revegetated. A series of existing berms on the top surface of the 19 Dump will continue to reduce the velocity of the flow reporting from the upstream catchment area. A diversion berm is proposed along the north perimeter of the 19 Dump to divert the flow in a controlled manner into the future reclaimed Cottonwood Canyon Reservoir area.

3.9.4 Environmental Consequences

Primary issues related to geology and minerals include:

- Impacts on the topography and geomorphology of the analysis area associated with past, present, and future mine disturbance.

- Impacts on mineral resources.
- Potential impacts associated with the long-term geotechnical stability of project components.

Note that potential impacts associated with leaching or acid production from rocks stored in facilities on site or exposed in the pit walls are addressed in section 3.21, "Water Resources and Hydrogeochemistry."

3.9.4.1 **Analysis Methodology and Assumptions**

The general method of analysis used to evaluate the potential impacts for this resource included the following:

- Describe mine disturbance related impact on the geology of the area.
- Describe the resources to be mined based on information provided by Pinto Valley Mining Corp.
- Tabulate and describe the amount of materials (tons) of ore to be processed and tailings generated during mining.
- Evaluate geologic hazards, including seismic hazards, subsidence hazards, and landslide potential.
- Evaluate geotechnical design and geotechnical stability of the proposed expansion facilities (including Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, and the Open Pit) during operation and in the post-closure period.
- The stability results (computed factors of safety) discussed in this section are highly dependent on the model input assumptions regarding the distribution and continuity of the undrained zones within the tailings impoundments, and the position of the phreatic surface or distribution of excess pore pressures that develop in response to the facility raises. It is critical that the model assumptions be routinely verified as the facilities are raised, through diligent monitoring, field and laboratory testing, and engineering analyses.

3.9.4.2 **No-Action Alternative – Direct and Indirect Impacts**

3.9.4.2.1 Geology

Under the no-action alternative, active mining operations would continue for the first 2 months of the 6-month transition period as described in section 2.3.1, "No-Action Alternative." Compared to the existing conditions, 357 acres of new surface disturbance on private land for borrow and riprap sources and 10 acres of lateral expansion of Tailings Storage Facility No. 4 and would result in a total net increase of approximately 367 acres where the natural topographic and geomorphic features would be permanently altered (even with reclamation) within the analysis area.

3.9.4.2.2 Mineral Resources

Direct impacts on mineral resources resulting from the mining-related activities under the no-action alternative would include: (1) the mining of approximately 3.48 million tons of ore during the 2 months of active mining operations; and (2) the generation and permanent disposal of approximately 4.92 million tons of waste rock and approximately 7.5 million tons of tailings material. Transition activities to prepare the mine for closure under the no-action alternative would include mining of a minimal volume of ore as needed to stabilize pit faces and the generation and permanent disposal of relatively minor quantities of waste rock. There would be no other planned expansion of the Open Pit or tailings storage facilities. Ceasing active mining operations two months after the record of decision would leave known mineral resources in the ground on both private and National Forest System land. The known mineral resources that are left in the ground could be targeted by future mining operations.

3.9.4.2.3 Geotechnical Stability

Tailings Storage Facilities No 3. and No. 4

Under the no-action alternative, Tailings Storage Facility No. 3 would not be expanded, and Tailings Storage Facility No. 4 would be only minimally expanded compared to existing conditions to accommodate milling of existing ore stockpiles. The planned dam crest elevation, dam height, and storage capacity for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 under the no-action alternative are summarized in table 3-51. Additional information regarding the geotechnical design of these facilities (including maps and representative stability cross-sections) is provided in appendix F, "Geotechnical Stability Appendix," and in the referenced technical documents.

Slope stability factors of safety have been computed for various configurations of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (table 3-53). Slope stability was evaluated using a range of assumptions to simulate drained and undrained strength behavior of the in-place tailings materials. The lowest calculated factors of safety for both static and pseudo-static loading for the no-action alternative, summarized in table 3-53, were found at Tailings Storage Facility No. 3. The lowest result for static loading was a factor of safety of 1.44 computed for an undrained response assumption, which is above the minimum 1.3 based on the best available demonstrated control technology (table 3-53). The lowest result for pseudo-static loading was also found on Tailings Storage Facility No. 3, with a computed factor of safety of 1.08.

Over time this facility will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and it will likely evolve in a similar fashion. This may include development of erosion features, increased sedimentation to downgradient streams, slope creep, and a general rounding of angular features. In order to maintain form and function during the closure and post-closure period, ongoing inspections and routine maintenance and reclamation would be required and is planned.

Due to the relatively minimal level of expansion of tailings storage facilities, the no-action alternative is not anticipated to affect the stability of the tailings storage facilities compared to existing conditions. In addition, Pinto Valley Mining Corp. would continue to maintain and apply its tailings operation, maintenance, and surveillance manual that would reduce the potential for instability issues (Capstone Mining Corp. 2020c).

Cottonwood Tailings Impoundment

Cottonwood Tailings Impoundment does not receive tailings and is generally inactive and would remain so under the no-action alternative. Over time this facility will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and will likely evolve in a similar fashion. This may include development of erosion features, increased sedimentation to downgradient streams, slope creep, and a general rounding of angular features. Under the no-action alternative, ongoing and routine maintenance for reclamation and closure of this facility would continue. These activities could include regrading and covering the embankment face and recontouring portions of the surface to direct storm water off the facility.

As indicated above, Cottonwood Tailings Impoundment meets the 1.3 static safety factor and 1.0 pseudo-static safety factor criteria required under the Arizona Department of Environmental Quality's Best Available Demonstrated Control Technology criteria for a tailings storage facility. Ongoing and routine maintenance for reclamation would further support meeting these safety factors and reduce potential for instability caused by poor surface runoff and grading or slopes.

Open Pit

The existing Open Pit has experienced slope instability with existing slope instabilities located in the south and southeast highwall areas of the pit that have encroached onto National Forest System lands (figure 5 of attachment B, "Open Pit Wall Stability and Mitigation Plan," provided in appendix H, "Environmental Protection Measures, Monitoring, and Mitigation"). Open-pit mines can experience periodic slope instability problems due to weak geologic materials; adversely oriented geologic structures, such as fractures, faults, and jointing; and high pore pressures resulting from the presence of groundwater. Ground movement caused by seismic events can trigger failure of slopes that are marginally stable under static conditions. Impacts associated with potential instability of the pit walls could occur during both the operation and post-closure periods. Unforeseen conditions in pit walls can sometimes result in major pit wall stability problems during construction and operation.

During the post-closure period, progressive slope failure through time could expand the perimeter of the pit and reduce the overall angle of pit slopes, particularly in areas underlain by weak or highly fractured bedrock and areas with adverse dipping geologic structures. Typical slope failures that occur in steep rock cuts include rock falls, toppling, block slides, and deep-seated slides or zones of creep in weak bedrock. If adjacent facilities are not located a sufficient distance away from the final pit rim, progressive failure of the pit walls during the post-closure period could eventually damage adjacent reclaimed facilities.

Under the no-action alternative, there would be no further lateral expansion of the Open Pit through active mining. However, sections of the open pit where the Pinal Schist are exposed may continue to fail until equilibrium for the rock mass is reached. Progressive failure of the Pinal Schist in the south wall of the pit could impact National Forest System land in the southwest quadrant of the pit that are closest to the National Forest System land boundary.

At closure, water management operations designed to dewater the Open Pit during mining would cease. As a result, the groundwater levels in the pit and pit walls would partially recover and be controlled by the final pit lake elevation as discussed in section 3.21, "Water Resources and Hydrogeochemistry." During the post-closure period, Pinto Valley Mining Corp. would continue to monitor groundwater levels and pore pressures in the pit area as routine compliance monitoring. The types and duration of site inspections and adaptive management responses and actions may be modified depending on actual pit conditions and stability trends observed during the post-closure period.

At the end of active mining operations, Pinto Valley Mining Corp. anticipates the persistence of 90-foot high benches in the Open Pit, leaving an engineered, benched appearance. Over time, the step-like appearance is expected to soften as the effects of natural weathering, freeze-thaw cycles, and the storm water runoff internally within the pit begin to erode the sharp-edged benches. The post-closure pit wall landform will likely always look "man-made" relative to the adjacent unmined slopes but will reach a smoother, less step-like appearance that more closely mimics the surrounding landscape within the 100-year post-closure modeling period (SRK Consulting, Inc. 2020c).

19 Dump

The 19 Dump is an existing dump encompassing approximately 76 acres of National Forest System lands. The 19 Dump has been inactive since 1993 and would remain inactive under the proposed action. Pinto Valley Mining Corp. has no plans to add more material to the 19 Dump, but a portion of the stored overburden would likely be removed for use as cover material to reclaim certain features at the end of the mine life. The area of the dump where the material would be removed would be regraded, with no net change to the facility's footprint.

Over time this facility will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and will likely evolve in a similar fashion. This may include development of erosion features, increased sedimentation to downgradient streams, slope creep, and a general rounding of angular features. Under the no-action alternative, ongoing and routine maintenance for reclamation and closure of this facility would continue, which could reduce potential instability issues over time.

3.9.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.9.4.3.1 Geology

Disturbance associated with the expansion of the Open Pit, waste rock dumps, and tailings facilities would result in an incremental increase in the area where the topography and geomorphology would be modified by mining compared to existing conditions. Other existing facilities (such as stockpiles, the mill and concentrator plant, ancillary facilities, and haul roads) cause localized disturbance. However, many of these localized features may eventually be dismantled, removed, or reclaimed and, for the purposes of this analysis, assumed to be less likely to result in large-scale permanent alteration of the natural topography or geomorphic features in the area.

Table 2-6 provides a detailed listing of the acres of disturbance by facility by land ownership (private and National Forest System lands) under alternative 1. Compared to the no-action alternative, mining activities included under alternative 1 would result in an additional 542 acres of new surface disturbance on private land (0 acres of new surface disturbance on National Forest System land) due to expansion of the Open Pit, waste rock dumps, excavation borrow and riprap sources, and expansion of tailings storage facilities. Due to the increased expansion of facilities and associated new surface disturbance on private lands, alternative 1 would increase the area where the natural topographic and geomorphic features would be permanently altered within the analysis area.

Alternative 1 would extend the operational life of the mine by approximately 7 years compared to the no-action alternative and the start of reclamation and closure would generally occur 7 years later than under the no-action alternative.

Although the surface of the expanded waste rock dumps and tailings facilities would be reclaimed, these mine facilities would permanently alter the natural topography and geomorphology of the area. The expansion of the Open Pit toward the east would remove a portion of Jewell Hill and adjacent mountainous topography within the expansion area. Mountainous terrain and canyons within the proposed expansion of Tailings Storage Facility No. 4 in Eastwater Canyon would be covered and brought to a higher elevation with a flatter topography as they are filled by tailings. Natural undulating topography in these drainages where the tailings would be deposited will be replaced with a monolithic flat-topped bench or terrace that terminates downstream at the face of the tailings dam. Waste rock facilities have also covered the pre-mine topography and several prior mine facilities, resulting in a higher, flatter, and more homogenous topography. Upon development of the West Dump, the topographic surface would be brought up to a higher level and create topography within this area that slopes both to the west and east. The expansion of the Main Dump over the existing Leach Pile on private land would bring the topographic surface to a higher level.

3.9.4.3.2 Mineral Resources

Direct impacts on mineral resources resulting from the continuation of mining under alternative 1 would include: (1) the mining of approximately 148.3 million tons of ore; (2) the generation and permanent disposal of approximately 209.7 million tons of waste rock and approximately 232 million tons of tailings material. Ceasing active mining operations 7 years after the record of decision would leave known mineral resources in the ground on both private and National Forest System land. The known mineral resources that are left in the ground could be targeted by future mining operations.

3.9.4.3.3 Geotechnical Stability

Tailings Storage Facilities No 3. and No. 4

Under alternative 1, Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would be expanded compared to the no-action alternative. The planned expansions of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 under alternative 1 are described in section 2.3.2, “Alternative 1 – Authorization of Existing Uses of National Forest System Land.” The planned dam crest elevation, dam height, and storage capacity for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 at the end of mining under alternative 1 are summarized in table 3-51. Additional information regarding the geotechnical design of these facilities (including maps and representative stability cross-sections) is provided in appendix F, “Geotechnical Stability Appendix,” and in the referenced technical documents.

Tailings Storage Facilities No. 3 and No. 4 are being constructed using the upstream raise method, in which successive raises of the outer containment dam embankment are built upon previously placed tailings. Evaluation of the potential for static liquefaction is an important consideration for tailings storage facilities constructed in the upstream manner such as Tailings Storage Facilities No. 3 and No. 4. Static liquefaction occurs when a saturated or near-saturated granular soil loses its strength in response to a sudden change in applied stress, such as shaking during an earthquake or loading applied too rapidly. Slope failures that occurred in 1997 at Tailings Storage Facility No. 1/2 were attributed to static liquefaction under rapid loading caused by placement of waste rock on top of those facilities, as described in section 3.9.3.3, “Geotechnical Stability.” In recognition of the potential for static liquefaction to occur due to the upstream method of construction at Tailings Storage Facilities No. 3 and No. 4, and the past occurrence of static liquefaction slope failures in similar onsite tailings materials at Tailings Storage Facility No. 1/2, diligent monitoring of pore-water pressures, the rate of construction, and load is advised if the tailing dam facilities are raised (AMEC 2015b).

Slope stability factors of safety have been computed for various configurations of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (table 3-53). The range of minimum factors of safety computed for the different cases analyzed for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 for alternative 1 is summarized in table 3-53. For alternative 1, the slope stability factors of safety for both static and pseudo-static (seismic) loading conditions were shown to meet the State of Arizona design criteria shown in table 3-52 for the minimum required factors of safety.

The lowest calculated factors of safety for both static and pseudo-static loading for alternative 1, summarized in table 3-53, were found on section B at Tailings Storage Facilities No. 3 (section B is provided in appendix F). The lowest result for static loading was a factor of safety of 1.34 computed for an undrained response assumption, which meets the minimum required factor of safety of 1.30 under the Best Available Demonstrated Control Technology (table 3-53). The lowest result for pseudo-static loading was also found on that same section, with a computed factor of safety of 1.01, which meets the minimum required factor of safety of 1.0. Diligent monitoring of both facilities is needed to ensure that the predicted pore pressure responses to the facility raises, as used for the geotechnical analyses, are valid.

Operational considerations also are important and maintaining minimum beach distances between the outer dams and the supernatant pools is a key consideration. The minimum beach distance for Tailings Storage Facility No. 4 is 1,500 feet, although it is reported to be typically operated at a much longer beach distance. The configuration of Tailings Storage Facility No. 3 was altered in 2011 and 2012 by shifting the active deposition inward from the original dam crest. The inset Tailings Storage Facility No. 3 starter embankment was offset about 560 to 750 feet from the outer dam crest. The inset dam has been subsequently raised to an existing (2020) elevation of 3,785 feet above mean sea level (Pinto Valley Mining Corp. 2020a). Tailings Storage Facility No. 3 is reported to be typically operated with a minimal pool.

Seismic permanent deformation analyses were performed for raised dam configurations for both Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (AMEC 2015d). The analyzed configurations were different from alternative 1 raises for both structures. Deformations were evaluated for a 40-foot raise (to a crest elevation of 3,790 feet) for Tailings Storage Facility No. 3, and for a 330-foot raise (to a crest elevation of 4,130 feet) for Tailings Storage Facility No. 4. The main conclusion of the analyses was that the Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 embankments would experience some limited permanent deformations during and after a level of ground shaking equivalent to a one-in-975 annual exceedance probability event for the site, which was the design basis event previously approved by the Arizona Department of Environmental Quality for mine operational permitting. Such deformations would not result in triggering liquefaction or a flow failure of the embankments. Permanent deformation results from the analyses are summarized in appendix F, “Geotechnical Stability Appendix.”

An emergency action plan (Wood 2019a) was developed for the Pinto Valley Mine in recognition of the need for timely warning of downstream persons at risk in the event of a dam breach given the potential that a breach during a significant flood event would adversely affect and inundate downstream infrastructure and communities. The emergency action plan was developed in accordance with the “Federal Guidelines for Emergency Action Planning for Dams” (Publication No. P-64; Federal Emergency Management Agency 2013b). The purpose of the emergency action plan is to guide tailing storage facility operating personnel in identifying, monitoring, and responding to situations involving failure, potential failure, or other serious conditions at the Pinto Valley Mine tailing storage facilities. The emergency action plan defines roles and responsibilities and activities in the event of a breach of the tailings storage facilities. The emergency action plan is intended to supplement the emergency operations plans, warning and evacuation plans, and annexes of other local, county, and State jurisdictions to ensure that response actions will be effectively implemented.

Over time these facilities will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and will likely evolve in a similar fashion, which over time may lead to surface erosion, slope creek, and mass wasting that could reshape these facilities and possibly exposing tailings to these same effects. In order to maintain form and function, ongoing and routine inspection, maintenance, and reclamation would be required.

Similar to the no-action alternative, Pinto Valley Mining Corp. would continue to maintain and apply its tailings operation, maintenance, and surveillance manual that would reduce the potential for instability issues (Capstone Mining Corp. 2020c).

Cottonwood Tailings Impoundment

The stability of Cottonwood Tailings Impoundment, long-term potential for erosion and sparse vegetation cover, and implications for land use on National Forest System lands would be the same as under the no-action alternative and alternative 1. Similar to the no-action alternative and alternative 1, ongoing and routine maintenance for reclamation and closure of this facility would continue, which would reduce potential instability issues over time.

Open Pit

In general, the types of potential impacts associated with pit slope stability would be the same as the no-action alternative. However, alternative 1 would increase the depth of the Open Pit by 90 feet compared to the no-action alternative.

Pinto Valley Mining Corp. has developed a pit slope design for the pit expansion based on geological and geotechnical information and slope stability analysis. Additional data acquisition, management, and maintenance activities would occur as mining progresses based on the actual geologic conditions encountered and pit wall performance during the life of the mine. Pinto Valley Mining Corp. plans to incorporate updated bench and inter-ramp slope angles in the mine designs and the recommendations related to slope depressurization, surface water management, and geotechnical monitoring to enhance slope stability conditions and performance and to ensure the pit slopes meet the recommended factor of safety during mining (SRK Consulting, Inc. 2018b).

Under alternative 1, the pit slopes would intersect and mine out small portions of the Leach Piles and Main Dump and be located adjacent to several other existing and planned facilities. The facilities that would be intersected or located close to the final pit rim and their recommended minimum setback distances from the pit crest (SRK Consulting, Inc. 2018b) are summarized in table 3-54. Application of these setback distances would reduce potential effects of instability on proximate facilities. However, in the long-term post-closure period, the pit walls may continue to undergo slope creep and unravelling until a state of slope equilibrium is reached. This is especially true in areas of weak and weathered rock such as the southern quadrant of the Open Pit where the Pinal Schist is exposed.

Water management during closure and post-closure would generally be the same as described for the no-action alternative except that these activities would cover the larger footprint of the Open Pit on private land under alternative 1 and these closure and post-closure activities would occur approximately 7 years later than under the no-action alternative.

Table 3-54. Mine facilities adjacent to the final pit margin under the alternatives

Mine Facility	Description	Recommended Minimum Setback Distance Under the alternatives[79] (feet)	All or Portion of Facility Located on National Forest System Lands
Leach Piles	Existing facility immediately north of the Open Pit that would not be expanded under the no-action alternative. Leach rock material that is part of the facility would be exposed in the northwestern and northern pit slope walls under both alternative 1 and the proposed action. The life of the mine pit design under both alternative 1 and the proposed action would intersect and mine out a portion of the Leach Piles located along the north wall of the pit.	0	No

[79] Minimum setback distance as measured from the margin of the pit to the toe of the facility.

Mine Facility	Description	Recommended Minimum Setback Distance Under the alternatives[79] (feet)	All or Portion of Facility Located on National Forest System Lands
Main Dump	Existing waste rock storage facility north of the Open Pit that would not be expanded under the no-action alternative. The waste rock facility was placed on the surface of the existing Leach Piles with some overlap onto natural ground. The life of the mine pit design under both alternative 1 and the proposed action would not intersect the Main Dump located north of the north wall of the pit.	0	No
Castle Dome Marginal Dump	Existing waste rock facility and marginally mineralized material placed on the upper benches of the south-central portion of the Open Pit. Under the no-action alternative, construction of the Castle Dome Marginal Dump would cease and there would be no further expansion of the dump. Under alternative 1 and the proposed action, the Castle Dome Marginal Dump would be expanded from approximately 25 acres to 44 acres on private land.	250	No
Inert Limestone Stockpile	Existing stockpile of reclamation material northeast of the Open Pit. There is no anticipated expansion of the Inert Limestone Stockpile under the no-action alternative. Under alternative 1 and the proposed action, the facility would be expanded onto approximately 48 acres of private land outside the footprint of the Main Dump.	150	No
North Barn Marginal Dump	This facility would not be constructed under the no-action alternative. Planned facility for waste rock and marginally mineralized material deposited into an existing depression on the west rim of the Open Pit under both alternative 1 and the proposed action.	0	No
West Dump	This facility would not be constructed under the no-action alternative. Waste rock dump planned to be constructed at the base of the existing Leach Pile in Gold Gulch adjacent to the northwestern portion of the Open Pit.	0	No

Source: SRK Consulting, Inc. 2018b

19 Dump

The stability of the 19 Dump, and long-term potential for erosion and sparse vegetation cover and implications for land use on National Forest System lands, would be the same as under the no-action alternative. Over time this facility will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and will likely evolve in a similar fashion. Similar to the no-action alternative, ongoing and routine maintenance for reclamation and closure of this facility would continue, which would reduce potential instability issues over time.

3.9.4.4 Proposed Action – Direct and Indirect Impacts

3.9.4.4.1 Geology

Table 2-10 provides a detailed listing of the acres of disturbance by facility by land ownership (private and National Forest System lands) under the proposed action. The proposed action would increase new surface disturbance on private land by approximately 720 acres compared to the no-action alternative and by approximately 178 acres compared to alternative 1. In addition, the proposed action would result in approximately 229 acres of new surface disturbance on National Forest System lands that would not occur under the other alternatives.

Disturbance associated with the expansion of the Open Pit, waste rock dumps, and tailings facilities would result in an incremental increase in the area where the topography and geomorphology would be modified by mining compared to existing conditions. Other facilities (such as stockpiles, the mill and concentrator plant, ancillary facilities, and roads) also cause surface disturbance. However, many of these smaller or more localized features may eventually be reclaimed, removed, and, therefore, for the purposes of this analysis, it is assumed that these other facilities are less likely to result in large-scale permanent alteration of the natural topography or geomorphic features within the Pinto Valley Mine project boundary.

Due to the increased amount of new surface disturbance and increased generation of waste rock and tailings materials, the proposed action would result in increased potential for impacts on topography compared to the other alternatives, including on 229 acres of National Forest System lands, that would not occur under the other alternatives. The expansion of the Open Pit toward the east would remove adjacent mountainous topography within the expansion area. By the end of active mining operations, the Open Pit would be mined to an estimated depth 360 feet deeper than the no-action alternative and 270 feet deeper than under alternative 1. Mountainous terrain and canyons within the proposed expansion of Tailings Storage Facility No. 4 in Eastwater Canyon included under the proposed action would be covered and brought to a higher elevation with a flatter topography as they are filled by tailings. Natural undulating topography in these drainages where the tailings would be deposited would be replaced with a monolithic flat-topped bench or terrace that terminates downstream at the face of the tailings dam. Even though the proposed action would increase potential impacts on topography compared to the other alternatives, the overall topographic setting in the analysis area would generally not change, as the topography of the area has been altered by decades of mining activity and the existing mining facilities.

The proposed action would extend the operational life of the mine by approximately 19 years compared to the no-action alternative and by approximately 12 years compared to alternative 1, with corresponding delays in initiating reclamation and closure activities.

3.9.4.4.2 Mineral Resources

Under the proposed action, direct impacts on mineral resources resulting from the proposed mining activities and increase in mine life under the proposed action would include: (1) the mining of approximately 402.2 million tons of ore; and (2) the generation and permanent disposal of approximately 568.7 million tons of waste rock and approximately 440 million tons of tailings material.

3.9.4.4.3 Geotechnical Stability

Tailings Storage Facilities No 3. and No. 4

Under the proposed action, Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would be expanded through the end of mining and the facilities would operate for approximately 19 more years than under the no-action alternative and 12 years more than under alternative 1. In addition, Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would both be expanded onto National Forest System lands under the proposed action (22 acres for Tailings Storage Facility No. 3 and 102 acres for Tailings Storage Facility No. 4), which would not occur under the no-action alternative and alternative 1.

The planned expansions of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 under the proposed action are described in section 2.3.3, “Proposed Action – Authorization of New and Existing Uses of National Forest System Lands.” The planned dam crest elevation, dam height, and storage capacity for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 at the end of mining under the proposed action are summarized in table 3-52. Additional information regarding the geotechnical design of these facilities (including maps and representative stability cross-sections) is provided in appendix F, "Geotechnical Stability Appendix," and in the technical documents referenced in this section and in appendix F.

Similar to alternative 1, potential loss of shear strength in saturated, slow-draining layers within the tailings pile that supports the raised dam, a phenomenon referred to as static liquefaction, is a particular concern for tailings storage facilities constructed in the upstream manner. As noted under alternative 1, the tailings materials on site are known to be potentially susceptible to static liquefaction when loading occurs too rapidly. This was evidenced by the slope failure that occurred at Pinto Valley Mine Tailings Storage Facility No. 1/2 in 1997, which were loaded by up to 100 feet of rock fill in less than 3 months, as described in section 3.9.3.3, "Geotechnical Stability." At the end of mining operations under the proposed action, Tailings Storage Facility No. 3 would be approximately 568 feet high and approximately 3,860 feet above mean sea level, which represents an increase of 75 feet compared to the no-action alternative and alternative 1. At the end of active mining operations under the proposed action, Tailings Storage Facility No. 4 would be approximately 1,045 feet high and approximately 4,250 feet above mean sea level, which represents an increase of 160 feet compared to alternative 1 and an increase of 292 feet compared to the no-action alternative. Monitoring of pore-water pressures, the rate of construction, and load is advised if the tailings storage facilities are raised (AMEC 2015b).

The lowest calculated factors of safety for both static and pseudo-static loading for the proposed action, summarized in table 3-53, were found on section B at Tailings Storage Facilities No. 3. The lowest result for static loading was a factor of safety of 1.30 for static loading and 1.0 for pseudo-static loading, which are equal to the minimum required factors under the Best Available Demonstrated Control Technology (table 3-53). The lowest result for Tailings Storage Facility No. 4 was 1.34 for static loading and 1.08 for pseudo-static loading. Diligent monitoring of both facilities will be needed to ensure that the predicted pore pressure responses to the facility raises, as used for the geotechnical analyses, are valid.

Additional analyses were completed to determine seismic liquefaction potential and deformations under seismic loading. A liquefaction analysis report was prepared in 2014 and indicated that earthquake-induced site accelerations on the order of 0.15g (where g = gravitational acceleration) would be required to trigger liquefaction within portions of the impounded tailing (AMEC 2014a). The peak acceleration for the design-basis earthquake of 1 in 2,475 annual exceedance probability (table 3-52) is 0.137g, which is below the anticipated threshold for triggering liquefaction.

Similar to the no-action alternative and alternative 1, Pinto Valley Mining Corp. maintains a tailings operation, maintenance, and surveillance program and associated manual that describes facility operation and the surveillance and maintenance activities at the five active and inactive tailings storage facilities at the Pinto Valley Mine (Capstone Mining Corp. 2020c). Continued application of this program would reduce the potential for instability issues and provide a program for early notification and management of issues if they do arise.

Cottonwood Tailings Impoundment

The stability of Cottonwood Tailings Impoundment, long-term potential for erosion and sparse vegetation cover, and implications for land use on National Forest System lands would be the same as under the no-action alternative. Similar to the no-action alternative and alternative 1, ongoing and routine maintenance for reclamation and closure of this facility would continue, which would reduce potential instability issues over time.

Open Pit

In general, the types of potential impacts associated with pit slope stability would be the same as under alternative 1 and the no-action alternative. However, the proposed action would increase the depth of the Open Pit by 270 feet compared to alternative 1 and by 360 feet compared to the no-action alternative. In addition, impacts associated with potential instability of the pit walls that could occur during active mining operations would persist for 12 more years than under alternative 1 and 19 more years than the no-action alternative and potential impacts during the closure and post-closure periods would occur 12 years later than under alternative 1 and 19 years later than the no-action alternative. In addition, because the Open Pit would be expanded onto National Forest System lands under the proposed action, potential impacts on National Forest System lands associated with pit stability would be increased compared to the other alternatives.

Under the proposed action, the pit slopes would intersect the mined-out portions of the Leach Piles and Main Dump and be located adjacent to several other existing and planned facilities. The facilities that would be intersected or located close to the final pit crest and their recommended minimum setbacks distances from the pit crest under the proposed action are summarized in table 3-54 (SRK Consulting, Inc. 2018b). As noted in table 3-54, the same minimum setback distances are recommended for both alternative 1 and the proposed action. However, sections of the Open Pit where the Pinal Schist are exposed may continue to creep until equilibrium for the rock mass is reached.

To better understand long-term stability of the Open Pit, Pinto Valley Mining Corp. and their consultants conducted an assessment of the long-term stability of the proposed action pit walls and expected deformation during the post-closure period using a 3-dimensional numerical model (SRK Consulting, Inc. 2020c). Long-term stability was evaluated through a sensitivity analysis which considered different sets of parameters corresponding to different rock mass and geochemical properties over time. The analyses included static conditions, which assumes gravity loading only, as well as two pseudo-static scenarios to represent seismic conditions for a 975-year and a 2,475-year return period earthquake (SRK Consulting, Inc. 2020c). The 3-dimensional numerical modeling of post-closure pit wall stability resulted in the following conclusions:

- The likelihood of deep-seated failures affecting the pit walls is very low. The analyses did not show any areas with a fully developed failure surface.
- During active mining operations and the post-closure period, movement and slope creep in the Pinal Schist is expected to continue at similar rates as is currently being observed within the pit rim and in the natural slopes south of the Open Pit. These movements are anticipated to be shallow and are independent of mining. No interaction between the failure surface in the Pinal Schist and the Open Pit was observed in the model.
- A potential overall deep-seated failure of the pit walls, while unlikely, is predicted to be limited to within the Pinto Valley Mine private property and is not expected to create new disturbances on National Forest System land. The area of the pit showing less favorable stability conditions corresponds to the nose geometry, which is shown in Cross Section 4 (figure 18) and Cross Section 5 (figure 19 and figure 28) in the Post-Closure Pit Wall Stability Model (SRK Consulting, Inc. 2020c). A hypothetical failure would potentially extend upward to near the toe of the Castle Dome Marginal Dump.
- Bench-scale failures, including raveling, are expected to occur within the Open Pit. The pit will be fenced off from public access. Those staff who access the pit to perform site inspections or pit lake monitoring via the maintained in-pit access roads will be trained to be alert for the

potential occurrence of slumps and bench failures. Pinto Valley Mining Corp. will implement remote monitoring technologies during the post-closure period to facilitate inspections of the pit walls.

- Interramp-scale failures will not have an impact beyond the final pit rim and will not extend onto National Forest System land.
- The pit lake is not expected to cause a deep-seated failure. Model results showed small differences in displacement between the drained case (dry condition, no pit lake) and the 100-year post-closure water table case. Pit wall raveling and erosion are expected near the pit lake surface, which may undercut the slope. However, the effect of this would be local and limited to the bench and inter-ramp scale.
- The pseudo-static runs showed that for the largest return period of 2,475 years and with the highest strength reduction (reduction 3), the pit walls are expected to be marginally stable (FOS slightly above 1). In this same scenario, the Pinal Schist may show extensive but superficial movement. This is the worst-case, most conservative scenario modeled.

In summary, the pit wall stability model indicates that the probability of a deep-seated pit wall failure extending to the pit bottom occurring during the life of mine and the post-closure periods such that it would cause unplanned disturbance to National Forest System land is very low. However, creep and continued movement of Pinal Schist within the Schist Hill Creep Monitoring Zone is considered likely. The creep would occur in previously mined areas and on the native slopes south of the Open Pit extending onto National Forest System land (SRK Consulting, Inc. 2020c).

Backfilling of the Open Pit and water management during closure and post-closure would generally be the same as described for alternative 1 except that these activities would cover the larger footprint of the Open Pit and these closure and post-closure activities would occur 12 years later than under alternative 1. In addition, because the Open Pit would be expanded onto National Forest System lands under the proposed action, water management activities during closure and post-closure could occur on National Forest System lands.

19 Dump

The stability of the 19 Dump, and long-term potential for erosion and sparse vegetation cover and implications for land use on National Forest System lands, would be the same as under the no-action alternative and alternative 1. Over time this facility will be subjected to the same environmental and climatic forces that have shaped the surrounding landscape and will likely evolve in a similar fashion. Similar to the no-action alternative and alternative 1, ongoing and routine maintenance for reclamation and closure of this facility would continue, which would reduce potential instability issues over time.

3.9.4.5 Cumulative Impacts

The cumulative impact analysis area for geology, minerals, and geotechnical stability includes the Pinto Valley Mine project boundary plus a 1-mile buffer around the Pinto Valley Mine as shown on map 3-7 in appendix A. The analysis area was selected to encompass the area where all proposed activities would occur plus an appropriate buffer. The temporal boundary for analyzing cumulative impacts on geology, mineral resources, and geotechnical stability includes construction, operation, mine closure, final reclamation, and post-closure phases at the Pinto Valley Mine.

Section 3.9.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on geology, minerals, and geotechnical stability. The primary types of past actions that have resulted in present effects that contribute to cumulative impacts include historical mining operations at the Carlota Mine and the Pinto Valley Mine.

Existing surface disturbance within the cumulative impacts analysis area encompasses an estimated 3,830 acres. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. The only present and reasonably foreseeable action in the cumulative impact area is the Carlota Copper Mine (see table 3-3). However, there is no additional surface disturbance planned in the future at the Carlota Mine. As a result, the total proposed action surface disturbance in the cumulative impact analysis area for geology, mineral resources, and geotechnical stability is estimated at 5,147 acres. Therefore, cumulative impacts from surface disturbance would be the same as described under the analysis of direct and indirect impacts.

This cumulative analysis considers the present effects of past actions described in section 3.9.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect geology, minerals, and geotechnical stability in the future as identified in table 3-3 and further described in table 3-2.

3.9.4.5.1 Geology

Present effects of the relevant past and present actions have resulted in the geologic and topographic conditions presented in section 3.9.3, “Affected Environment.” Mining activity affects geology by excavating, modifying, or covering natural topographic and geomorphic features. Mining activities that have resulted in surface disturbance in the cumulative impact analysis are associated with the Carlota Mine and historical construction and operation of the Pinto Valley Mine, including exploration (drilling, trenching, sampling, and road construction), Open Pit excavation, waste rock dumps, Leach Piles, ore milling and processing, tailings storage facilities, mine plant sites and buildings, access roads, transmission lines, and other facilities.

The only identified ongoing and reasonably foreseeable action that could contribute to cumulative impacts on geology is the Carlota Copper Mine (see table 3-3). In general, mine-related facilities that permanently alter the natural topographic and geomorphic features in the area, even if reclaimed, result in the greatest potential cumulative impacts on geology. Mine-related facilities that do not alter the natural topography and geomorphic features of the landscape, and that are fully reclaimed, generally do not result in notable cumulative impacts on geology. For example, a large open pit that persists in perpetuity represents a greater potential impact on geology compared to plant sites, transmission lines, and pipelines that are decommissioned and fully reclaimed following active mining operations.

The differences in cumulative impacts on geology under the alternatives is commensurate with the differences in mine facility expansion areas, surface disturbance, and mine life described under the alternatives in sections 3.9.4.2 through 3.9.4.4. The proposed action would result in the greatest expansion of the Open Pit and Tailings Storage Facilities No. 3 and No. 4 that would permanently alter the natural topographic and geomorphic features in the area. In addition, the proposed action would extend active mining operations longer than the other alternatives, thereby delaying reclamation activities and reclamation success compared to the other alternatives. Based on these factors, the proposed action is anticipated to result in greatest cumulative impacts on geology, followed by alternative 1, with the no-action alternative having the least cumulative impacts on geology.

3.9.4.5.2 Mineral Resources

The Pinto Valley Mine is in the Globe-Miami Mining District and the commodities that are extracted in the district include copper, zinc, lead, manganese, molybdenum, gold, and silver (Peterson 1962). Mining activity affects mineral resources by excavating and removing mineral deposits.

In 2018, Pinto Valley Mine produced approximately 6.18 pounds of copper and 0.009 pound of molybdenum for each ton of ore processed (Capstone Mining Corp. 2019). The 119,066,852 pounds of copper and 181,147 pounds of molybdenum produced by Pinto Valley Mine in 2018 represent approximately 5 percent of recoverable copper and 0.2 percent of molybdenum mined in the U.S. that year (U.S. Geological Survey 2019b).

The differences in cumulative impacts on mineral resources under the alternatives is commensurate with the total estimated copper and molybdenum extraction and production over the life of the mine under the alternatives. The proposed action would involve the largest expansion of the Open Pit and extension of the mine life, resulting in the greatest copper and molybdenum extraction and production of the alternatives. Under the proposed action, the Pinto Valley Mine is forecasted to produce 2,430,100,000 pounds of copper concentrate and 23,750,000 pounds of molybdenum over the life of the mine, which would result in continued contributions to domestic copper and molybdenum production. Consequently, the proposed action is anticipated to result in greatest cumulative impacts on mineral resources compared to the other alternatives.

3.9.4.5.3 Geotechnical Stability

Present effects of relevant past and present actions have resulted in the geotechnical conditions for Pinto Valley Mine project facilities presented in section 3.9.3, “Affected Environment.” In general, the geotechnical stability of Pinto Valley Mine project facilities in the cumulative impacts analysis area is independent of other ongoing or reasonably foreseeable actions. Other factors such as large precipitation events and earthquakes can affect the geotechnical stability of facilities and could potentially result in cumulative impacts on the geotechnical stability of facilities at both the Carlota Mine and the Pinto Valley Mine if extreme events occur. However, these events are generally unpredictable during the temporal scope of analysis.

Cumulative impacts on geotechnical stability under the alternatives would generally be the same as the direct and indirect impacts presented in sections 3.9.4.2 through 3.9.4.4. Because the proposed action would have the deepest Open Pit and the largest and highest expansion of Tailings Storage Facilities No. 3 and No. 4, it is assumed that the proposed action would result in the greatest potential for cumulative impacts on geotechnical stability.

3.9.4.6 **Tailings Dam Breach Run-out Analysis**

The 1978 Council on Environmental Quality National Environmental Policy Act Regulations (Council on Environmental Quality 1978) required agencies to address uncertainties with worst-case scenario analyses. However, that regulation was amended in 1986 to rescind the worst-case analysis approach and replace it with a more flexible mandate that agencies must discuss the uncertainties in their analyses (see 40 CFR 1502.22(b)). Based on this guidance and in response to public and agency input, this section describes uncertainties associated with conducting a risk assessment and presents the Forest Service’s approach to evaluating and disclosing the potential adverse effects associated with the scenario of a tailings storage facility failure.

As described above in section 3.9.3, “Affected Environment,” a qualitative risk analysis of dam failure was performed by Pinto Valley Mining Corp. and their contractors for the design of the Pinto Valley Mine tailings storage facilities in 2015 (AMEC 2015c). However, a quantitative risk analysis of potential dam failure or failure mode effects analysis for the current design of the facilities has not been completed to numerically quantify the risk of a dam failure. While a quantitative risk analysis of the current proposed design could provide insight into the potential risk of failure, there is a high degree of uncertainty associated with these analyses, especially for existing tailings storage facilities where the failure mode effects analysis was not conducted at a design stage when these facilities were first constructed.

In addition, when tailings facilities fail, they fail for specific reasons, or often a combination of reasons related to design (such as design flaws, design oversights like unknown foundation conditions, or deviation from planned design), operations (such as improper pond management or tailings deposition practices), and environmental triggers (such as seismic events, extreme precipitation). In general, these are known as “failure modes.” There is no such thing as a “typical” facility failure, as each situation is the result of a specific failure mode or combination of failure modes. As such, a quantitative risk analysis/failure mode effects analysis for the existing tailings storage facilities at the Pinto Valley Mine would have produced results with a high degree of uncertainty.

A quantification of potential failure modes and the numeric risk potential of a failure is not necessary to evaluate the potential impacts that could result from a tailings storage facility failure. To evaluate the adverse effects of a potential failure of the tailings storage facilities, dam breach studies were completed by Pinto Valley Mining Corp. and their consultants in 2019 (Wood 2019d). The dam breach studies and results that are presented in this section and in Appendix F, “Geotechnical Stability Appendix,” represent the best available existing information to evaluate the potential adverse impacts from a failure of tailings storage facilities at the Pinto Valley Mine.

A tailings dam failure is similar to other high-consequence, low-probability events, such as catastrophic wildfires, hazardous material spills, or 1,000-year floods. The likelihood of these events happening is low and given the uncertainty in numerically quantifying the risk of failure it is not possible to accurately predict when or how they might occur. However, they do occur, and when they occur the impacts can be severe. A tailings dam failure has immediate consequences to those in the vicinity and living downstream, including loss of life, destruction of property and infrastructure, and destruction of aquatic and terrestrial ecosystems. Once the tailings stop moving downstream, long-term consequences from a catastrophic failure may continue through the contamination of large geographic areas, compromised water supplies, economic disruption, and displacement of large numbers of people. Aside from catastrophic failures, tailings storage facilities can represent other long-term risks, including the potential for groundwater contamination from tailings seepage, erosion of material into downstream waters, and windblown dust. While tailings facilities gradually drain over time, becoming less susceptible to failure, the potential risks can last for many decades after closure.

3.9.4.6.1 Analysis and Methodology

As detailed in appendix F, “Geotechnical Stability Appendix,” dam breach studies were completed by Pinto Valley Mining Corp. in 2019 in response to requests from the Forest Service for supporting information related to the potential downstream consequences in the event of a failure of the Tailings Storage Facility No. 3 or Tailings Storage Facility No. 4 embankments and downstream release of tailings and tailings-impacted fluids. Refer to appendix F, “Geotechnical Stability Appendix,” for a detailed description of the dam breach analysis assumptions, methods, and results.

The tailings dam breach studies were performed in a staged manner for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. The preliminary analyses considered the approximate maximum planned dam heights for alternative 1 and the proposed action. The preliminary analyses were followed by a more rigorous physical model approach described in a report by Wood (2019e), and summarized in more detail in appendix F, “Geotechnical Stability Appendix.” The physical model procedure incorporated site hydrology, the physical and mechanical properties of the tailings materials, and the downstream topography. The physical models were used to develop figures and maps showing the extent of downstream runout of released tailings solids and inundation by fluids. The physical models considered dam breach scenarios under two initial hydrologic conditions, as follows:

- Sunny-day failure – a sudden dam failure that occurs during normal operations, which may be caused by static liquefaction, internal erosion, piping, earthquakes, mis-operation leading to overtopping, or another event.
- Flood-induced or rainy-day failure – a dam failure resulting from a natural flood of a magnitude that is greater than what the dam can safely pass.

The breach modeling methodology was different for each of the two conditions as described in section F.8 in appendix F, “Geotechnical Stability Appendix.”

The tailings dam breach studies were performed considering several worst-case scenario modeling conditions and parameters that would result in a “what-if” dam breach scenario for purposes of evaluating potential impacts on the downstream environment, populations, and infrastructure. These parameters represent extreme conditions that would all have to occur to result in a dam breach. For example, the dam breach modeling scenarios assumed that during a probable maximum precipitation event affecting the tailings storage facilities, a 100-year flood event would also be occurring in the Pinto Creek watershed (Wood 2020). Standard practice for this type of analysis is that the consequences of a dam breach do not consider the likelihood that such an event would occur, just that the event does occur.

3.9.4.6.2 No-Action Alternative

If a dam breach of the tailings storage facilities were to occur, impacts could be similar to those presented in alternative 1 and the proposed action based on the dam breach runout analysis; however, due to the lower height and volume of the tailings storage facilities under the no-action alternative, potential runout distances would be less than the other alternatives.

3.9.4.6.3 Alternative 1

The preliminary dam breach analysis indicated that a complete breach (full height dam failure) of either Tailings Storage Facility No. 3 or Tailings Storage Facility No. 4 could result in flow of supernatant water and tailings into Pinto Creek and then downstream to Roosevelt Lake, about 21 miles from the Pinto Valley Mine.

As described in appendix F, “Geotechnical Stability Appendix,” a more rigorous quantitative dam breach and inundation analyses were conducted for alternative 1 and proposed action for Tailings Storage Facilities No. 3 and No. 4 (Wood 2019e). The dam breach studies indicate that, for alternative 1, the consequences of a sunny-day (normal operational) breach of Tailings Storage Facility No. 4 could result in a runout release of tailing materials that could affect up to a 1.89-mile reach of Pinto Creek downstream from the facility. A sunny-day breach of Tailings Storage Facility No. 3 could run out over 1.64 miles downstream. Under a major flooding scenario, breach models indicate water and entrained tailings would inundate the entire reach of Pinto Creek between the mine site and Theodore Roosevelt Lake, with significant flood depths affecting a ranch on private property owned by Pinto Valley Mining Corp., State Route 188, and two communities, Roosevelt Shores and Roosevelt Estates located near Roosevelt Lake.

Roosevelt Shores and Roosevelt Estates are within the Federal Emergency Management Agency-delineated 100-year flood plain and are already at risk of flooding from natural rainfall events; however, the peak flow and area inundated by flood water could be substantially greater in the event of a dam breach. Under alternative 1, the peak flow from a dam breach of Tailings Storage Facility No. 3 is estimated to arrive at these communities after approximately 3.7 hours and the peak flow from a dam breach of Tailings Storage Facility No. 4 is estimated to arrive at these communities after approximately 2.4 hours.

Any people within these communities during such a flood event, particularly during peak flow, would be at risk of drowning. The dam breach model indicates that the bridge over Pinto Creek on State Route 188 would be overtopped for the modeled Tailings Storage Facility No. 4 dam breach events, but not for those involving Tailings Storage Facility No. 3. Therefore, a flood-induced failure of Tailings Storage Facility No. 4 presents a risk to motorists on State Route 188. Contaminants deposited in Roosevelt Shores and Roosevelt Estates by flood waters would require extensive remediation.

If a sunny-day breach event occurred, Pinto Valley Mine staff and members of the public recreating on lands within the Pinto Creek corridor or adjoining stream corridors downstream of the tailings storage facilities would be at risk of drowning, injury, and exposure to toxic constituents from mobilized tailings.

Roosevelt Lake is the largest reservoir in the Salt River Project water storage and supply system for the city of Phoenix and dam breach and associated downstream inundation could pose a risk to Roosevelt Lake. In addition, since the tailings contain heavy metals, a dam breach could pose an environmental contamination risk if a dam breach were to occur.

A flood-induced failure is assumed to be caused by an extreme rainfall event which results in overtopping and erosion of the tailings storage facility embankment. The hydraulic models HEC-RAS 2D (U.S. Army Corps of Engineers 2016) and FLO-2D (2018) were used to estimate the dam breach hydrographs and dam breach inundation areas, as described in section F.8 in appendix F, “Geotechnical Stability Appendix.”

The results for the flood-induced breach are presented in Wood 2019d as a series of flood inundation maps for five different cases: (1) the 100-year flood with no dam breach; (2) alternative 1 and (3) proposed action dam breaches for Tailings Storage Facility No. 4; and (4) alternative 1 and (5) proposed action dam breaches for Tailings Storage Facility No. 3. The model results and flood inundation maps indicate that flood-induced breaches at either tailings storage facility for both alternative 1 and the proposed action will affect the full length of the Pinto Creek drainage from the tailings storage facilities down to Theodore Roosevelt Lake. The following general observations about downstream impacts from a flood-inducted breach are summarized based on the model results and flood inundation maps as presented in appendix F, “Geotechnical Stability Appendix”:

- There are ranch buildings owned by the mine within the Pinto Creek drainage in close proximity (approximately 1 mile) downstream from Tailings Storage Facility No. 4. As of June 2019, the ranch is no longer permanently inhabited. Peak flow arrival time to the structures nearest the tailings storage facilities is estimated at approximately 30 minutes, as measured from the start of the breach process. Maximum flood depths are greater than 20 feet at the ranch buildings for breach of Tailings Facility No. 4 under the flooding scenarios modeled.
- There are no permanently inhabited residences between the mine site and State Route 188, which is approximately 11.3 miles downstream. The bridge over Pinto Creek on State Route 188 will be overtopped for the modeled flood-induced breach at Tailings Storage Facility No. 4. Flows from a breach of Tailings Storage Facility No. 3 are predicted to flow beneath the bridge.
- Between State Route 188 and Theodore Roosevelt Lake are two adjacent communities, Roosevelt Shores and Roosevelt Estates. Residences in both communities, which lie adjacent to Pinto Creek between State Route 188 and Roosevelt Lake, are subject to significant inundation depths (5 to 15 feet) in the event of a flood-induced dam breach. Some of these residences also

are within the Federal Emergency Management Agency delineated 100-year floodplain, and would be subject to flooding without a dam break. Dam break on top of a natural flood event would increase the depths, velocities, and lateral extents of flooding in these areas. The time to arrival of peak flow from the dam breach in the area of the communities is estimated at 2.5 to 3 hours, as measured from the initiation of the dam breach.

The flood-induced dam breach models for Tailings Storage Facility No. 4 resulted in the highest levels of flooding. Under Alternative 1, the peak flow from a flood-induced breach of Tailings Storage Facility No. 4 would be approximately 92,857 cubic feet per second with a maximum flow depth of 8.8 feet.

After mine closure, there would no longer be a supernatant pond on the tailings storage facility surface and storm water would be routed over the embankment crest, thereby eliminating millions of gallons of water from contributing to the mobilization of tailings in the event of a dam breach. In this case, the consequences of a storm-induced dam breach would likely be less than that modeled for a breach occurring during operations. That said, the tailings themselves may be susceptible to static liquefaction for some time after closure and could continue to pose a threat even in the absence of a storm event. This is due to unique and inherent physical characteristics of the tailings themselves, and their response to external trigger mechanisms such as seismic shaking, elevated phreatic surfaces, or changed foundation conditions. Were a failure to occur from static liquefaction, the resulting consequences would most likely be similar to those modeled for the "sunny day" failure.

If a failure of Tailings Storage Facility No. 3 or Tailings Storage Facility No. 4 embankments and release of tailings and tailings-impacted fluids were to occur, wildlife and riparian vegetation along Pinto Creek and portions of the West Fork of Pinto Creek and Horrell Creek that provides important habitat for wildlife would be washed away by downstream slump or flow of materials, or exposed to toxic constituents within the tailings and tailings-impacted fluids. Depending on the location, mode, and size of the failure, effects on vegetation could extend as far as Roosevelt Lake, affecting water quality and potentially contaminating associated fisheries, aquatic habitat, and potable water supply. Affected riparian and upland areas may remain barren, take a long period of time to reestablish, or be reestablished by a different mix of species due to accumulation of heavy metals in the soils, which would decrease the suitability of riparian habitats to support native species. Uptake of heavy metals by plants could contribute to bioaccumulation in food chains.

3.9.4.6.4 Proposed Action

As summarized previously, dam breach and inundation analyses were conducted for alternative 1 and the proposed action for Tailings Storage Facilities No. 3 and No. 4 (Wood 2019e) and results are presented in detail in appendix F, *"*Geotechnical Stability Appendix.*"* The results for the sunny-day breach models for the proposed action are summarized in table 3-55 in terms of runout distance of tailings downgradient from the toe of each dam.

As summarized in table 3-55 the dam breach studies indicate that for the proposed action, the consequences of a sunny-day (normal operational) breach of Tailings Storage Facility No. 4 could result in a runout release of tailing materials that could affect up to a 2.75-mile reach of Pinto Creek downstream from the facility, approximately 0.86 mile more than alternative 1. A sunny-day breach of Tailings Storage Facility No. 3 could run out over 1.64 miles downstream, the same distance as estimated for alternative 1.

Table 3-55. Sunny-day breach impacts – maximum runout distance

Tailings Storage Facility	Alternative 1	Proposed Action
No. 3	8,700 feet (1.64 miles)	8,700 feet (1.64 miles)
No. 4	10,000 feet (1.89 miles)	14,500 feet (2.75 miles)

Source: Wood 2019e, table 5.1

Similar to alternative 1, under a flood-induced dam breach, breach models indicate water and entrained tailings would inundate the entire reach of Pinto Creek between the mine site and Theodore Roosevelt Lake, with significant flood depths affecting a ranch on private property owned by Pinto Valley Mining Corp., State Route 188, and two communities, Roosevelt Shores and Roosevelt Estates located near Roosevelt Lake. As indicated in table 3-56, under a flood-induced breach of the proposed action configuration of Tailings Storage Facility No. 3 the peak flow would be approximately 17,683 cubic feet per second with a maximum flow depth of approximately 1.5 feet and a peak flow arrival time at the Roosevelt Shores community occurring approximately 30 minutes earlier than a similar breach under alternative 1. A flood-induced breach of the proposed action configuration of Tailings Storage Facility No. 4 would result in an estimated peak flow of approximately 91,451 cubic feet per second with a maximum flow depth of approximately 9.7 feet and a peak flow arrival time at the Roosevelt Shores community occurring approximately 20 minutes later than a similar breach under alternative 1.

Potential impacts on these communities and on vegetation, fish, and wildlife from a dam breach would generally be the same as described for alternative 1.

Table 3-56. Flood-induced breach impacts – peak flow, depth, and time near Roosevelt Shores community

Tailings Storage Facility	Alternative	Peak Flow (cubic feet per second)	Peak Flow Arrival Time (hours)	Maximum Flow Depth (feet)
No. 3	Alternative 1	20,008	3.7	1.6
	Proposed Action	17,683	3.2	1.5
No. 4	Alternative 1	92,857	2.4	8.8
	Proposed Action	91,451	2.6	9.7

Source: Wood 2019e

3.9.5 Mitigation Measures

The Forest Service identified a variety of mitigation measures to address potential adverse impacts on and from short-term and long-term geotechnical stability issues associated with the Open Pit and tailings storage facilities. This section provides a summary of monitoring and mitigation measures for geotechnical issues. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.7, “Geology, Minerals, and Geotechnical Studies,” for additional information on the mitigation measures and the impacts being mitigated, the timing of the measures, the regulatory authority for the measures, and the potential effectiveness of the measures.

- **Mitigation Measure GM-1: Open Pit Wall Stability and Mitigation Plan.** This pit wall stability and mitigation plan addresses potential impacts on and from instability of the open pit during operation, closure, and post-closure of the Pinto Valley Mine that could result in impacts on public health and safety and on mine workers, loss of National Forest System lands for post-mine land use, and long-term maintenance liabilities for the Forest Service. The pit wall stability and mitigation plan identifies actions and procedures that Pinto Valley Mining Corp. would continue to apply to mitigate the potential for slope creep and failures within the Open Pit during operations and mitigation measures that would be applied post-closure. The plan also identifies adaptive management practices that would be applied based on the results of pit wall monitoring and inspection. Refer to attachment B in appendix H for the complete "Open Pit Wall Stability and Mitigation Plan."

- **Mitigation Measure GM-2: Post-Closure Storm Water Control, Inspection, and Maintenance Plan for Tailings Storage Facilities on National Forest System Land**. This plan addresses potential geotechnical stability issues at Tailings Storage Facilities No. 3 and No. 4 that could occur if storm water is not properly controlled during the post-closure period. The plan describes the post-closure storm water control plan including inspection and maintenance protocols for Tailings Storage Facilities No. 3 and No. 4; describes the operation, maintenance, and surveillance components of the post-closure storm water control plan; identifies triggers for maintenance and mitigation for post-closure storm water controls; and describes reporting requirements for the post-closure storm water controls. Pinto Valley Mining Corp. will also update the plan to include appropriate storm water control measures, inspection procedures, and potential maintenance activities for the existing Cottonwood Tailings Impoundment on National Forest System lands. Refer to attachment C in appendix H for the complete "Post-Closure Stormwater Control, Inspection, and Maintenance Plan."
- **Mitigation Measure GM-3: Post-Closure Grading for Tailings Storage Facilities on National Forest System Land.** This mitigation measure addresses the potential for improper grading that could result in retention of storm water and other fluids in Tailings Storage Facility No. 3 and No. 4, increasing the potential for geotechnical instabilities. Geotechnical instabilities would increase the risk of downstream flooding and contamination of National Forest System lands. Under this mitigation measure, prior to commencement of final closure activities at either Tailings Storage Facility No. 3 or No. 4, and whenever changes are made to the post-closure storm water management strategies and plans already submitted, Pinto Valley Mining Corp. will provide the Forest Service with copies of the new strategies and plans containing details on how updates maintain consistency with the closure strategy of not retaining fluids in the facilities and ensuring stable slopes. In addition, Pinto Valley Mining Corp. would conduct appropriate maintenance and grading activities on the Cottonwood Tailings Impoundment to ensure proper surface runoff from the facility, as deemed necessary by Pinto Valley Mining Corp. or the Forest Service.

Under Mitigation Measure GM-1, any potential disturbance associated with pit wall stability and appropriate setbacks is accounted for in the estimates of existing disturbance for the alternatives in chapter 2, "Proposed Action and Alternatives," and in the disclosure of environmental consequences in chapter 3, "Environmental Consequences."

Under Mitigation Measure GM-2, ongoing maintenance of storm water management facilities is not anticipated to result in additional surface disturbance outside of those areas authorized under the proposed action. These maintenance activities are accounted for in the estimated disturbance calculations presented under the alternatives in chapter 2, "Proposed Action and Alternatives," and potential impacts are disclosed in chapter 3, "Environmental Consequences." The Forest Service does not anticipate any further impacts associated with this mitigation measure unless there are departures from planned maintenance activities described in the plan.

Mitigation Measure GM-3 ensures that surface disturbance and other project-related activity associated with post-closure grading is accounted for in the estimated disturbance calculations presented under the alternatives in chapter 2, "Proposed Action and Alternatives," and potential impacts are disclosed in chapter 3, "Environmental Consequences." The Forest Service does not anticipate any further impacts associated with this mitigation measure unless there are departures from planned grading activities identified in updated strategies that are referenced in this mitigation measure.

3.10 Paleontology

Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Significant paleontological resources are those possessing scientific importance due to distinguishing characteristics of identity, context, or preservation (Forest Service 2005a). Significant paleontological resources include invertebrate, plant, and vertebrate fossils that further paleontological knowledge about the history of life on Earth. The Pinto Valley Mine project boundary contains geologic units with low to moderate paleontological resource potential, and no significant fossil localities have been recorded within the Pinto Valley Mine project boundary (Peterson 1962; Ralston 2019).

The analysis area for paleontology is the Pinto Valley Mine project boundary, encompassing 10,701 acres. The analysis area encompasses the Pinto Valley Mining Corp. private land, unpatented mining claims and unpatented mill sites where mining facilities are located, existing and proposed mine use areas on National Forest System land, and the linear corridors for mine-related pipelines, power lines, and roads. The analysis area includes all areas where geological units with potential to contain paleontological resources would be disturbed by expansion of Pinto Valley Mine.

3.10.1 Relevant Laws, Regulations, and Policy

3.10.1.1 **<u>Federal Authorities</u>**

3.10.1.1.1 Paleontological Resources Preservation Act

In March 2009, the Paleontological Resources Preservation Act was enacted as a result of the passage of the Omnibus Public Lands Management Act of 2009, Public Law 111-011, title VI, subtitle D, "Paleontological Resources Preservation." Under the Paleontological Resources Preservation Act, fossils from Federal lands are Federal property that must be preserved and protected using scientific principles and expertise. The Paleontological Resources Preservation Act provides the following:

- Uniform definitions for "paleontological resources" and "casual collecting."
- Uniform minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants).
- Uniform criminal and civil penalties for illegal sale and transport, theft, and vandalism of fossils from Federal lands.
- Uniform requirements for curation of Federal fossils in approved repositories.

The Paleontological Resources Preservation Act applies only to lands administered by the U.S. Department of the Interior (except tribal lands) and the Forest Service.

3.10.1.1.2 Federal Land Policy and Management Act

Neither the Federal Land Policy and Management Act of 1976 (43 U.S. Code 1712(c), 1732(b)) nor the Federal Land Policy and Management Act of 1962 (30 U.S. Code 611, subpart 3631.0, et seq.) specifically refer to fossils. However, "significant fossils" are understood and recognized in policy as scientific resources. Permits that authorize the collection of significant fossils for scientific purposes are issued under the authority of the Federal Land Policy and Management Act.

3.10.1.1.3 American Antiquities Act of 1906 (6 U.S. Code 431-433)

The act establishes a penalty for disturbing or excavating any historic or prehistoric ruin or monument or object of antiquity on Federal lands as a maximum fine of $500 or 90 days in jail. The American Antiquities Act is pertinent to paleontological resources because “objects of antiquity” include fossils.

3.10.1.1.4 National Historic Preservation Act of 1966

The act (Public Law 89 665; 16 U.S. Code 470 et seq.) provides for the survey, recovery, and preservation of significant paleontological data when such data may be destroyed or lost as a result of a Federal, federally licensed, or federally funded project.

3.10.1.2 **Forest Service Regulations, Policies, and Guidance**

3.10.1.2.1 Tonto National Forest Land and Resource Management Plan, as Amended

While the Tonto National Forest Plan does not provide standards and guidelines specifically for paleontological resources, they are incorporated in guidelines for cave resources because of their paleontological value (Forest Service 1985).

- “Preserve and protect cave ecosystems as nonrenewable resources to maintain their geological, scenic, educational, cultural, biological, hydrological, paleontological, and recreational values.”

The Tonto National Forest Plan does not describe the desired condition relevant to paleontological resources; however, paleontological resources must be preserved and protected using scientific principals and expertise under the Paleontological Resources Preservation Act of 2009.

3.10.2 Resource Indicators

Table 3-57 below provides the resource indicators and measures for assessing potential effects on paleontological resources.

Table 3-57. Resource indicators and measures for assessing effects on paleontological resources

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Paleontological resources	Potential loss of unknown paleontological resources	Acres of ground-disturbing activities in sensitive areas	No	Sensitive acres disturbed, geospatial data
Paleontological resources	Potential loss of known paleontological resources	Known paleontological resources in the analysis area	No	Geology and Ore Deposits of the Globe-Miami District, Arizona (Peterson 1962)

3.10.3 Affected Environment

Table 3-58 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-58. Resource indicators and measures for the existing condition for paleontology

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Paleontological resources	Potential loss of unknown paleontological resources	Acres of ground-disturbing activities in sensitive areas	Approximately 1,310 acres of analysis area consist of geologic units with an infrequent to moderate occurrence of paleontological resources
Paleontological resources	Potential loss of known paleontological resources	Known paleontological resources in the analysis area	No known paleontological resources in analysis area

3.10.3.1 Potential Loss of Unknown Paleontological Resources

The majority of the analysis area (6,876 acres) consists of metamorphic or igneous geologic units with a dominantly silicic or mafic composition. Igneous units have no probability of containing paleontological resources. There is a low probability of recognizable paleontological resources in metamorphosed limestone formations. Approximately 2,515 acres in the analysis area consist of quaternary age or older alluvium and surficial deposits, which also have a low probability of containing paleontological resources (Utah State University 2018).

Approximately 1,064 acres in the analysis area consist of carbonate-dominated formations composed of either limestone or dolomites of all ages that have moderate probability of containing paleontological resources. The remaining area (247 acres) consists of sandstone-dominated formations of all ages. This geologic unit also has a moderate or infrequent occurrence of paleontological resources (Utah State University 2018). The location of these geologic units in the analysis area is shown on map 3-9 in appendix A.

3.10.3.2 Potential loss of Known Paleontological Resources

Fossil-bearing sedimentary rocks in southeastern Arizona contain an array of various ages and types of fossils. Mesozoic rock units near the analysis area have yielded marine invertebrates, as well as dinosaurs and other terrestrial vertebrates. Fossils have also been identified in Neogene surficial sedimentary deposits such as the Gila Group, as well as in unnamed Pliocene and Pleistocene lacustrine and alluvial deposits close to the analysis area (Peterson 1962). However, none of these paleontological resources has been recorded in the analysis area and no significant fossil encounters have been recorded by Pinto Valley Mining Corp. (Ralston 2019).

Fossils have been found in the upper part of the Troy Quartzite in Ash Creek Canyon, northeast of Winkelman. No fossils have been found in the Troy Quartzite of the Globe-Miami district, but have been found in the Mescal Mountains, 14 miles south of Globe.

In the Globe-Miami district, the upper Martin Formation has been found to be fossiliferous, containing a large assemblage of brachiopods and corals. Fossils are generally uncommon or lacking in the lower Martin Formation. Numerous invertebrate fossil localities have also been found in the Escabrosa Limestone. No significant fossil localities have been recorded within the Pinto Valley Mine project boundary (Peterson 1962) and Pinto Valley Mining Corp. has not encountered any significant fossils in the course of mine operations (such as Open Pit excavation and road construction) (Ralston 2019).

3.10.4 Environmental Consequences

3.10.4.1 Analysis Methodology and Assumptions

The analysis of impacts on paleontological resources applies the following methods and assumptions:

- Increases in surface disturbance correspond to an increase in the potential for impacts on paleontological resources.
- Subsurface paleontological resources cannot be identified prior to their disturbance, but some geological features can indicate a higher likelihood of subsurface paleontological resource occurrence.
- Paleontological resources are typically associated with bedrock exposures. Areas of deep soils, alluvium, or colluvium only rarely contain significant fossils. Therefore, the main areas of concern for impacts on paleontological resources are where fossil-bearing bedrock is at or near the surface, such as badlands, hill slopes, or areas with thin soils over bedrock.
- Occurrences of paleontological resources are closely tied to the geological units that contain them. The probability of finding paleontological resources can be generally predicted from the geological units present at or near the surface. Therefore, geological mapping can be used to assess the potential for the occurrence of paleontological resources. Based on the geologic units in the analysis area, the potential for paleontological resources and significant fossils is generally low.
- Impacts on unknown paleontological resources would often be greater than impacts on resources that had previously been identified, because recordation and evaluation of those unknown resources would not occur prior to any damage to them.

3.10.4.2 No-action Alternative – Direct and Indirect Impacts

3.10.4.2.1 Potential Loss of Unknown Paleontological Resources

Surface disturbance under the no-action alternative from continued deposition of tailings in Tailings Storage Facility No. 4 and excavation of borrow and riprap sources would result in an estimated 367 acres of additional surface disturbance on private land. This disturbance would occur on geologic units consisting of carbonate-dominated formations of either limestone or dolomites or of sandstone-dominated formations, both of which contain moderate potential for paleontological resources (Utah State University 2018). Impacts on significant fossils could result from project related surface-disturbing activities; however, it is unlikely that fossils would be encountered due to the infrequent occurrence of fossils in these geologic units, the lack of identified significant fossils in the analysis area, and the lack of significant fossil encounters from previous mining activity in the analysis area (Ralston 2019).

3.10.4.2.2 Potential Loss of Known Paleontological Resources

Continuation of mining activities at the Pinto Valley Mine onto an additional 367 acres of private lands under the no-action alternative would not result in the potential loss of known paleontological resources because no known fossil localities have been recorded within the Pinto Valley Mine project boundary.

3.10.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.10.4.3.1 Potential Loss of Unknown Paleontological Resources

Expansion of mining facilities onto private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in similar impacts on paleontological resources as described under the no-action alternative, but to a slightly greater degree. Under alternative 1, expansion of mining facilities would result in surface disturbance on approximately 909 acres of private land in geologic units consisting of carbonate-dominated formations of either limestone or dolomites or of sandstone-dominated formations, both of which contain moderate potential paleontological resources (Utah State University 2018). Surface-disturbing activities on additional acreage could result in greater potential for impacts on unknown paleontological resources if fossils are encountered during construction or operation of the mine. However, due to the infrequent occurrence of paleontological resources in geologic units within the analysis area and the general lack of fossil encounters from previous mining activity, it is unlikely that fossil localities would be encountered. Continuation of mining operations for approximately 7 more years under alternative 1 compared to the no-action alternative would not increase the potential for impacts on unknown paleontological resources in the analysis area.

3.10.4.3.2 Potential Loss of Known Paleontological Resources

Expansion of mining facilities under alternative 1 onto an additional 909 acres of private lands would not result in the potential loss of known paleontological resources. As described under the no-action alternative, no known paleontological resources have been identified within the analysis area; therefore, alternative 1 would not result in greater impacts on known paleontological resources when compared to the no-action alternative.

3.10.4.4 **Proposed Action – Direct and Indirect Impacts**

3.10.4.4.1 Potential Loss of Unknown Paleontological Resources

Expansion and reclamation of mining facilities under the proposed action would have the same types of impacts on paleontological resources described for the no-action alternative and alternative 1, except to a greater degree because the proposed action would result in additional surface disturbance on private land and National Forest System lands compared to the no-action alternative and alternative 1. The proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative and an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. In total, the proposed action would result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands) in geologic units consisting of carbonate-dominated formations of either limestone or dolomites or of sandstone-dominated formations, both of which contain moderate potential for paleontological resources (Utah State University 2018).

Surface-disturbing activities on additional acreage could result in greater potential for impacts on unknown paleontological resources if fossils are encountered during construction or operation of the mine. However, due to the infrequent occurrence of paleontological resources in geologic units within the analysis area and the general lack of fossil encounters from previous mining activity, it is unlikely that fossil localities would be encountered. Continuation of mining operations for approximately 19 more years than the no-action alternative, or 12 more years compared to alternative 1, would not increase the potential for impacts on unknown paleontological resources in the analysis area under the proposed action.

3.10.4.4.2 Potential Loss of Known Paleontological Resources

Expansion of mining facilities under the proposed action onto an additional 1,087 acres of private lands and 229 acres of National Forest System lands would not result in the potential loss of known paleontological resources. As described under the no-action alternative and alternative 1, no known paleontological resources have been identified within the analysis area; therefore, the proposed action would not result in greater impacts on known paleontological resources when compared to the no-action alternative or alternative 1.

3.10.4.5 **Cumulative Impacts**

The cumulative impact analysis area for paleontology is the Pinto Valley Mine project boundary—the same area used to analyze direct and indirect effects in section 3.10.4, “Environmental Consequences.” The analysis area encompasses 10,701 acres and includes all areas where geologic units with potential to contain paleontological resources would be disturbed by expansion of Pinto Valley Mine. The cumulative impacts timeframe for paleontology encompasses the operational life of the mine under the alternatives, which coincides with surface-disturbing activities that have the potential to affect paleontological resources.

Section 3.10.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on paleontological resources. Within the cumulative impacts analysis area, no significant fossil localities have been recorded within the Pinto Valley Mine project boundary (Peterson 1962) and Pinto Valley Mining Corp. has not encountered any significant fossils in the course of mine operations (such as Open Pit excavation and road construction) (Ralston 2019).

Existing surface disturbance associated with the paleontology cumulative impacts analysis area encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands and 566 acres are on National Forest System lands and Bureau of Land Management lands. The proposed action could result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands) in the cumulative analysis area. No ongoing or reasonably foreseeable actions are expected to have a cumulative effect on paleontological resources. Therefore, the total surface disturbance within the cumulative impacts analysis area is estimated at 5,232 acres, which is approximately 49 percent of the cumulative impacts analysis area.

This cumulative analysis considers the present effects of past actions described in section 3.10.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect paleontological resources in the future as identified in table 3-3 and further described in table 3-2.

3.10.4.5.1 Paleontological Resources

Present effects of the relevant past and present actions have not resulted in known impacts on paleontological resources as discussed in section 3.10.3, “Affected Environment.” Surface disturbance associated with expansion and reclamation of mining facilities under the proposed action that would occur within geologic units consisting of carbonate-dominated formations of either limestone or dolomite, or of sandstone-dominated formations, could result in the potential for impacts on known paleontological resources. However, due to the infrequent occurrence of paleontological resources in geologic units within the analysis area and the general lack of fossil encounters from previous mining activity, it is unlikely that fossil localities would be encountered.

Present and reasonably foreseeable actions that could contribute to paleontological resources in the future are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because the timeframe of the project impacts would not overlap the timeframe of impacts from the proposed action or the alternatives.

The differences in cumulative impacts on paleontological resources among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.10.4.2 through 3.10.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Expansion and reclamation of mining facilities under the proposed action would result in an additional 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The timeframe when paleontological resources could be encountered during construction or operation of the mine would be approximately 19 years longer under the proposed action compared to the no-action alternative, and 12 years longer when compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater potential for cumulative impacts on paleontological resources compared to the other alternatives. However, due to the absence of known fossil localities within the proposed expansion areas at Pinto Valley Mine, the potential for adverse effects on paleontological resources is limited to the disturbance of approximately 325 acres under the proposed action within geologic units consisting of carbonate-dominated formations of either limestone or dolomites or of sandstone-dominated formations. As described in section 3.10.4, "Environmental Consequences," these geologic units have moderate potential to contain paleontological resources, but no significant fossils have been recorded at Pinto Valley Mine and, if present, it is likely that the fossils found would be the same types of fossils that occur in other localities where this geologic unit is present.

3.11 Hazardous and Nonhazardous Materials

This section discusses the storage, use, and transportation of hazardous and nonhazardous materials associated with Pinto Valley Mine. Hazardous wastes are dangerous or potentially harmful to human health and the environment and include fuels, chemicals, and explosives used for regular mine operations and mine equipment. Nonhazardous wastes or "solid wastes" include any garbage or refuse, sludge, and other discarded materials from mine operations. These can include solid, liquid, or gaseous materials. Although these wastes are classified as "nonhazardous," they may still pose a risk to human health or the environment if handled improperly. The description of the affected environment and environmental consequences focuses on the types of materials handled at Pinto Valley Mine, their transportation and storage, and the systems in place to ensure public health and safety is protected.

The analysis area for direct and indirect effects on hazardous and nonhazardous materials is the operational areas of Pinto Valley Mine, as well as areas where materials could be released into the environment and areas with the potential to receive materials through migration in groundwater or surface water. The analysis area also includes National Forest System Road 287 from U.S. Highway 60 through the Pinto Valley Mine project boundary, as well as existing and proposed access roads and adjacent environmental receptors because they may be affected during transportation of materials. The temporal boundary for analyzing the direct and indirect effects on hazardous and nonhazardous materials includes ongoing operations at Pinto Valley Mine through post-closure of the facility, because accidental releases of materials into the environment have the potential to result in long-term contamination.

3.11.1 Relevant Laws, Regulations, and Policy

3.11.1.1 **Federal Authorities**

3.11.1.1.1 Resource Conservation and Recovery Act of 1976

The Resource Conservation and Recovery Act sets standards for the treatment, storage, and disposal of solid and hazardous wastes and is applicable to hazardous waste generators as well as owners and operators of facilities involved in hazardous waste treatment, storage, or disposal.

3.11.1.1.2 Solid Waste Disposal Act of 1965, as amended

The amended Solid Waste Disposal Act exempts “solid waste from the extraction, beneficiation, and processing of ores and mineral” from Resource Conservation and Recovery Act subtitle C regulations.

3.11.1.1.3 Federal Water Pollution Control Act (the Clean Water Act) of 1972 (33 U.S. Code §1251 et seq.)

This act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Section 311(c)(2) of the Clean Water Act authorizes the President (delegated to the U.S. Environmental Protection Agency for discharges in the inland zone, as defined in the National Oil and Hazardous Substances Pollution Contingency Plan), to direct all Federal, State, and private action to remove a discharge or to mitigate or prevent a substantial threat of discharge of oil or a hazardous substance that is a substantial threat to the public health or welfare of the United States. This authority includes responding to discharges or a substantial threat of discharges from a vessel, offshore facility, or onshore facility.

3.11.1.1.4 Hazardous Materials Transportation Act of 1975

The Hazardous Materials Transportation Act requires regulation of hazardous materials in transport as well as training and license requirements for hazardous materials transporters.

3.11.1.1.5 Comprehensive Environmental Response, Compensation, and Liability Act of 1980

The Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S. Code 9601 et seq.) establishes prohibitions and requirements concerning closed and abandoned hazardous waste sites and provides for liability of persons responsible for releases of hazardous waste at these sites.

3.11.1.1.6 Emergency Planning and Community Right-to-Know Act of 1986

The Emergency Planning and Community Right-to-Know Act directs facilities working with extremely hazardous substances to engage in emergency planning activities and to immediately report accidental releases of hazardous substances.

3.11.1.1.7 Hazard Communication Standard

The Hazard Communication Standard (29 CFR 1910.1200(g)) requires employers to provide information to employees about hazardous chemicals in the workplace.

3.11.1.1.8 Title 40, Part 112 of the Code of Federal Regulations

This U.S. Environmental Protection Agency regulation outlines the requirements for both the prevention of and the response to oil spills. The prevention aspect of the rule requires preparation and implementation of spill prevention, control, and countermeasure plans by most industrial facilities.

3.11.1.1.9 Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, Executive Order 12856 of August 3, 1993

Executive Order 12856 directs Federal agencies to minimize the quantity of toxic chemicals entering the waste stream or the environment, and to report releases to the public.

3.11.1.2 **Forest Service Regulations, Policies and Guidance**

3.11.1.2.1 Forest Service Manual 2100, "Environmental Management," chapter 2160, "Hazardous Materials Management"

This Forest Service manual chapter standardizes pollution prevention practices and requires Forest Service staff to be appropriately trained in the protection of health and safety in hazardous material management.

3.11.1.2.2 Forest Service Handbook 2109.14, "Pesticide-Use Management and Coordination Handbook"

This handbook provides Forest Service guidance associated with pesticide use, management, and coordination.

3.11.1.2.3 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for hazardous and nonhazardous materials (Forest Service 1985):

- "Pesticide proposals will be handled through additional environmental analysis and documentation to ensure project objectivity and public safety."
- "When pesticides are used, project plans will contain appropriate and necessary monitoring procedures and mitigation measures."
- "Use of approved herbicides on a selective basis where brush encroachment is clearly inhibiting forage production for wildlife and domestic livestock. Possible treatment areas will be identified in Allotment Management Plans and will involve areas of limited size and extent where other management practices (prescribed burning) cannot be effectively or economically utilized to achieve management objectives. Projects of this nature will be subject to environmental assessment and public involvement to insure project objectivity and public safety."

Hazardous and nonhazardous materials will be managed in accordance with the mission and goals of the Tonto National Forest Plan (Forest Service 1985). Materials and wastes should not interfere with air, soil, or water resources beyond minimum local, State, or Federal standards and should be used, stored, transported, or disposed of only when consistent with the goal of promoting dependent user and community stability (Forest Service 1985). This direction applies to all management areas identified in the Tonto National Forest Plan.

3.11.1.3 State and Local Laws, Regulations, and Policies

3.11.1.3.1 Arizona Hazardous Waste Management (Arizona Revised Statute 49-921–932) and Pollution Prevention (Arizona Revised Statute 49-961–969) Laws

These State laws provide guidance on the required permits and reports necessary to comply with Arizona's Hazardous Waste Management and Pollution Prevention programs.

3.11.2 Resource Indicators

Table 3-59 below provides the resource indicators and measures for assessing potential effects on hazardous and nonhazardous materials.

Table 3-59. Resource indicators and measures for assessing effects on hazardous and nonhazardous materials

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Materials storage and use	Hazardous and nonhazardous materials used at the Pinto Valley Mine	Inventory of material types, quantities, and locations	Yes	Pinto Valley Mining Corp. hazardous and nonhazardous materials inventory
Materials transportation	Transportation of hazardous and nonhazardous materials	Routes, disposal locations, volumes	Yes	Pinto Valley Mining Corp. data
Materials release	Fate and transport mechanisms of hazardous materials if released into the environment	Varies	No	Generally from other resource sections

3.11.3 Affected Environment

Existing conditions associated with hazardous and nonhazardous materials are related to historic and ongoing mining and associated activities at Pinto Valley Mine. Table 3-60 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-60. Resource indicators and measures for the existing condition of hazardous and nonhazardous materials

Resource Element	Resource Indicator	Measure	Existing Condition
Materials storage and use	Hazardous and nonhazardous materials used at the Pinto Valley Mine	Inventory of material types, quantities, and locations	Various materials, both hazardous and nonhazardous, are used and stored on site at Pinto Valley Mine. Refer to appendix G, "Hazardous and Nonhazardous Materials Inventory."
Materials transportation	Transportation of hazardous and nonhazardous materials	Routes, disposal locations, volumes	Eight annual shipments of hazardous waste via two routes to disposal locations in Coolidge, AZ and Phoenix, AZ. Nine annual shipments of nonhazardous waste via multiple routes to multiple disposal locations.
Materials release	Fate and transport mechanisms of hazardous materials if released into the environment	Varies	Risks from an accidental release to soils, surface water, or groundwater.

3.11.3.1 Materials Storage and Use

A variety of hazardous and nonhazardous materials are used and stored on private property at Pinto Valley Mine for use in mine operations; no hazardous materials are stored on National Forest System lands. The types and amounts of materials on site are key resource indicators due to the potential for short- and long-term contamination if these materials are not properly managed. Pinto Valley Mining Corp. keeps an inventory of all hazardous and nonhazardous materials used and stored on site at Pinto Valley Mine. Maps 3-10 and 3-11 in appendix A show the material storage locations within Pinto Valley Mine. Appendix G, "Hazardous and Nonhazardous Materials Inventory," lists all materials used and stored at Pinto Valley Mine, including storage and use locations, the amount of each material on site, and each material's Fire Code Hazard Classification. The information in appendix G, "Hazardous and Nonhazardous Materials Inventory," was drawn from Pinto Valley Mining Corp.'s 2016 annual inventory of hazardous and nonhazardous materials (Pinto Valley Mining Corp. 2016b). Pinto Valley Mining Corp. provides the hazardous materials inventory to the Tri-City and City of Globe fire departments. Although Pinto Valley Mine does not qualify as a tier I or tier II facility under section 312 of the Emergency Planning and Community Right-to-Know Act, Pinto Valley Mining Corp. elects to generate tier I and tier II reports annually. Tier I reporting requires identification of the maximum, average daily amount, and general location of hazardous chemicals on site, while tier II reporting must provide more specific information on location and storage. Pinto Valley Mining Corp.'s combined tier I and II report dated November 11, 2016, was reviewed while preparing this EIS (Pinto Valley Mining Corp. 2016a).

The mine currently uses and stores materials with fire code hazard classifications including, but not limited to, carcinogen, target organ toxin, irritant, corrosive, and various levels of flammable and combustible liquids. Pinto Valley Mining Corp. keeps and adheres to material safety data sheets, implements precautionary and containment measures, and trains all staff in hazardous materials management. Sanitary and solid wastes are managed on private Pinto Valley Mining Corp. property; no sanitary or solid wastes from mine operations are disposed of on National Forest System lands. Sulfuric acid and petroleum-based products such as fuels and lubricants are among the most commonly used hazardous materials in the analysis area. Pinto Valley Mining Corp. does not store hazardous materials on National Forest System lands; however, petroleum products are used on National Forest System lands for powering, lubricating, or cooling motor vehicles or transformers.

Pinto Valley Mining Corp. uses a number of sealed sources of radioactive materials in various industrial applications as gauges and x-ray analyzers (Arizona Radiation Regulatory Agency 2013; Arizona Department of Health Services 2020). These radiation sources are sealed within instrumentation and are not stored or used on National Forest System lands.

3.11.3.2 Materials Transportation

Hazardous and nonhazardous materials used at Pinto Valley Mine are transported from various points of origin on U.S. Highway 60, then onto National Forest System Road 287 before being delivered to destinations within Pinto Valley Mine using the existing network of National Forest System roads and access roads. Sulfuric acid is delivered to the site in 6,000-gallon tanker trucks. Diesel fuel, gasoline, and numerous other products used in mine operations are also regularly delivered to the project site. All transporters of hazardous materials must be properly licensed and inspected, in accordance with Arizona Department of Transportation guidelines.

Table 3-61 provides information on transportation of hazardous wastes out of Pinto Valley Mine in 2017. A manifest is prepared to accompany each hazardous waste shipment and provide information on the amount and type of hazardous waste, the container size, intermediate and final destination of the shipment, as well as the route traveled. Pinto Valley Mine shipments go to one of two intermediate destinations and are ultimately dispersed to six final destinations: Coolidge, Arizona; Phoenix, Arizona; El Dorado, Arkansas; Knolis, Utah; Liverpool, Ohio; or La Porte, Texas. Eight shipments left Pinto Valley Mine in 2017 carrying 45 distinct sources of hazardous materials. Throughout 2017, 3,762 pounds of hazardous materials were transported as a result of regular mine operations (Pinto Valley Mining Corp. 2018b).

Table 3-61. Hazardous wastes transportation, 2017

Intermediate Destination	Route	Distance (miles)	Frequency
Heritage Environmental Services 284 E. Storey Road Coolidge, AZ 85128	National Forest System Road 287 to U.S. Highway 60 to State route 79 to State route 287	62	5 times per year
Clean Harbors Arizona LLC 1340 W. Lincoln Street Phoenix, AZ 85007	National Forest System Road 287 to U.S. Highway 60 to Interstate 10 to S. 15th Avenue	78	3 times per year

Source: Pinto Valley Mining Corp. 2018b

Shipments of nonhazardous wastes out of Pinto Valley Mine are handled by nine separate transporters and go by unique routes to various landfills or processing locations around the State of Arizona (table 3-62). In 2017, 866,291 pounds of nonhazardous wastes were transported from Pinto Valley Mine to disposal locations.

Table 3-62. Nonhazardous waste transportation, 2017

Material	Transporter	Disposal or Processing Location	Route	Distance (miles)	Frequency
Arizona special wastes	Chemical Transportation, Heritage Environmental Services, Clean Harbors	Republic Services Apache Junction Landfill	National Forest System Road 287 to U.S. Highway 60 to Tomahawk Road	49	31 times per year
Arizona special wastes	Various	Republic Services Cactus Landfill	National Forest System Road 287 to U.S. Highway 60 to State route 79 to Deep Well Ranch Road	68	15 times per year
Arizona special wastes	Various	Heritage Environmental Services 284 E. Storey Road Coolidge, AZ 85128	National Forest System Road 287 to U.S. Highway 60 to State route 79 to State route 287	62	5 times per year
General trash	Copper State Sanitation	Gila County Landfill	National Forest System Road 287 to U.S. Highway 60 to Russell Road to Hope Lane	13	1–2 times per week
Construction debris	DJ's	Republic Services Apache Junction Landfill	National Forest System Road 287 to U.S. Highway 60 to Tomahawk Road	49	5 times per week
Scrap metal	American Metals Company	American Metals Company 740 W. Broadway Mesa, AZ 85210	National Forest System Road 287 to U.S. Highway 60 to Mesa Drive	63	1 time per week

Material	Transporter	Disposal or Processing Location	Route	Distance (miles)	Frequency
Used oil	Heritage-Crystal Clean, LLC	Heritage-Crystal Clean, LLC 2440 W Lincoln St Suite 100 Phoenix, AZ 85009	National Forest System Road 287 to U.S. Highway 60 to Interstate 17 to W. Sherman Street	80	2 times per week
Scrap metal	Tucson Iron & Metals	Tucson Iron & Metals 690 E 36th St Tucson, AZ 85713	National Forest System Road 287 to U.S. Highway 60 to State route 79 to State route 287 to Interstate 10 E to S. 6th Avenue	125	10 times per year
Scrap high-density polyethylene pipe	Plastic Industries, Inc.	Mesa, AZ	National Forest System Road 287 to U.S. Highway 60 to Mesa Drive	65	1 time per year

Source: Pinto Valley Mining Corp. 2018c

3.11.3.3 Materials Release

Materials and wastes, particularly hazardous materials and wastes, have the potential to affect other resources through both direct contact and secondary transportation channels once released into the environment. Pinto Valley Mining Corp. maintains a spill prevention, control, and countermeasures plan to address any spills of petroleum-based products. Pinto Valley Mining Corp. also has various accidental release protocols in place, trains its staff on each protocol, and stocks spill containment kits around the analysis area for use in the event of an emergency. All mine equipment is inspected and maintained on a regular basis to avoid leaks or spills. Any accidental release on National Forest System lands that exceeds Forest Service–imposed reporting thresholds would be reported as directed, although the threat of a spill is minimized due to Pinto Valley Mining Corp.'s prevention measures.

The level of risk from an accidental release varies. A release event could range from a minor spill that is easily cleaned up to a catastrophic release of toxins into a body of water subsequently transported throughout the analysis area. Vegetation is sparse in the analysis area due to historic and current mining activities. Therefore, an accidental spill of hazardous or nonhazardous materials would likely be released into the immediately surrounding soils. Soils can absorb and immobilize small amounts of materials and contaminated soils can be excavated relatively easily. A release into soils would generally present a lower environmental risk.

The more significant risk is for hazardous materials, once within the soil matrix, to migrate to surface water or groundwater, either in dissolved phase or through erosion and movement of contaminated soil. More information on the existing conditions of soil and water resources in the analysis area are provided in those respective resource sections.

3.11.4 Environmental Consequences

3.11.4.1 Analysis Methodology and Assumptions

Hazardous and nonhazardous materials kept and used on site at Pinto Valley Mine are assessed quantitatively by their amount, physical state, and location. Hazard classifications are also provided to assess the public health and safety risk associated with exposure to each material. Recorded transportation routes, disposal locations, and volume of trucks are disclosed to quantitatively analyze the frequency and geographic range of material transport. Risks to the environment and other resources from an unplanned release are considered qualitatively. Actual impacts are impossible to predict, as they would be dependent on the type and amount of material released, the location of the release, the use of contingency plans, and the presence of groundwater or surface water in the area as a potential transport mechanism.

The analysis of impacts on hazardous and nonhazardous materials includes the following assumptions:

- Hazardous and nonhazardous materials will be transported to and from Pinto Valley Mine by the same shipment routes as currently used in operations (National Forest System Road 287 from U.S. Highway 60).
- As stated in the proposed mining plan of operations (Capstone Mining Corp. 2016a), Pinto Valley Mining Corp. maintains a spill prevention, control, and countermeasures plan in accordance with regulations at 40 CFR 112 to address spills of petroleum and non-petroleum products. The plan is a “living document” that is updated continually to reflect current management of petroleum and non-petroleum products and will continue to be updated throughout active mining operations. Pinto Valley Mining Corp. would implement all spill prevention, control, and countermeasure protocols and practices in accordance with the plan.
- All materials being used at Pinto Valley Mine have been documented in the materials inventory (appendix G).
- Minor quantities (greater than 1 liter or 1 kilogram, but less than a drum or bag) are able to be completely mitigated through cleanup procedures.
- Exempt wastes under Resource Conservation and Recovery Act subtitle C are not precluded from control under State or other Federal regulations.

3.11.4.2 **<u>No-action Alternative – Direct and Indirect Impacts</u>**

3.11.4.2.1 Materials Storage and Use

The types and amounts of hazardous and nonhazardous materials stored at Pinto Valley Mine during the 6-month transition period from active operations to the start of mine closure would be essentially the same as the existing conditions described in section 3.11.3. Use and storage of a variety of petroleum-based products and other materials identified in appendix G, “Hazardous and Nonhazardous Materials Inventory,” at Pinto Valley Mine would continue. Pinto Valley Mining Corp. would continue to apply proper materials management and diligently implement measures to prevent inadvertent spills.

During reclamation and closure, Pinto Valley Mining Corp. would characterize all materials, equipment, or demolition debris to identify appropriate disposal requirements. Hazardous materials or hazardous wastes identified at facilities would require isolation, treatment, containment, or neutralization. Hazardous materials that cannot be neutralized or contained would require disposal to permitted hazardous waste disposal facilities in accordance with regulatory requirements of the Resource Conservation and Recovery Act or the Comprehensive Environmental Response, Compensation, and Liability Act. All salvageable materials would be reused, resold, or recycled at an appropriate location. Following demolition, construction debris and all other nonhazardous and non-salvageable materials would be disposed of at an appropriately permitted facility.

3.11.4.2.2 Materials Transportation

Use of approximately 29.8 miles of existing National Forest System roads during the 6-month transition period under the no-action alternative. All industrial products used at Pinto Valley Mine would continue to be delivered via National Forest System Road 287 from U.S. Highway 60.

Pinto Valley Mining Corp.'s use of National Forest System Road 287 would continue during closure and post-closure activities. Use of the remaining National Forest System roads is expected to cease within 36 months of mine closure. Hazardous and nonhazardous materials inventoried and identified for salvage, recycling, or disposal at mine closure would be transported to appropriately permitted facilities.

3.11.4.2.3 Materials Release

Pinto Valley Mining Corp. would continue to minimize risks of materials release through proper material management and implementation of precautionary measures during the 6-month transition period in accordance with current practices described in section 3.11.3. Under the no-action alternative, closure and reclamation of most facilities at Pinto Valley Mine is expected to last 12 years, with additional post-closure activities continuing for up to 30 years. Risks associated with an accidental materials release would decrease during reclamation and closure phases due to the cessation of active mining activities and removal of hazardous and nonhazardous materials from the analysis area.

3.11.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.11.4.3.1 Materials Storage and Use

Under alternative 1, Pinto Valley Mining Corp. would continue mining activities for approximately 7 more years than under the no-action alternative, increasing the cumulative total volume of materials stored at the mine and the amount of time hazardous and nonhazardous materials would be used and stored on site during active mining operations. Risks associated with materials storage and use would continue for approximately 7 more years than under the no-action alternative due to the longer life of the mine. New disturbance of approximately 909 acres of private land (542 more than the no-action alternative) under alternative 1 may result in temporary or long-term changes in the location of petroleum products for powering, lubricating, or cooling motor vehicles or transformers within Pinto Valley Mining Corp.'s private lands. However, storage and use locations for most hazardous and nonhazardous materials would not change from existing locations and volumes. On-site management or removal of materials off site during mine closure and reclamation would be the same as described for the no-action alternative.

3.11.4.3.2 Materials Transportation

Under alternative 1, Pinto Valley Mining Corp. would continue mining activities and the use of existing National Forest System roads for approximately 7 years longer than under the no-action alternative. Similar to the no-action alternative, all industrial products would continue to be delivered via National Forest System Road 287 from U.S. Highway 60 under alternative 1. Material use and shipment rates would generally be the same as under existing conditions but would persist for approximately 7 more years during the extended operational life of the mine under alternative 1. Potential realignments of National Forest System Road 287 and other roads could change the transportation routes for materials to the Pinto Valley Mine, but impacts of these route changes would be negligible, as materials are generally stored within or nearby their location of use. Although the mine would operate for approximately 7 more years than the no-action alternative, the volume of materials transported out of Pinto Valley Mine is not anticipated to exceed the capacity of the existing disposal locations. Use of

National Forest System Road 287 and certain access roads during mine closure and reclamation would be the same as described under the no-action alternative.

3.11.4.3.3 Materials Release

Alternative 1 would extend active mining operations for approximately 7 more years than the no-action alternative. As a result, alternative 1 would extend the timeframe during which accidental release of hazardous and nonhazardous materials could occur due to active mining, especially in areas prone to groundwater or surface water transport. Pinto Valley Mining Corp. would continue to minimize these risks through proper material management and implementation of precautionary measures. The reclamation practices and estimated duration of reclamation activities for alternative 1 would be generally consistent with the no-action alternative but would begin approximately 7 years later.

3.11.4.4 **Proposed Action – Direct and Indirect Impacts**

3.11.4.4.1 Materials Storage and Use

Expansion of mining facilities onto National Forest System lands and extension of the mine life under the proposed action would have the same types of impacts on materials described for the no-action alternative and alternative 1, but the duration of potential impacts would be approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1. Active mining operations under the proposed action would require the same hazardous and nonhazardous materials being used under the no-action alternative and alternative 1. However, the extended mine life under the proposed action would increase the amount of hazardous and nonhazardous materials stored and used in the analysis area and the duration they would be stored and used, compared to the no-action alternative and alternative 1. Certain mobile and fixed equipment on National Forest System lands would contain regulated materials, such as petroleum-based fuels and lubricants. Use of this equipment on National Forest System lands for a longer period of time than under the no-action alternative and alternative 1 would increase the probability that a spill could occur; however, the potential for and consequences of such an event would be minimized through implementation of materials management training and precautionary containment measures, the relatively small volumes of hazardous materials contained in this equipment, and storage and disposal of all hazardous materials or hazardous wastes not contained within equipment on private lands or off site.

3.11.4.4.2 Materials Transportation

Realignments of roads used to transport materials to the Pinto Valley Mine could change relative to the no-action alternative and alternative 1 as the Open Pit and Tailings Storage Facility No. 4 are constructed or realigned, but the same requirements and procedures would be followed to ensure safe transport. The proposed action would not alter the frequency of shipments, but material transportation to support mine operations would continue for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. Similar to the no-action alternative and alternative 1, transportation routes to landfills and processing locations outside of Pinto Valley Mine could change over the life of the mine; however, alternative disposal locations are likely to be available within similar distances to those currently traveled. The volume of materials transported out of Pinto Valley Mine is not anticipated to exceed the capacity of the existing disposal locations.

3.11.4.4.3 Materials Release

Extension of the mine life by approximately 19 years compared to the no-action alternative and expansion onto National Forest System lands would extend the duration and slightly expand the geographic area in which hazardous and nonhazardous materials are used, stored, and transported. Risk of accidental material release would remain low throughout the extended mine life due to safety measures in place, but the probability of material release occurring would increase slightly compared to the no-action alternative and alternative 1 due to the longer duration of active mining operations and the expansion of mine facilities onto National Forest System lands. Pinto Valley Mining Corp. would continue to minimize the risks of a material release through implementation of materials management training and precautionary containment measures. Overall, the proposed action represents a continuation of risks to the surrounding environment for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. During reclamation and closure risks of accidental releases would decrease in the same manner as they would under the no-action alternative and alternative 1 due to on-site management, removal, and decreased storage and transportation of hazardous and nonhazardous materials at Pinto Valley Mine.

3.11.4.5 **Cumulative Impacts**

The cumulative impact analysis area for hazardous and nonhazardous materials is the operational areas of Pinto Valley Mine, the network of National Forest System roads and access roads used to access project facilities within the Pinto Valley Mine project boundary and vicinity, and adjacent environmental receptors. The analysis area encompasses 11,086 acres and includes all areas where materials could be released into the environment and areas with the potential to receive materials through migration in groundwater or surface water. The temporal boundary for analyzing cumulative impacts on hazardous and nonhazardous materials includes ongoing operations at Pinto Valley Mine through post-closure of the facility because accidental releases of materials into the environment have the potential to result in long-term contamination.

Section 3.11.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on hazardous and nonhazardous materials. A variety of hazardous and nonhazardous materials are used and stored at Pinto Valley Mine for use in mine operations. Hazardous and nonhazardous materials used at Pinto Valley Mine are transported from various points of origin on U.S. Highway 60, then onto National Forest System Road 287 before being delivered to destinations within Pinto Valley Mine using the existing network of National Forest System roads and access roads. More information on the existing conditions of soil and water resources from past nonhazardous and hazardous wastes is provided in section 3.18, “Soils,” and section 3.21, “Water Resources and Hydrogeochemistry.”

Transportation, handling, and storage of hazardous and nonhazardous materials are subject to a variety of regulatory controls and managed independently by each entity utilizing these materials within the cumulative impact analysis area. This cumulative analysis considers the present effects of past actions described in section 3.11.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect hazardous and nonhazardous materials in the future as identified in table 3-3 and further described in table 3-2.

3.11.4.5.1 Materials Storage and Use

Present effects of the relevant past and present actions are as described for existing conditions in section 3.11.3, “Affected Environment.” The use and storage of a variety of petroleum-based products and other materials identified in appendix G, “Hazardous and Nonhazardous Materials Inventory,” at Pinto Valley Mine would continue under the proposed action and Pinto Valley Mining Corp. would continue to apply proper materials management and diligently implement measures to prevent inadvertent spills. Present and reasonably foreseeable actions that could contribute to materials usage and storage in the future are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because the timeframe of the project impacts would not overlap the timeframe of impacts from the proposed action or the alternatives.

The differences in cumulative impacts on materials storage and waste among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.11.4.2 through 3.11.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would increase the amount of hazardous and nonhazardous materials stored and used in the analysis area and the duration they would be stored and used, compared to the no-action alternative and alternative 1, by extending the mine life 19 years and 12 years, respectively.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater probability for cumulative impacts from a spill or release; however, the potential for and consequences of such an event would be minimized through implementation of materials management training and precautionary containment measures, the relatively small volumes of hazardous materials contained in this equipment, and storage and disposal of all hazardous materials or hazardous wastes not contained within equipment on private lands or off site.

3.11.4.5.2 Materials Transportation

Present effects of the relevant past and present actions are as described for existing conditions in section 3.11.3, "Affected Environment." Transportation routes to landfills and processing locations outside of Pinto Valley Mine could change over the life of the mine; however, alternative disposal locations are likely to be available within similar distances to those currently traveled. Present and reasonably foreseeable actions that could contribute to materials transportation in the cumulative impacts analysis area are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because the timeframe of the project impacts would not overlap the timeframe of impacts from the proposed action or the alternatives.

The differences in cumulative impacts on materials transportation among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.11.4.2 through 3.11.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Realignments of roads used to transport materials to the Pinto Valley Mine could change relative to the no-action alternative and alternative 1 as the Open Pit and Tailings Storage Facility No. 4 are constructed or realigned, but the same requirements and procedures would be followed to ensure safe transport of materials.
- The proposed action would not alter the frequency of shipments, but material transportation to support mine operations would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater probability for cumulative impacts from a material release during transportation; however, Pinto Valley Mining Corp. would continue to minimize the risks of a material release through implementation of materials management training and precautionary containment measures.

3.11.4.5.3 Materials Release

Present effects of the relevant past and present actions are as described for existing conditions in section 3.11.3, “Affected Environment.” Pinto Valley Mining Corp. maintains a spill prevention, control, and countermeasures plan to address any spills of petroleum-based products. Pinto Valley Mining Corp. also has various accidental release protocols in place, trains its staff on each protocol, and stocks spill containment kits around the analysis area for use in the event of an emergency. A release event could range from a minor spill that is easily cleaned up to a catastrophic release of toxins into a body of water subsequently transported throughout the analysis area.

Present and reasonably foreseeable actions that could contribute to material releases in the cumulative impacts analysis area are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because the timeframe of the project impacts would not overlap the timeframe of impacts from the proposed action or the alternatives.

The differences in cumulative impacts from material releases among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.11.4.2 through 3.11.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would extend the duration and slightly expand the geographic area in which hazardous and nonhazardous materials are used, stored, and transported.
- The proposed action represents a continuation of risks to the surrounding environment for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, represents a continuation of cumulative risks to the surrounding environment from material releases for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

3.12 Land Ownership

Landownership within and surrounding the Pinto Valley Mine project boundary consists of private lands owned by Pinto Valley Mining Corp., public lands managed by the Forest Service, and public lands managed by the Bureau of Land Management (as shown in detail on map 1-1 and relative to key mine features on map 3-12 in appendix A). The majority of Pinto Valley Mine is on private property owned by Pinto Valley Mining Corp. However, certain facilities and operations are located on National Forest System lands, and were authorized by the Forest Service or the Bureau of Land Management through rights-of-way, plans of operations, special use permits, and letter agreements.

The analysis area for land ownership and boundary management is the Pinto Valley Mine project boundary and project-related rights-of-way that extend outside the project boundary, particularly the Burch pipeline that extends east from the project boundary (map 1-1 in appendix A). The analysis area encompasses the Pinto Valley Mining Corp. private land including patented mining claims and other private lands owned or controlled by Pinto Valley Mining Corp., unpatented mining claims on National Forest System lands, proposed mine use areas on National Forest System land, and the linear corridors for mine-related pipelines, power lines, and roads. The analysis area includes all areas where surface land is or would be directly used for Pinto Valley Mine project components.

3.12.1 Relevant Laws, Regulations, and Policy

3.12.1.1 **Federal Authorities**

3.12.1.1.1 General Mining Law of 1872

The General Mining Law of 1872 confers a statutory right for claimants to enter public lands open to location, stake mining claims in pursuit of locatable minerals, and conduct mining activities in compliance with Federal and State statutes and regulations. The U.S. Department of the Interior, Bureau of Land Management is responsible for managing mining claims.

3.12.1.1.2 Small Tracts Act of January 12, 1983

This act provides the Secretary of Agriculture with discretionary authority to sell, exchange, or interchange by quitclaim deed all of the United States' right, title, and interest, including the mineral estate, in and to certain limited categories of National Forest System lands.

3.12.1.1.3 Forest Service Manual 5571 - Sales

Forest Service Manual 5571 provides for the conveyance of specific and limited categories of land to relieve or resolve title conflicts and certain management problems through incorporation of the Small Tracts Act of 1983. Additionally, this manual provides encroachments of innocent occupancy and use of improvements constructed on National Forest System lands under claim or color of title.

3.12.1.1.4 Forest Service Manual 7152 - Land Line Location Program

This manual provides the land manager and the public with visible and legally defendable administrative and property boundary lines on the ground, and guidance to accurately depict the location of landownership lines on administrative maps produced by the Forest Service.

3.12.1.1.5 18 U.S. Code § 1858 - Survey Marks Destroyed or Removed

This section of Title 18 conveys penalties for persons who engage in the unauthorized alteration or removal of any government survey monument or marked tree.

3.12.1.2 **Forest Service Regulations, Policies, and Guidance**

3.12.1.2.1 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides specific standards and guidelines for individual management areas in the Tonto National Forest; however, management area 2F (covering the majority of the Globe Ranger District) does not contain specific management prescriptions pertaining to land ownership adjustments and boundary management (Forest Service 1985).

The Tonto National Forest Plan identifies the desired condition of land ownership generally as allowing adjustments to facilitate effective management of resources and continue to allow the use of National Forest System lands for appropriate public or private interests (Forest Service 1985).

3.12.1.3 State and Local Laws, Regulations, and Policies

3.12.1.3.1 Arizona Revised Statute Title 33 – Property § 33-103

Arizona Revised Statute title 33 conveys penalties for those who knowingly or by gross negligence destroy or remove permanent monuments set by a land surveyor.

3.12.2 Resource Indicators

Table 3-63 below provides the resource indicators and measures for assessing potential effects on land ownership and land use.

Table 3-63. Resource indicators and measures for assessing effects on land ownership

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Land ownership	Surface land ownership acreage	Acres of land in the analysis area by ownership	No	Geospatial data
Land uses	Description of types of land uses in the analysis area	Types of uses in the analysis area	No	Tonto National Forest Plan, geospatial data
Land use authorizations	Description of the various rights-of-way and other land use authorizations in the analysis areas	Types of land use authorizations	No	Pinto Valley mining plan of operations

3.12.3 Affected Environment

Table 3-64 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-64. Resource indicators and measures for the existing condition for land ownership

Resource Element	Resource Indicator	Measure	Existing Condition
Land ownership	Surface land ownership acreage	Acres of land in the analysis area by ownership	3,137 acres of private land (map 1-1) 560 acres on National Forest System lands (map 3-12 in appendix A)
Land uses	Description of types of land uses in the analysis area	Acres and types of land uses in the analysis area	Pinto Valley Mining Corp. owns 6,325 acres of land in the analysis area. Other uses include recreation access, livestock grazing, and general use of National Forest System lands.
Land use authorizations	Description of the various rights-of-way and other land use authorizations in the analysis area	Types of land use authorizations and encroachments in the analysis area	Land use authorizations include right-of-way, plans of operations, special use permits, and letter agreements. Encroachments include roads, an equipment laydown yard, storm water ponds, powder magazines, a water pipeline, and stand dispenser.

Note: Geospatial data for land ownership include negligible areas of overlap.

3.12.3.1 Land Ownership

The majority of the Pinto Valley Mine is on private property owned by Pinto Valley Mining Corp. However, certain facilities and operations are located on National Forest System land, and were authorized by the Forest Service or the Bureau of Land Management through rights-of-way, plans of operations, special use permits, and a letter of agreement (table 1-1). Authorizations related to the Pinto Valley Mine date from as early as the 1940s and have been amended, updated, and reauthorized over the years. Some facilities were inadvertently placed or expanded onto National Forest System lands without modification to existing authorizations by Pinto Valley Mining Corp.'s predecessors (see table 2-6).

Existing surface disturbance associated with Pinto Valley Mine facilities encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands, and 566 acres are on National Forest System lands and Bureau of Land Management lands (map 1-1 in appendix A). The area surrounding the mine site consists of National Forest System lands in the Globe Ranger District. Pinto Valley Mining Corp. also shares the southwestern property boundary with the Carlota Mine, which is also situated on a combination of private and National Forest System lands.

3.12.3.2 Land Uses

Past and present uses in the analysis area include a variety of previously authorized activities and inadvertent encroachments onto National Forest System lands (map 1-1 in appendix A). The primary use in the Pinto Valley Mine project boundary consists of mining-related activities (map 3-12 in appendix A) including the Open Pit, tailings storage facilities, ponds, and linear infrastructure such as pipelines, power lines, and roads. Approximately 14.7 miles of National Forest System roads used by Pinto Valley Mining Corp. are also open to the public and provide access to recreation areas or other points of interest including Pinto Creek or Haunted Canyon, west of Pinto Valley Mine. A portion of National Forest System Road 287 passes through Pinto Valley Mining Corp.'s private property. The analysis area also includes portions of two livestock grazing allotments, the Pinto Creek and Sleeping Beauty Complex allotments (map 3-13 in appendix A).

3.12.3.3 Land Use Authorizations

Upon issuance of a land patent on April 12, 1972 (United States of America 1972), the Federal government reserved an easement, 66 feet in width, for a portion of National Forest System Road 287 within Tract 40 of Township 1 North, Range 14 East on private lands currently owned by Pinto Valley Mining Corp.

Some mining facilities were previously inadvertently placed or expanded onto unpatented claims on National Forest System lands without modification to the existing authorizations by Pinto Valley Mining Corp.'s predecessors at the mine (see table 2-1 and map 1-1 in appendix A). These encroachments include roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser. Additionally, Pinto Valley Mining Corp. holds a variety of environmental permits and approvals, principally from the Arizona Department of Environmental Quality and the Arizona Department of Water Resources, which cover Pinto Valley Mining Corp. activities on both private and National Forest System land. Tables 1-1 and 1-2 list previous authorizations, permits, and approvals relevant to the Pinto Valley Mine.

3.12.4 Environmental Consequences

3.12.4.1 Analysis Methodology and Assumptions

The analysis of impacts on land ownership includes the following assumptions:

- A search conducted for National Forest System land in the analysis area concluded that there are no corner survey monuments and boundary markers within the analysis area. Therefore, impacts on corner survey monuments and boundary management are not analyzed in this section.

3.12.4.2 No-action Alternative – Direct and Indirect Impacts

3.12.4.2.1 Land Ownership

There is an estimated 3,915 acres of existing disturbance at the Pinto Valley Mine, including 3,349 acres on private land and 556 acres on National Forest System lands. There would be no change in land ownership under the no-action alternative.

3.12.4.2.2 Land Uses

Under the no-action alternative, there would be an additional 367 acres of surface disturbance on private land, including 10 acres of disturbance associated with continued deposition of tailings in Tailings Storage Facility No. 4 and 357 acres of disturbance associated with excavation of borrow and riprap sources for reclamation. Continuation of active mining operations at the Pinto Valley Mine for 2 months under the no-action alternative would not result in substantial changes to land use because the Forest Service would not authorize uses of National Forest System lands unless the uses were necessary for reclamation and closure and there would be no new disturbance on National Forest System lands. Under the no-action alternative, closure and reclamation of most facilities at Pinto Valley Mine is expected to begin after the 6-month transition period. Although public users may encounter minor delays resulting from mine operation and closure activities, public access to Pinto Creek and Haunted Canyon would be maintained along National Forest System Road 287. As a result, potential impacts on use of adjacent National Forest System lands for recreation would be minor and temporary. Refer to section 3.16, “Recreation and Wilderness,” for more information.

All new surface disturbance under the no-action alternative would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, the no-action alternative would not result in a loss of forage, as measured by animal unit months, and would not reduce the amount of grazing in the allotments. Refer to section 3.13, “Livestock Grazing,” for more information.

3.12.4.2.3 Land Use Authorizations

Under the no-action alternative, previously authorized rights-of way and special use permits for mining and ancillary facilities on National Forest System lands would not be authorized, and remaining reclamation under existing plans of operations would be required. At the date of the record of decision, use of National Forest System lands would be limited to those activities that are required to initiate shutdown of the mine and transition the mine from production to closure and reclamation as well as those activities associated with closure, reclamation, and post-closure care. Any mine-related facilities within existing encroachments on National Forest System lands would be decommissioned and removed after the 6-month transition period and the lands would be reclaimed in accordance with the mining plan of operations.

3.12.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.12.4.3.1 Land Ownership

Expansion of mining facilities onto private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in approximately 909 acres of additional surface disturbance on private land, an increase of 542 acres compared to the no-action alternative. Similar to the no-action alternative, there would be no change in land ownership under alternative 1.

3.12.4.3.2 Land Uses

Under alternative 1, operations at the Pinto Valley Mine are expected to continue approximately 7 years longer than under the no-action alternative. Similar to the no-action alternative, ongoing operation of the Pinto Valley Mine would not result in substantial changes to land use because Pinto Valley Mine is an existing, operating mine and there would be no new disturbance on National Forest System lands. Ongoing, previously authorized activities would continue on private land under alternative 1, resulting in similar types of effects on existing land uses in the Pinto Valley Mine project boundary as under the no-action alternative, but for a longer duration. Temporary public road user conflicts with mining traffic could continue along the segment of National Forest System Road 287 that passes through Pinto Valley Mining Corp. property. Although public users may encounter minor delays or reroutes during alterations or realignments of this segment of National Forest System Road 287, recreational public access to Pinto Creek and Haunted Canyon would be maintained. As a result, potential impacts on use of adjacent National Forest System lands for recreation would be minor and temporary but would occur for approximately 7 more years, compared to the no-action alternative. Refer to section 3.16, “Recreation and Wilderness,” for more information.

Similar to the no-action alternative, all new surface disturbance under alternative 1 would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, alternative 1 would not result in a loss of forage (as measured by animal unit months) or reduce the amount of grazing in the allotments. Refer to section 3.13, “Livestock Grazing,” for more information.

3.12.4.3.3 Land Use Authorizations

Under alternative 1, the record of decision would include authorization of existing encroachments, existing uses of National Forest System lands including rights-of-way, special use permits, and other authorizations (see table 1-1 and table 1-2), including all State and Federal authorizations on public or private lands, but no new surface disturbance on National Forest System lands. Authorizing existing encroachments on National Forest System lands would clarify the administrative requirements of these facilities for both the Forest Service and Pinto Valley Mining Corp. and would integrate reclamation requirements, bonding, and other considerations for the previous encroachments into the overall mining plan of operations.

Previous land use authorizations and rights-of-way would continue under alternative 1 with effects similar to existing conditions. Under alternative 1, Pinto Valley Mining Corp. would continue to conduct ongoing and routine maintenance for facilities on National Forest System lands, such as the Cottonwood Tailings Impoundment and the 19 Dump.

Under alternative 1, use and maintenance of the Burch pipeline would continue as previously authorized on National Forest System lands and as currently authorized on Bureau of Land Management lands. Compared to the no-action alternative, where use of the Burch pipeline would be discontinued as soon as possible after the 6-month transitional period from active operations to the start of mine closure, and the expired Forest Service special use permit for operation and maintenance of the pipeline would not be renewed; use and maintenance of the Burch pipeline during active mining operations would continue for approximately 7 more years under alternative 1.

3.12.4.4 **Proposed Action – Direct and Indirect Impacts**

3.12.4.4.1 Land Ownership

Expansion of mining facilities under the proposed action would result in an extended footprint on National Forest System lands when compared to the no-action alternative and alternative 1 to access unpatented claims; however, as under the no-action alternative and alternative 1, there would be no change in land ownership under the proposed action.

3.12.4.4.2 Land Uses

The proposed action would increase surface disturbance on private land by 720 acres compared to the no-action alternative and 178 acres compared to alternative 1. The proposed action would also increase surface disturbance and changes in land uses on National Forest System lands by 229 acres compared to the no-action alternative and alternative 1. However, the majority of the land where the footprint would be expanded onto National Forest System lands is directly adjacent to existing mining facilities that currently have limited to no public use due to fencing, earthen berms, natural terrain, and lockable gates at access points.

There would be no anticipated closures of existing roads under the proposed action, and National Forest System roads would remain open to the public. However, the segment of National Forest System Road 287 within Pinto Valley Mining Corp. property would be used for mining operations for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. As a result, the proposed action would increase the timeframe where potential conflicts could occur with the public using the road to access recreation areas. Refer to section 3.16, "Recreation and Wilderness," for more information.

The proposed action would result in an estimated 229 acres of new disturbance within the Pinto Creek and Sleeping Beauty Complex allotments. The additional surface disturbance on National Forest System lands in the two allotments could result in an estimated loss of up to 47 animal unit months (27 in the Pinto Creek allotment and 20 in the Sleeping Beauty Complex allotment). The estimated loss of 47 animal unit months is approximately 0.5 percent of the total 10,038 existing animal unit months in the analysis area. The longer duration of mine operations under the proposed action would expand the area unavailable for forage and extend the length of time during which forage on National Forest System lands occupied by mining activities would be unavailable to livestock grazing by approximately 229 acres and 19 years compared to the no-action alternative and 229 acres and 12 years compared to alternative 1. However, the estimated loss of animal unit months under the proposed action is not expected to result in a reduction in authorized livestock grazing numbers because the allotments are capable of supporting more animal unit months than currently permitted. Refer to section 3.13, "Livestock Grazing," for more information.

3.12.4.4.3 Land Use Authorizations

Previous encroachments (legacy encroachments) from miscellaneous mining activities such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser (see table 1-1 and map 1-1 in appendix A), that expanded onto National Forest System lands without authorization would be resolved under the proposed action through their incorporation under a new consolidated authorization. The benefits of authorizing the encroachments would be the same as under alternative 1.

Under the proposed action, the Forest Service would authorize the use of approximately 795 total acres of National Forest System lands for mining-related use by Pinto Valley Mining Corp. including the 566 acres of existing encroachments and areas of previous authorizations and the 229 acres of additional disturbance due to expansion of the Open Pit, tailings storage facilities, and construction or relocation of linear features under the proposed action (roads and pipelines). Compared to the no-action alternative where encroachments would remain unauthorized until the end of the life of the mine, the proposed action would result in beneficial impacts related to land use authorizations by authorizing the encroachments and requiring appropriate reclamation.

Similar to alternative 1, Pinto Valley Mining Corp. would continue to conduct ongoing and routine maintenance for facilities on National Forest System lands, such as the Cottonwood Tailings Impoundment and the 19 Dump.

Use and authorization of the Burch pipeline system would be the same as described under alternative 1, except the proposed action would extend its use during active mining operations by approximately 12 years. Under the no-action alternative, use of the Burch pipeline would be discontinued as soon as possible after the 6-month transitional period from active operations to the start of mine closure, and the expired Forest Service special use permit for operation and maintenance of the pipeline would not be renewed. In addition, under the proposed action, the northernmost segment of the pipeline between the Mine Reservoir and the water fill stations would be relocated to accommodate the extended Open Pit. The National Forest System land use for the pipeline authorized under its special use permit would be superseded by a new authorization.

3.12.4.5 **Cumulative Impacts**

The cumulative impacts analysis area for land ownership is the same as for direct and indirect effects and includes the Pinto Valley Mine project boundary and project-related rights-of-way that extend outside the mine boundary, particularly the Burch pipeline that extends east from the mine boundary (map 1-1 in appendix A). The analysis area encompasses 11,516 acres including all areas where surface land is or would be directly used for Pinto Valley Mine project components. The temporal boundary for analyzing cumulative land ownership impacts includes ongoing operations at Pinto Valley Mine through post-closure of the facility.

Section 3.12.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on land ownership. Authorizations related to the Pinto Valley Mine date from as early as the 1940s and have been amended, updated, and reauthorized over the years. Past and present uses in the cumulative impacts analysis area include a variety of previously authorized activities and inadvertent encroachments onto National Forest System lands. The primary use in the Pinto Valley Mine project boundary consists of mining-related activities (map 3-12 in appendix A) including the Open Pit, tailings storage facilities, ponds, and linear infrastructure such as pipelines, power lines, and roads.

Existing surface disturbance in the land ownership cumulative impacts analysis area encompasses an estimated 3,915 acres, of which 3,349 acres are on private lands, and 566 acres are on National Forest System lands and Bureau of Land Management lands (map 1-1 in appendix A). This existing disturbance accounts for approximately 34 percent of the land ownership cumulative impacts analysis area. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. There are no identified reasonably foreseeable actions that would occur within the cumulative impacts analysis area that would contribute to cumulative surface disturbance. As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 5,232 acres, which is approximately 45 percent of the cumulative impacts analysis area. In general, the cumulative surface disturbance would primarily occur adjacent to existing mining facilities and would not change current land ownership.

This cumulative analysis considers the present effects of past actions described in section 3.12.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect land ownership, land uses, and land use authorizations in the future as identified in table 3-3 and further described in table 3-2.

3.12.4.5.1 Land Ownership

Present effects of the relevant past and present actions are as described for existing conditions in section 3.12.3, "Affected Environment." As described in sections 3.12.4.2 through 3.12.4.4, there would be no change in land ownership under any alternative. As a result, there would be no direct or indirect effects that could contribute to cumulative effects on land ownership in the cumulative impacts analysis area.

3.12.4.5.2 Land Uses

Present effects of the relevant past and present actions are as described for existing conditions in section 3.11.3, "Affected Environment." The cumulative impacts on land use would generally be the same as those described in sections 3.12.4.2 through 3.12.4.4. Expansion of mining facilities would result in an extended footprint on National Forest System lands under the proposed action. However, the majority of the land where the footprint would be expanded onto National Forest System lands is directly adjacent to existing mining facilities that currently have limited to no public use due to fencing, earthen berms, natural terrain, and lockable gates at access points. There would be no anticipated closures of National Forest System roads under the proposed action that are currently open to public access. Present and reasonably foreseeable actions that could contribute to land use impacts in the future are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because they represent the continuation of existing land uses or specific future actions have not been identified (such as Bureau of Land Management rights-of-way and Tonto National Forest special use permit and grazing permit authorizations). The Tonto National Forest Plan Revision is expected to revise land use designations for National Forest System lands but these decisions would not specifically allow or restrict use of lands for mining.

The differences in cumulative impacts on land use among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.12.4.2 through 3.12.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would increase surface disturbance on private land by 720 acres compared to the no-action alternative and 178 acres compared to alternative 1. The proposed action would also increase surface disturbance and changes in land use on National Forest System lands by 229 acres compared to the no-action alternative and alternative 1.

- The segment of National Forest System Road 287 within Pinto Valley Mining Corp. property would be used for mining operations under the proposed action for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.
- Expansion and reclamation of mining facilities under the proposed action would result in an additional 229 acres of new surface disturbance within the cumulative impacts analysis area, whereas the no-action alternative and alternative 1 would not contribute any new disturbance in this area. The additional surface disturbance in the two allotments could result in an estimated loss of up to 47 animal unit months (up to 0.5 percent of existing animal unit months) in the analysis area.

Based on the factors above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, would generally result in increased potential for cumulative impacts on land use compared to the other alternatives.

3.12.4.5.3 Land Use Authorizations

Present effects of the relevant past and present actions are as described for existing conditions in section 3.11.3, "Affected Environment." The cumulative impacts on land use authorizations would generally be the same as those described in sections 3.12.4.2 through 3.12.4.4. Previous encroachments (legacy encroachments) from miscellaneous mining activities such as roads, an equipment laydown yard, storm water ponds, powder magazines, and a water pipeline and stand dispenser (see table 1-1 and map 1-1 in appendix A) that expanded onto National Forest System lands without authorization would be resolved under the proposed action through their incorporation under a new consolidated authorization. The proposed action would result in beneficial impacts related to land use authorizations by authorizing the encroachments and requiring appropriate reclamation. The use and maintenance of the Burch pipeline would continue as previously authorized on National Forest System lands and as currently authorized on Bureau of Land Management lands. Present and reasonably foreseeable actions that could contribute to land use authorization impacts in the future are identified in table 3-3 and further described in table 3-2. Present and reasonably foreseeable actions in the cumulative impacts analysis area would not likely contribute to cumulative impacts because no new land use authorizations have been specifically identified. Existing land use authorizations would continue, expire, or renew in accordance with the terms of each authorization.

The differences in cumulative impacts on land use authorizations among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.12.4.2 through 3.12.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Under the proposed action, the Forest Service would authorize the use of approximately 795 total acres of National Forest System lands for mining-related use by Pinto Valley Mining Corp. including the 566 acres of existing encroachments and areas of previous authorizations and the 229 acres of additional disturbance due to expansion of the Open Pit, tailings storage facilities, and construction or relocation of linear features under the proposed action (roads and pipelines).
- Compared to the no-action alternative where encroachments would remain unauthorized until the end of the life of the mine, the proposed action would result in beneficial impacts related to

land use authorizations by authorizing the encroachments and requiring appropriate reclamation.

- Use and authorization of the Burch pipeline system under the proposed action would extend its use during active mining operations by approximately 12 years compared to alternative 1. Under the no-action alternative, use of the Burch pipeline would be discontinued as soon as possible after the 6-month transitional period from active operations to the start of mine closure, and the expired Forest Service special use permit for operation and maintenance of the pipeline would not be renewed.

Based on the factors above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, would generally result in increased potential for cumulative impacts on land use authorizations compared to the other alternatives.

3.13 Livestock Grazing

Pinto Valley Mining Corp.'s proposed mining plan of operations proposes activities on National Forest System lands within the Pinto Creek and Sleeping Beauty Complex livestock grazing allotments (map 3-13 in appendix A). The description of the affected environment and environmental consequences for livestock grazing focuses on acres within these allotments available to livestock grazing, permitted livestock numbers, estimated animal unit months, and range improvements.

The analysis area for direct and indirect effects on livestock grazing is the full extent of the grazing allotments that intersect the Pinto Valley Mine project boundary (48,912 acres[80]) (map 3-13 in appendix A). This analysis area represents the total area of National Forest System lands in which the availability, quality, or connectivity of grazing lands and range improvements could be affected by implementation of the proposed action. The analysis area also includes areas where vegetation and water sources used by livestock could be affected by a change in groundwater level of 5 feet or greater as modeled by SRK Consulting, Inc. (2019b).

The Forest Service authorizes livestock grazing on National Forest System lands within the Pinto Creek and Sleeping Beauty Complex allotments through term grazing permits. No federally permitted livestock grazing occurs on private lands owned by Pinto Valley Mining Corp. The temporal boundaries for analyzing the direct and indirect effects on livestock grazing include the ongoing operations at the Pinto Valley Mine through the reclamation, closure, and post-closure periods. These spatial and temporal boundaries encompass the extent of potential changes to livestock grazing from the proposed action.

3.13.1 Relevant Laws, Regulations, and Policy

3.13.1.1 **Federal Authorities**

3.13.1.1.1 Organic Administration Act of 1897

The Organic Administration Act of 1897 provides the main statutory basis for the management of forest reserves in the United States. This law authorizes the Secretary of Agriculture to make rules and regulations to control the use, including livestock grazing and occupancy of national forests.

[80] Forest Service geospatial data for grazing allotment boundaries was modified to exclude private lands owned by Pinto Valley Mining Corp., which are not subject to Forest Service grazing regulations or permits.

3.13.1.1.2 The Taylor Grazing Act of 1934, as amended, 43 U.S. Code 315 et seq.

The Taylor Grazing Act provides for the regulation of grazing on public lands to improve rangeland conditions and regulate their use.

3.13.1.1.3 Granger-Thye Act of 1950

The Granger-Thye Act authorizes range improvements and allows the Forest Service to issue grazing permits for periods not exceeding 10 years.

3.13.1.1.4 Multiple-Use Sustained-Yield Act of 1960

The Multiple-Use Sustained-Yield Act establishes the policy and purpose of the national forests to provide for multiple use and sustained yield of products and services including outdoor recreation, range, timber, watershed, and wildlife and fish.

3.13.1.1.5 Forest and Rangeland Renewable Resources Planning Act of 1974

The Forest and Rangeland Renewable Resources Planning Act authorizes long-range planning by the Forest Service to ensure the forest resources are managed in a renewable manner, including the management of livestock grazing.

3.13.1.1.6 National Forest Management Act of 1976

The National Forest Management Act requires the Secretary of Agriculture to assess National Forest System lands, develop a management program based on multiple-use and sustained-yield principles, and implement a resource management plan for each national forest unit.

3.13.1.1.7 Public Rangelands Improvement Act of 1978

The Public Rangelands Improvement Act establishes the national policy to inventory and identify current public rangeland conditions and trends as well as manage, maintain, and improve the condition of public rangelands.

3.13.1.1.8 Grazing Fees, Executive Order 12548 of February 14, 1986

This executive order indefinitely extended the Public Rangelands Improvement Act grazing fee formula.

3.13.1.2 **Forest Service Regulations, Policies, and Guidance**

3.13.1.2.1 Title 36, Part 222 of the Code of Federal Regulations

Under 36 CFR 222, the Forest Service administers and protects range resources and permits the grazing use of all kinds and classes of livestock on all National Forest System lands and on other lands under Forest Service control.

3.13.1.2.2 Forest Service Manual 2200 and Forest Service Handbook 2209.13

Objectives, policies, and responsibilities for the range management program are in Forest Service Manual 2200 and Forest Service Manuals 2230.01 through 2230.06. National direction and guidance for grazing permit administration is contained in Forest Service Manual 2230 through Forest Service Manual 2238. Guidance for the administration of grazing permits is provided in Forest Service Handbook 2209.13.

3.13.1.2.3 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for livestock grazing (Forest Service 1985):

- "Provide wildlife access and escape ramps on all livestock and wildlife water developments."

The desired condition of livestock grazing is one that allows for the attainment of sustainable multiple-use resource objectives that are compatible with the standards and guidelines in the Tonto National Forest Plan (Forest Service 1985) and allows for the continued existence of threatened and endangered species.

3.13.1.3 **State and Local Laws, Regulations, and Policies**

3.13.1.3.1 Arizona Livestock Laws (Arizona Revised Statute title 3, chapter 11, article 8)

This State law determines regulations for the ownership, control, and regulation of livestock in Arizona. The regulation provides definitions for lawful fences, the recovery for damage to fences as well as unfenced lands, and livestock reporting.

3.13.2 Resource Indicators

Table 3-65 below provides the resource indicators and measures for assessing potential effects on livestock grazing.

Table 3-65. Resource indicators and measures for assessing effects on livestock grazing

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Grazing allotments	Acres available to grazing	Acres of forage change as a result of surface activities	No	Tonto National Forest Plan (DU 16)
Grazing allotments	Estimated animal unit months	Estimated animal unit months supported by allotment based on permitted livestock numbers	No	Tonto National Forest Plan (DU 16)
Range improvements	Range improvements	Types of range improvements and potential damage or destruction of the improvements	No	Tonto National Forest Plan (DU 16)

3.13.3 Affected Environment

3.13.3.1 **Grazing Activity, Grazing Allotment Acreages, and Animal Unit Months**

Federal livestock grazing occurs on the two allotments that intersect the Pinto Valley Mine project boundary: the Pinto Creek and Sleeping Beauty Complex allotments (map 3-13 in appendix A). Pinto Valley Mining Corp. holds a permit for the Pinto Creek allotment and the Sleeping Beauty Complex allotment is permitted to Freeport-McMoRan Miami. Both of these allotments are used for cattle grazing. The two allotments contain 48,912 acres in total, of which 4,242 acres (9 percent of the total acreage of two allotments) exist on National Forest System lands within the Pinto Valley Mine project boundary (Forest Service 2018b). Livestock grazing on the Sleeping Beauty Complex allotment is authorized through a term grazing permit with on and off provisions, meaning that the logical grazing area for the allotment contains both lands under Forest Service management and private lands owned by the range permittee. However, the Pinto Creek allotment is authorized under a term grazing permit on National Forest System lands only. These two allotments combined have an estimated 2,315 acres (5 percent of the total acreage of the two allotments) that have already experienced surface disturbance from past and ongoing actions in the analysis area, of which 65 percent has occurred on private lands that are not owned by Pinto Valley Mining Corp.

Collectively, the allotments are estimated to support 10,038 animal unit months based on the numbers of permitted livestock, seasons of use, geospatial data for allotment acreage and existing surface disturbance, and assumptions about forage consumption. An animal unit month refers to the amount of forage necessary to feed one animal unit equivalent, which is a 1,000-pound cow or one cow with a 6-month-old calf, for a period of 1 month. Adult cattle and calves constitute one animal unit equivalent and yearlings (the progeny of adult cattle) constitute 0.7 animal unit equivalent, as they do not consume as much forage as an adult 1,000-pound cow (Sprinkle and Bailey 2004). The allotments that intersect the Pinto Valley Mine boundary are permitted collectively for 679 adult cattle and calves year-round and for 450 yearlings for 6 months (Wages 2021). In 2018, the allotments were authorized collectively for 483 adult cattle and calves and for 55 yearlings (Wages 2021). Authorized livestock numbers are usually less than permitted numbers for a variety of factors, including the condition of the allotment and vegetation.

Table 3-66 reports permitted livestock grazing numbers, estimated animal unit months, and grazing allotment acreages for the Pinto Creek and Sleeping Beauty Complex grazing allotments. Grazing allotment acreages and animal unit months indicate how the current allotments are being used for livestock grazing; range improvements generally lead to better livestock distribution and management that improve rangeland condition and health. Any project activities that could affect these indicators may lead to an impact on livestock grazing.

Table 3-66. Permitted livestock numbers and estimated animal unit months by allotment

Allotment	Permitted Cows/Calves[81]	Permitted Yearlings[82]	Estimated Animal Unit Months[83]	Total Acres in Allotment[84]	Estimated Animal Unit Months per Acre[85]
Pinto Creek	486	340	7,260	30,914	0.24
Sleeping Beauty Complex	193	110	2,778	17,998	0.18
Total	**679**	**450**	**10,038**	**48,912**	**Not applicable**

Additional information on these two grazing allotments that intersect the Pinto Valley Mine project boundary is provided below.

3.13.3.1.1 Pinto Creek Allotment

The Pinto Creek allotment, permitted to Pinto Valley Mining Corp., contains 30,914 acres of National Forest System lands, of which 1,868 acres (6 percent of the allotment) are located within the Pinto

[81] Source: Wages 2021.
[82] Ibid.
[83] Estimated based on sum of cow/calf animal unit months (486 cows/calves × 1 animal unit month per cow/calf × 12 months of use per year) and yearling animal unit months (450 yearlings × 0.7 animal unit month per yearling × 6 months of use per year).
[84] Source: Forest Service 2018b. Forest Service geospatial data for grazing allotment boundaries was modified to exclude private lands owned by Pinto Valley Mining Corp., which are not subject to Forest Service grazing regulations or permits.
[85] Calculated for each allotment as: estimated animal unit months / (total acres in allotment – existing surface disturbance in allotment).

Valley Mine project boundary. Approximately 99 acres (0.3 percent of the allotment) contain existing disturbance.

The season of use for the Pinto Creek allotment permit is yearlong (March 1 to February 28) for 486 adult cattle and 6 months (January 1 to May 31) for 134 yearlings (Wages 2021; Forest Service 2016a). However, in 2018, the Pinto Creek allotment was only authorized for 363 adult cattle and calves and 45 yearlings (Wages 2021). This allotment contains one cattle grazing permit estimated to support approximately 7,260 animal unit months (see table 3-66). Range improvements on the allotment include water wells, stock tanks, fences, corrals, springs, and pipelines (Forest Service 2016a, 2018d). The Pinto Creek allotment uses an eight-pasture deferred grazing rotation system to allow each pasture to rest during the growing season.

A decision notice and finding of no significant impact was published in 1987 to reduce permitted numbers of livestock and implement rest-rotation management to improve rangeland health on the Pinto Creek allotment (Forest Service 1987). Monitoring in the uplands occurs in two phases in this allotment. The end-of-growing-season monitoring is performed to determine if the conservative use guidelines were met. Mid-season monitoring occurs to account for unpredictable precipitation patterns and indeterminate or multiple growing seasons for some plant communities. The Forest Service provides the permittee annual operating instructions that give specific yearly direction for the authorized use, monitoring practices, vegetation use guidelines, and range improvement maintenance for the allotment. In general, annual operating instructions on the Pinto Creek allotment set thresholds on allowable use of herbaceous species, upland browse species, riparian herbaceous species, and riparian woody species based on forage condition (Forest Service 2019d).

3.13.3.1.2 Sleeping Beauty Complex Allotment

The Sleeping Beauty Complex was once a community allotment (several range permittees grazing one area), including the Sleeping Beauty Complex allotment. The community allotment status has been dissolved and the allotment is now referred to as the Sleeping Beauty Complex, consisting of Bohme, Bellevue, and Sleeping Beauty pastures.

The Sleeping Beauty Complex allotment is classified as an on and off allotment. An on and off allotment means that the allotment contains both National Forest System lands and private lands where livestock are permitted to graze. In the Sleeping Beauty Complex allotment, the private lands are owned by the range permittee, Freeport-McMoRan Miami, Inc. Within the allotment, permitted livestock use is estimated to be approximately 86 percent on National Forest System lands and 14 percent on lands controlled by the permittee (Forest Service 2019a).

The Sleeping Beauty Complex allotment contains 17,998 total acres, of which 2,373 acres (13 percent of the allotment) are located on National Forest System lands within the Pinto Valley Mine project boundary (Forest Service 2018d). Approximately 2,217 acres (12 percent of the allotment) contain existing disturbance from past and ongoing actions in the analysis area, of which 68 percent has occurred on private lands (not under Pinto Valley Mining Corp. ownership).

The permitted season of use for all pastures in the Sleeping Beauty Complex allotment is from March 1 to February 28 for 193 adult cattle and January 1 to May 31 for 110 yearlings (Forest Service 2010, 2019f). The Sleeping Beauty Complex allotment is estimated to support approximately 2,778 animal unit months (see table 3-66). The allotment complex uses a five-pasture deferred grazing rotation system to allow each pasture to rest during the growing season (Forest Service 2016b).

A decision notice and finding of no significant impact was published in 2005 to issue a 10-year grazing permit to the current permittee of the Sleeping Beauty Complex allotment (Forest Service 2005b). The permit authorized an increased and flexible level of livestock grazing that complies with the standards and guidelines in the Tonto National Forest Plan (Forest Service 1985). Long-term monitoring measures were set in place for a number of key areas in the allotment identified in the Allotment Management Plan (Forest Service 2016b). The types of monitoring requirements for this allotment include compliance monitoring (improvement maintenance inspections, forage utilizations, and livestock counts), noxious weed monitoring, wildlife monitoring for threatened and endangered species, and heritage resources monitoring. In general, annual operating instructions for the Sleeping Beauty Complex allotment indicate that vegetation types that require monitoring on this allotment include upland herbaceous species, upland browse species, riparian herbaceous species, and riparian woody species (Forest Service 2016c).

3.13.3.2 Range Improvements

There are a variety of range improvements on the two grazing allotments that intersect the Pinto Valley Mine project boundary. Range improvements are generally designed to encourage better livestock distribution and management that improve rangeland condition and health. Range improvements include water wells, stock tanks, fences, corrals, springs, and pipelines.

3.13.4 Environmental Consequences

3.13.4.1 Analysis Methodology and Assumptions

The analysis of impacts on livestock grazing applies the following methods:

- Impacts associated with acres available to grazing are quantitatively assessed using estimated surface disturbance.
- Impacts associated with permitted animal unit month allocations are quantitatively assessed using estimated surface disturbance. Potential animal unit month changes from surface-disturbing activities are calculated based on the estimated animal unit months per acre supported by each allotment (see table 3-66). In general, loss of animal unit months would be greater when surface disturbance occurs in areas that provide a higher quality of forage. As a result, calculating loss of animal unit months based on total surface disturbance regardless of vegetation type likely overestimates loss of animal unit months but is provided here to present a conservative analysis. Reclamation and gradual revegetation of disturbed areas on National Forest System lands after the cessation of mining activities could increase the availability of livestock forage in the long term.
- The estimates of potential change of animal unit months by alternative is provided for analysis purposes in this final EIS. There would be no change to the existing grazing permits based on the alternatives or the analysis of potential loss of animal unit months in this final EIS.
- Potential impacts associated with changes to range improvements are quantitatively assessed using estimated surface disturbance.

The analysis of impacts on livestock grazing includes the following assumptions:

- Livestock grazing is not considered a surface-disturbing activity for purposes of this analysis due to the relatively low density and observable effects of livestock grazing compared to disturbance from mining, construction, and other activities.
- Range improvements generally lead to better livestock distribution and management, which would maintain or improve rangeland condition and health overall (across the allotment).

- Resources or resource uses that decrease forage availability would have an adverse impact on livestock grazing. Resources or resource uses that increase forage availability would have a beneficial impact on livestock grazing.
- Surface disturbances reduce the amount of forage available to livestock and wildlife and can be short and long term. Conversely, reclamation and revegetation of disturbed areas increase the amount of forage available to livestock and wildlife over the long term.
- Surface disturbances increase the likelihood for the introduction and spread of invasive nonnative plant species, which degrade rangeland health.
- Project activities would not substantially alter the type of grazing use (cattle) or grazing periods in the analysis area.

3.13.4.2 <u>**No-Action Alternative – Direct and Indirect Impacts**</u>

3.13.4.2.1 Grazing Activity, Allotment Acreages, and Animal Unit Months

All new surface disturbance under the no-action alternative would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, the no-action alternative would not result in a loss of forage, as measured by animal unit months, and would not reduce the amount of grazing in the allotments. Following the 6-month transition period from active mining operations to reclamation and closure, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands. Revegetation of these existing disturbances could provide additional forage for livestock grazing.

3.13.4.2.2 Range Improvements

The no-action alternative would have no effect on range improvements within portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service because there would be no new surface disturbance in these areas.

3.13.4.3 <u>**Alternative 1 – Direct and Indirect Impacts**</u>

3.13.4.3.1 Grazing Activity, Allotment Acreages, and Animal Unit Months

Similar to the no-action alternative, all new surface disturbance under alternative 1 would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, alternative 1 would not result in a loss of forage (as measured by animal unit months) or reduce the amount of grazing in the allotments. As the mine transitions to reclamation and closure, which would occur approximately 7 years later than under the no-action alternative, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands. Revegetation of these existing disturbances could provide additional forage for livestock grazing in the long term.

3.13.4.3.2 Range Improvements

Alternative 1 would have no effect on range improvements within portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service because there would be no new surface disturbance in these areas.

3.13.4.4 Proposed Action – Direct and Indirect Impacts

3.13.4.4.1 Grazing Allotment Acreages and Animal Unit Months

The proposed action would result in an estimated 117 acres of new disturbance in the Pinto Creek allotment and 112 acres of surface disturbance in the Sleeping Beauty Complex allotment. This totals to an additional 229 acres of disturbance in the two allotments. Based on the estimated animal unit months per acre presented in table 3-66, the additional surface disturbance on National Forest System lands in the two allotments could result in an estimated loss of up to 47 animal unit months (27 in the Pinto Creek allotment and 20 in the Sleeping Beauty Complex allotment). The estimated loss of 47 animal units months is approximately 0.5 percent of the total 10,038 existing animal unit months in the analysis area that are estimated based on permitted livestock numbers (see table 3-66). In contrast, neither the no-action alternative nor alternative 1 would result in new surface disturbance or direct forage loss within the analysis area.

The longer duration of mine operations under the proposed action would expand the area unavailable for forage and extend the length of time during which forage on National Forest System lands occupied by mining activities would be unavailable to livestock grazing by approximately 229 acres and 19 years compared to the no-action alternative and 229 acres and 12 years compared to alternative 1. However, the estimated loss of animal unit months under the proposed action is not expected to result in a reduction in authorized livestock grazing numbers because the allotments are capable of supporting more animal unit months than currently permitted. Vegetation would gradually reestablish in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands. Under the proposed action, reclamation would generally commence approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.

Table 3-67 provides a summary of estimated animal unit months available under each alternative until reclamation is successful and disturbed areas are available for livestock forage.

Table 3-67. Summary of animal unit months by alternative in the livestock grazing analysis area

Allotment	Existing Permitted Animal Unit Months	No Action Animal Unit Months	Alternative 1 Animal Unit Months	Proposed Action Animal Unit Months
Pinto Creek	7,260	7,260	7,260	7,232
Sleeping Beauty Complex	2,778	2,778	2,778	2,758
Total	**10,038**	**10,038**	**10,038**	**9,991**

3.13.4.4.2 Range Improvements

No existing range improvements were identified within grazing allotments on National Forest System lands within areas of new disturbance under the proposed action; therefore, no range improvements are anticipated to be damaged or destroyed.

3.13.4.5 Cumulative Impacts

The analysis area for cumulative impacts on livestock grazing is the same as for direct and indirect effects: the full extent of all grazing allotments that intersect the Pinto Valley Mine project boundary (map 3-13 in appendix A). The cumulative impacts analysis area encompasses approximately 48,912 acres. The temporal boundaries for analyzing the cumulative impacts on livestock grazing include the ongoing operations at the Pinto Valley Mine through the reclamation, closure, and post-closure periods.

Section 3.13.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on livestock grazing. Within the cumulative impacts analysis area, the following past and present activities have contributed to cumulative impacts and the existing condition of livestock grazing described in section 3.13.3, “Affected Environment”:

- A decision notice and finding of no significant impact was published in 1987 to reduce permitted numbers of livestock and implement rest-rotation management to improve rangeland health on the Pinto Creek allotment (Forest Service 1987). In general, annual operating instructions on the Pinto Creek allotment set thresholds on allowable use of herbaceous species, upland browse species, riparian herbaceous species, and riparian woody species based on forage condition (Forest Service 2019d).
- A decision notice and finding of no significant impact was published in 2005 to issue a new 10-year grazing permit to the current permittee of the Sleeping Beauty Complex allotment (Forest Service 2005b). The permit authorized an increased and flexible level of livestock grazing that complies with the standards and guidelines in the Tonto National Forest Plan (Forest Service 1985). Long-term monitoring measures were set in place for a number of key areas in the allotment identified in the Allotment Management Plan (Forest Service 2016b). Past and ongoing fire suppression has and will continue to protect public safety, residences, structures, and other public and private assets on lands within the Globe Ranger District. In general, annual operating instructions for the Sleeping Beauty Complex allotment indicate that vegetation types that require monitoring on this allotment include upland herbaceous species, upland browse species, riparian herbaceous species, and riparian woody species (Forest Service 2016c).
- There are a variety of range improvements on the two grazing allotments that intersect the Pinto Valley Mine project boundary. Range improvements include water wells, stock tanks, fences, corrals, springs, and pipelines.
- Past wildfires have contributed to short-term forage losses that may require temporary closure of burned areas to allow vegetation to regenerate. Two recent wildfires, the Woodbury Fire, which burned 124,000 acres in June and July of 2019, and the Salt Fire, which burned over 21,000 acres in August and September of 2020, burned areas within the Sleeping Beauty Complex allotment.

Existing surface disturbance within the livestock grazing cumulative impacts analysis area encompasses an estimated 2,315 acres, which represents approximately 5 percent of the 48,912 acres in the cumulative impacts analysis area. Approximately 65 percent of the existing surface disturbance has occurred on private lands that are not owned by Pinto Valley Mining Corp., largely in association with the Miami Copper Mine. The proposed action would result in an estimated total of 229 acres of additional surface disturbance in the cumulative impacts analysis area (117 acres of new disturbance in the Pinto Creek allotment and 112 acres of surface disturbance in the Sleeping Beauty Complex allotment). There are no identified reasonably foreseeable actions that would occur within the cumulative impacts analysis area that would contribute to cumulative surface disturbance. As a result, the total surface disturbance in the cumulative impacts analysis area under the proposed action is estimated at 2,544 acres, which is approximately 5 percent of the cumulative impacts analysis area. These cumulative surface disturbances have and would further reduce the lands within the Pinto Creek and Sleeping Beauty Complex allotments capable of providing forage for livestock. Forage loss in some disturbed areas on National Forest System lands, such as portions of the footprints of the Open Pit and tailings storage facilities, would be permanently lost. Most other areas would ultimately be reclaimed or are currently in various phases of active or passive reclamation, but cumulative losses of forage from mining disturbances would be a long-term impact. However, as explained in section 3.13.4, “Environmental Consequences,” the allotments are capable of supporting more animal unit months than currently authorized and the potential loss of animal unit months would not necessarily reduce the amount of grazing in the allotment relative to current levels.

This cumulative analysis considers the present effects of past actions described in section 3.13.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect water resources in the future as identified in table 3-3 and further described in table 3-2.

3.13.4.5.1 Grazing Allotments and Range Improvements

Present effects of the relevant past and present actions have resulted in the grazing allotment and range improvement conditions presented in section 3.13.3, “Affected Environment.” Present and reasonably foreseeable actions that could contribute to cumulative livestock grazing impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on grazing allotments and range improvements include the Tonto National Forest Plan Revision, grazing permit authorizations, and wildland fires. Livestock grazing management objectives in the pending Tonto National Forest Plan Revision and grazing permit authorizations could result in and contribute to cumulative impacts if changes in management direction result in changes to the authorized number of livestock in the allotments, grazing durations, grazing management strategies, structural range improvements in the allotments, or other management actions and that affect livestock grazing. The locations, intensity, and timing of future potential wildfires are unknown but, if future wildfires occur within the Pinto Creek and Sleeping Beauty Complex allotments, they could contribute to cumulative additional forage loss and damage to range improvements.

The differences in cumulative impacts on grazing allotments and range improvements among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.12.4.2 through 3.12.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Expansion and reclamation of mining facilities under the proposed action would result in an additional 229 acres of new surface disturbance within the cumulative impacts analysis area, whereas the no-action alternative and alternative 1 would not contribute any new disturbance in this area. The additional surface disturbance in the two allotments could result in an estimated loss of up to 47 animal unit months (up to 0.5 percent of existing animal unit months) in the analysis area.
- The longer duration of mine operations under the proposed action would expand the area unavailable for forage and extend the length of time during which forage on National Forest System lands occupied by mining activities would be unavailable to livestock grazing by approximately 229 acres and 19 years compared to the no-action alternative and 229 acres and 12 years compared to alternative 1.
- None of the alternatives analyzed in detail are expected to result in adverse impacts on range improvements.

Based on the factors listed above, the proposed action is anticipated to result in greater cumulative impacts on grazing allotments compared to the other alternatives which are not affecting the existing condition. However, the potential loss of animal unit months would not necessarily reduce the amount of grazing because the allotments are capable of supporting more animal unit months than currently permitted. Upon mine closure, vegetation would gradually reestablish in areas permitted for livestock grazing in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands.

3.13.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on livestock grazing and livestock grazing management. This section provides a summary of the mitigation measure for livestock grazing. Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," section 4.4.8, "Livestock Grazing," for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measure LG-1: Livestock Grazing Fencing.** This mitigation measure addresses potential impacts on livestock grazing fencing from project-related activities. Proposed activities at Pinto Valley Mine could result in removal of existing fencing or create need for additional fencing to manage livestock grazing in the Pinto Creek and Sleeping Beauty Complex allotments administered by the Forest Service. If Pinto Valley Mine-related activities damage or destroy livestock grazing fences, Pinto Valley Mining Corp. would promptly notify the Forest Service and would be responsible for promptly repairing or replacing livestock grazing fencing on National Forest System lands to control livestock movement and access.

Under Mitigation Measure LG-1, repairing and replacing livestock grazing fencing could result in localized and minor levels of surface disturbance due to installing fence footings and fence posts. However, this disturbance would typically be located in existing alignments and existing disturbance areas for fencing. Due to the minimal amount of surface disturbance and the localized nature of fence repair and replacement, impacts are expected to be negligible.

3.14 Noise

This section contains an assessment of the potential effects of each alternative on noise and vibration levels and on noise-sensitive land uses in the vicinity of Pinto Valley Mine. This analysis focuses on environmental noise exposure to the public and examines land uses (recreation use areas and residences) that may be sensitive to perceptible increases in ambient noise. The analysis area for noise includes Pinto Valley Mine and surrounding residential and recreational use areas up to 4 miles from the perimeter of the Pinto Valley Mining Corp. property boundary, extending through portions of Gila County to Pinal County and the Tonto National Forest. The analysis area accounts for areas where noise increases could occur due to the project, including blasting activities, and truck and equipment traffic on local and access roads. The temporal boundary for analyzing noise includes the ongoing operation of Pinto Valley Mine and extends through closure and final reclamation. The effects of noise from mining activity on wildlife are discussed in section 3.3.3.2, "Fish and Wildlife," and section 3.3.3.3, "Special Status Species."

The noise assessment is based on the noise technical report, "Noise Study to Support the U.S. Forest Service Evaluation for the Pinto Valley Mine Plan of Operations," produced February 2018 (WestLand Resources, Inc. 2018c). The potential for impacts is evaluated based on applicable Federal, State, and local noise policies and regulations, and other guidance.

3.14.1 Relevant Laws, Regulations, and Policy

3.14.1.1 **Federal Authorities**

3.14.1.1.1 Federal Noise Control Act

The Federal Noise Control Act of 1972 (Public Law 92 574) established a requirement that all Federal agencies administer their programs to promote an environment free of noise that would jeopardize public health or welfare. The U.S. Environmental Protection Agency was given the responsibility for:

- Providing information to the public regarding identifiable effects of noise on public health and welfare.
- Publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety.
- Coordinating Federal research and activities related to noise control.
- Establishing Federal noise emission standards for selected products distributed in interstate commerce.

As part of its responsibility, the U.S. Environmental Protection Agency published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" in 1974 (U.S. Environmental Protection Agency 1974). This report identifies sound levels less than or equal to 55 decibels in terms of day-night average as being appropriate outdoors for residential areas and other places in which quiet is a basis for uses to avoid annoyance and interference with outdoor activity (U.S. Environmental Protection Agency 1974).

3.14.1.2 **Forest Service Regulations, Policies, and Guidance**

There is no Federal or State agency guidance for maximum permissible levels for recreational users of National Forest System lands. For recreational users in scenic areas, a threshold of 40 A-weighted decibels is used to describe disturbance to forest visitors. A level of 40 A-weighted decibels is analogous to a "typical suburban area at night" (U.S. Environmental Protection Agency 1974). This threshold was also applied similarly in the Rosemont Copper Project EIS (Forest Service 2013a).

3.14.1.3 **State and Local Laws, Regulations, and Policies**

The Pinto Valley Mine is located in Gila County, which does not have a noise ordinance with specific sound level limits that would apply to the Pinto Valley Mine. Pinal County, where a small portion of the noise analysis area extends, has a noise ordinance. The Pinto Valley Mine is not required to meet Pinal County sound level limits; however, the limits for rural zone districts provide a relevant, local threshold against which to compare impacts from the project. Pinal County's noise ordinance (Ordinance 050306-ENO as amended by 031611 ENO-01) states that for areas zoned rural (designations Commercial Agriculture Ranch Zone [CAR], Suburban Ranch Zone [SR], Suburban Homestead Zone [SH], and Guest Ranch [GR]), the sound level should not exceed 65 A-weighted decibels from 7:00 a.m. to 9:00 p.m., and should not exceed 60 A-weighted decibels from 9:00 p.m. to 7:00 a.m. These levels represent the average sound level over a 2-minute period.

3.14.1.4 Other Guidance or Recommendations

3.14.1.4.1 Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development developed noise compatibility standards where residential use is normally considered acceptable with other noise sources in the area. A use where exterior levels would not exceed 65 A-weighted decibels day-night average at a residential use would generally be considered acceptable use and would require no special approvals.

3.14.1.4.2 Office of Surface Mining Standards

The general requirements of the Office of Surface Mining blasting performance standards (30 CFR 816.67) state, "Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availability of surface or ground water outside the permit area." The Office of Surface Mining Standards developed standards to govern maximum permissible levels of ground-borne vibration due to blasting. Blasting levels would be assessed at sensitive structures such as residences, schools, or other institutional use. Maximum peak particle velocity should not exceed 1.00 inch per second at a distance of more than 300 feet from the blasting site and 0.75 inch per second at a distance of more than 5,000 feet from the blasting site.

3.14.2 Resource Indicators

3.14.2.1 Noise Terminology and Concepts

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (such as air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound. The loudness of the source and obstructions or atmospheric factors affecting the propagation path to the receiver determine the sound level and characteristics of the sound perceived by the receiver (Ver and Beranek 2006).

The amplitude of pressure waves generated by a sound source determines the loudness of that source. A logarithmic scale is commonly used to determine sound pressure level in terms of decibels.

The decibel scale alone does not adequately characterize how noise is perceived. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound pressure level in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hertz and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. The "A-weighted" sound level (expressed in units of A-weighted decibels) approximates the frequency response of the average healthy human ear when listening to most ordinary sounds. When people judge the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted levels of those sounds. Noise levels for environmental noise studies are typically reported in terms of A-weighted decibels. Table 3-68 describes typical A-weighted noise levels for various noise sources (Ver and Beranek 2006). Refer to chapter 6, "Glossary," for definitions of sound terms used in this section.

Table 3-68. Typical sound levels measured in the environment and industry

Example Noise Source or Noise Environment	A-weighted Sound Levels	Subjective Impression
Shotgun (at shooter's ear) or on a carrier flight deck	140	Painfully loud
Civil defense siren (100 feet)	130	-
Jet takeoff (200 feet)	120	Threshold of pain
Loud rock music	110	-
Pile driver (50 feet)	100	Very loud
Ambulance siren (100 feet) or in a boiler room	90	-
Pneumatic drill (50 feet) or in a noisy restaurant	80	-
Busy traffic; hair dryer	70	Moderately loud
Normal conversation (5 feet) or in a data processing center	60	-
Light traffic (100 feet), rainfall, or in a private business office	50	-
Bird calls (distant) or in an average living room or library	40	Quiet
Soft whisper (5 feet), rustling leaves, or inside a quiet bedroom	30	-
In a recording studio	20	-
Normal breathing	10	Threshold of hearing

Source: Ver and Beranek 2006.

3.14.2.2 Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The nature of the source, including its height relative to the ground, atmospheric factors (such as wind direction), and shielding (such as by topographic features) all influence how sound decreases over distance. The manner in which noise reduces with distance depends on whether the source is localized (point) or multiple sources on a defined path (line). The sound level decreases at a rate of approximately 6 decibels for each doubling of distance from a point source plus attenuation due to atmosphere, ground impedance, and diffraction.

Noise from a line source propagates outward in a cylindrical pattern.

Sound levels attenuate at a rate of approximately 3 decibels for each doubling of distance from a line source (such as a highway) plus attenuation due to atmosphere, ground impedance, and diffraction.

The propagation path of noise from a highway to a receiver is usually very close to the ground. For acoustically absorptive or soft sites (those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 decibels per doubling of distance.

3.14.2.3 Pinto Valley Mine Measures and Indicators

Table 3-69 below provides the resource indicators and measures for assessing potential effects from noise.

Table 3-69. Resource indicators and measures for assessing effects on noise

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Mine operations and reclamation noise	A-weighted decibels	A-weighted decibels	Yes	Pinto Valley Mining Corp.–provided noise levels and Federal Highway Administration noise levels
Traffic noise	Proximity to traffic noise sources A-weighted decibels	Distance/feet from traffic noise sources A-weighted decibels	Yes	Traffic noise modeled by WestLand Resources, Inc. (2018c) using the Federal Highway Administration Traffic Noise Model
Blasting noise and vibration	A-weighted decibels Vibration decibels	A-weighted decibels Vibration decibels	Yes	Office of Surface Mining vibration standard

3.14.3 Affected Environment

Table 3-70 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-70. Resource indicators and measures for the existing condition for noise

Resource Element	Resource Indicator	Measure	Existing Condition
Existing sound levels	A-weighted decibels	A-weighted decibels	Average ambient sound level with no wind and far from human-made traffic and equipment noise: 30 A-weighted decibels Measured sound at representative noise receiver locations: Varies between 29.4 and 66.5 A-weighted decibels equivalent sound level depending on distance to existing roads and mining activities.

3.14.3.1 <u>Noise from Mine Operations, Reclamation, and Blasting</u>

Sound level measurements were performed to describe ambient noise levels in the area around the Pinto Valley Mine and to characterize noise sources (WestLand Resources, Inc. 2018c). The sound level measures capture sound generated from all noise sources including mine operations, ongoing reclamation activities, and blasting.

To describe the ambient noise environment, sound level measurements were made at the 10 locations shown on figure 3-14. The locations were selected based on accessibility and to define existing noise conditions around the mine and represent locations where the public and mine workers are most likely to be exposed to noise from the mine. A description and relative location from the Main Gate is shown in table 3-71. Sound level measurements were performed on Friday, October 13, 2017, and Thursday and Friday, November 2 and 3, 2017. Results of measurements and noise sources observed are shown in table 3-72.

Average, maximum, and minimum sound levels were recorded at each measurement location along with the date, time, and duration of the measurement; temperature; humidity; wind speed and direction; and a description of cloud cover. Wind speed was measured continuously during each measurement. No sound level measurements were taken when wind speeds were greater than 10 miles per hour. In addition, identifiable noise sources were noted.

Noise level measurements taken at sites 3 and 6 represented locations where the average level consisted primarily of natural sounds. Based on these measurements, it is assumed that the average ambient sound level in calm conditions (no wind) and far from traffic and equipment noise was approximately 30 A-weighted decibels. Accordingly, for the noise models 30 A-weighted decibels were added to all receivers to represent ambient conditions.

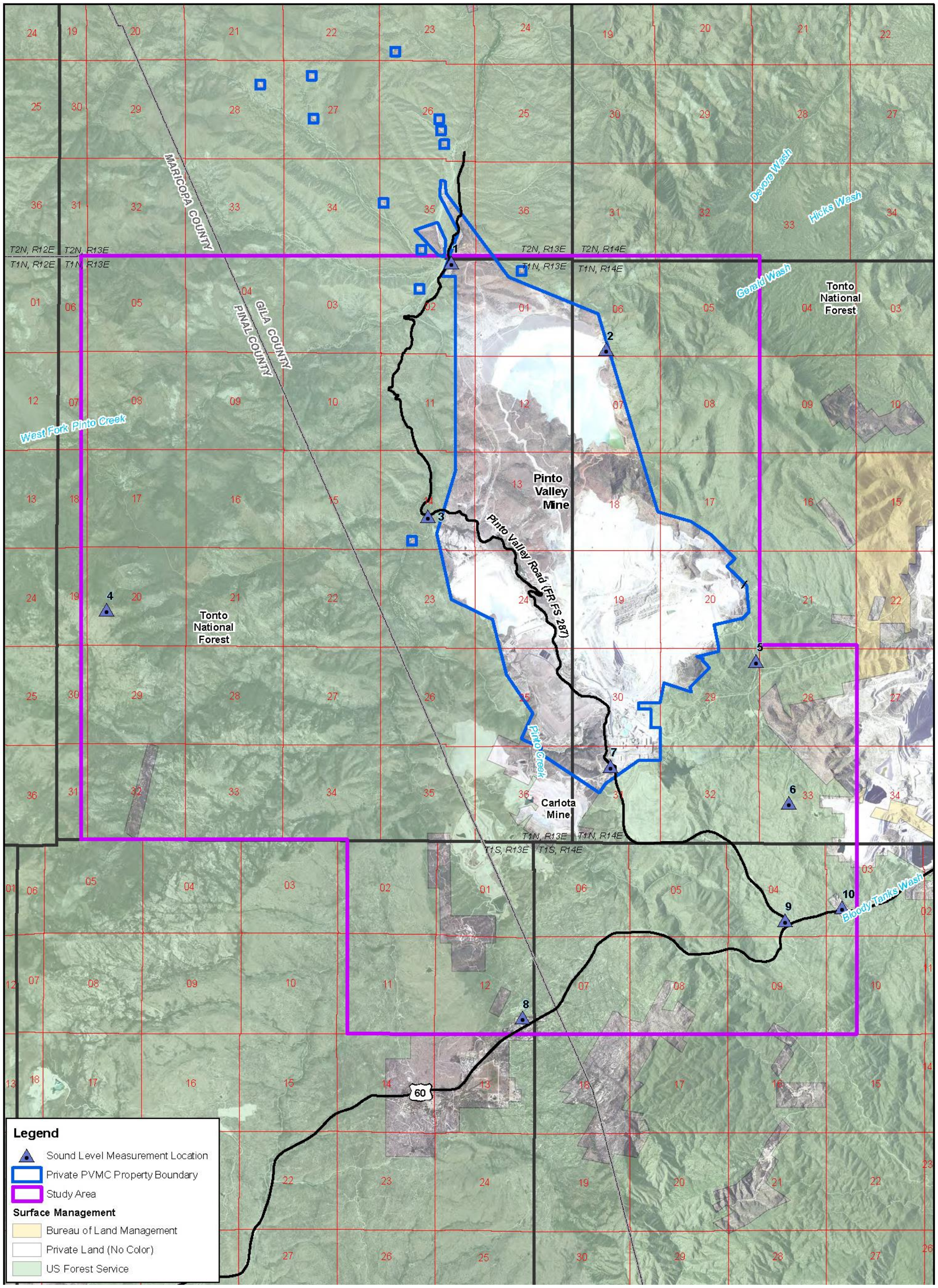

Figure 3-14. Sound measurement locations

Source: WestLand Resources, Inc. 2018c

Table 3-71. Ambient noise environment measurement locations

Measurement Location	Description	Distance from Main Gate (miles)	Purpose of Measurement
1	North-northwest of mine	5.22	Existing ambient conditions along Pinto Creek near Pinto Valley Mining Corp. private property boundary.
2	North of mine near Tailings Storage Facility No. 4	3.90	Existing ambient conditions at east side of Tailings Storage Facility No. 4 near the proposed extension onto National Forest System lands.
3	"Iron Bridge" at Pinto Creek	3.14	Existing ambient conditions at public use area (recreation consisting of hiking, picnicking, and birding). The model was also calibrated at this location.
4	Superstition Wilderness weather station near Government Hill	5.39	Existing ambient conditions in public use area (recreation consisting of hiking).
5	Along National Forest System Road 287B between Pinto Valley Mine and Miami Mine	1.49	Existing ambient conditions to differentiate Pinto Valley Mine, Miami Mine, and Carlota Mine. The model was also calibrated at this location.
6	Along National Forest System Road 287B between Carlota Mine and Miami Mine	1.84	Existing ambient conditions to differentiate Pinto Valley Mine, Miami Mine, and Carlota Mine. The model was also calibrated at this location.
7	National Forest System Road 287 near Pinto Valley Mine main gate	0.13	Existing ambient conditions near Pinto Valley Mine and Carlota Mine.
8	Top of the World	2.83	Existing ambient conditions at the residences closest to mine.
9	Intersection of U.S. Highway 60 and National Forest System Road 287	2.44	Existing ambient conditions to differentiate between traffic noise to the mine and along U.S. Highway 60. The traffic noise model was also calibrated at this location.
10	Residences near Mountain Breeze Cemetery	2.82	Existing ambient conditions at residences and near a site where serenity is valued. The traffic noise model was also calibrated at this location.

Source: WestLand Resources, Inc. 2018c

Table 3-72. Sound level measurement

Measurement Location	Duration (minutes)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	Predominant Noise Sources
1	15	38.9	42.9	28.9	Occasional cows mooing, birds, and insects
2	5	45.5	51.5	44.0	Water outlet of cyclone about 200 feet to the west
3	15	30.1	43.4	25.4	Birds and insects
4	15	36.7	45.9	23.7	Wind varied from calm to over 10 miles per hour; only used measurements when wind was less than 8 miles per hour. Most noise was wind through vegetation.
5	15	34.6	48.2	28.3	Faint sound of Pinto Valley Mine mining equipment
6	15	29.4	49.4	22.5	Birds and insects; faint sound of traffic from U.S. Highway 60 and occasional traffic on National Forest System Road 287
7	15	42.2	55.6	33.2	Pinto Valley Mine mining equipment; occasional traffic on National Forest System Road 287 and National Forest System Road 287B
8	15	45.0	51.9	33.1	Traffic on U.S. Highway 60 and birds
9	30	65.4	81.4	34.7	Traffic on U.S. Highway 60 and occasional traffic on National Forest System Road 287
10	30	66.5	80.7	36.2	Traffic on U.S. Highway 60

Source: WestLand Resources, Inc. 2018c

dBA = A-weighted decibel; L_{eq} = equivalent sound level; L_{max} = maximum sound level; L_{min} = minimum sound level

3.14.4 Environmental Consequences

3.14.4.1 **Analysis Methodology and Assumptions**

The analysis of impacts from noise applies the following methods and approaches:

- Noise from mining activities is modeled using the standard ISO 9613-2 (attenuation of sound during propagation outdoors, general method).
- Traffic noise is modeled using the Federal Highway Administration Traffic Noise Model.
- Modeled topography is based on existing U.S. Geological Survey digital elevation model data modified with Pinto Valley Mine topography from Pinto Valley Mining Corp.
- Modeling was conducted using the SoundPLAN Essential 3.0 noise modeling program.
- Potential noise impacts are analyzed across the alternatives and described for proximate recreational and other public use areas.

The modeling process and results are presented in detail in the "Noise Study to Support The U.S. Forest Service Evaluation of the Pinto Valley Mine Plan of Operations" (WestLand Resources, Inc. 2018c), which is summarized in this section and incorporated by reference.

Health-related noise exposure on the mine site is regulated by the Mine Safety and Health Administration, which is concerned with noise exposure, hearing protection, and hearing testing. Health-related noise exposure for Pinto Valley Mining Corp. employees or contractors is addressed in section 3.15, "Public Health and Safety," and is not further discussed here.

Noise pollution can be detrimental to wildlife generally; bird populations are particularly susceptible because they rely on acoustic signals for mating, predator evasion, and communication between adults and offspring, among other behaviors. Effects on wildlife are addressed in section 3.3.3.2, "Fish and Wildlife," and section 3.3.3.3, "Special Status Species," and are not further discussed here.

Refer to section 3.5, "Cultural Resources," for a description of potential noise impacts on cultural resources and historic properties.

The analysis of impacts from noise includes the following assumptions:

- Equipment noise levels are provided by Pinto Valley Mining Corp.; where no specific data were available, noise levels from the Federal Highway Administration database were determined appropriate for use in modeling.
- Traffic noise is modeled based on average annual traffic volume and fleet mix data provided by the Arizona Department of Transportation.
- Personnel commuter traffic and heavy truck trips are distributed based on a.m. and p.m. peak hours, with most heavy vehicle trips occurring during daytime hours.
- Blasting only occurs during the hours of 10:00 a.m. to 2:00 p.m., following the current procedure at the Pinto Valley Mine.
- Average ambient sound levels in calm conditions are assumed to have a value of 30 A-weighted decibels based on measurements (refer to table 3-72).

3.14.4.2 **No-Action Alternative – Direct and Indirect Impacts**

There are several categories of noise sources associated with operation of the mine and reclamation that were determined based on residential and recreational noise receptors and were included in the noise model (WestLand Resources, Inc. 2018c). These categories of noise sources consist of equipment and vehicles used in the operation of the mine, mills and conveyors, equipment and vehicles associated with reclamation, traffic on U.S. Highway 60 and National Forest System Road 287, and blasting. Additional considerations associated with each of these categories include the following:

- Noise modeling for equipment and vehicles used in the operation of the mine considered the A-weighted decibels generated by each vehicle and piece of equipment to generate a total sound power level for a given project year for the mine. The total sound power level was spread uniformly over areas of active mining such as the Open Pit and waste rock disposal areas.
- Noise from mills and conveyor areas was measured and modeled for the loudest adjacent area.
- Reclamation would generally occur during a 12-year period in three phases, each of which would employ different equipment and noise sources. Total sound power levels for equipment at reclamation locations in phases 1 and 3 were calculated for use in modeling; no heavy vehicles or equipment would be used in phase 2 and, therefore, no sound power levels were calculated for that phase.
- Traffic noise was modeled along U.S. Highway 60 and along National Forest System Road 287 using project traffic and assumptions for other non-mine-related projected travel growth along the route (U.S. Highway 60 only) during the life of the project.
- Noise from blasting was modeled using a conservative assumption (maximum potential) for the blasting charge weight per delay (1,200 pounds) and resulting sound power level.

Mining activities from operations through closure were divided into eight phases to represent distinct activity phases in the project life cycle. Table 3-73 shows project activities occurring during the eight phases modeled for the analysis for alternative 1 and the proposed action. The no-action alternative was not modeled separately, primarily because all activities and operations at the Pinto Valley Mine would begin transitioning to closure and reclamation following the record of decision; however, the noise sources for operation and reclamation would generally be the same as those of alternative 1 and the proposed action. The primary difference under the no-action alternative is that operational noise would cease following the record of decision and the 6-month transition period. As the mine fully transitions from active mining operations to reclamation and closure, vehicle trips would be reduced in proportion to the overall workforce and operational reductions during these phases under the no-action alternative. As a result, traffic noise would also be reduced under the no-action alternative when compared to alternative 1 and the proposed action.

Table 3-73. Project phases used in noise modeling

Phase	Period	Alternative 1 Activity	Proposed Action Activity
1	Existing–2027	Operation	Operation
2	2028–2030	Reclamation 1[86]	Operation
3	2031–2037	Reclamation 2[87]	Operation
4	2038	Reclamation 3[88]	Operation
5	2039–2040	Reclamation 3	Reclamation 1

[86] Reclamation phase 1 is a 3-year period during which reclamation will occur on the Main Dump and (future) West Dump, the low-grade ore Leach Piles, and the Inert Limestone Stockpile.
[87] Reclamation phase 2 is a 7-year period during which no reclamation activity will occur while waiting for consolidation of the tailings storage facilities.
[88] Reclamation phase 3 is a 3-year period during which reclamation will occur at Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4.

Phase	Period	Alternative 1 Activity	Proposed Action Activity
6	2041	None	Reclamation 1
7	2042–2048	None	Reclamation 2
8	2049–2051	None	Reclamation 3

Source: WestLand Resources, Inc. 2018c

During all eight phases modeled under alternative 1 and the proposed action, the mining-related sound is primarily concentrated inside the private Pinto Valley Mining Corp. property boundary, with the exception of the Open Pit expansion onto National Forest System lands under the proposed action. During periods when there are no mining or reclamation activities, such as phase 7 (2042–2048; table 3-73), noise levels greater than 60 A-weighted decibels are concentrated along U.S. Highway 60, and are due to traffic along U.S. Highway 60. Traffic on U.S. Highway 60 is a greater source of noise at adjacent receivers than activities at Pinto Valley Mine. The sound pressure levels (1-hour average) reported in this section represent average values. Actual noise levels at a given location and time may be higher or lower depending on the exact location of project activities that are currently unknown.

In general, the noise sources and activities are the same for the no-action alternative, alternative 1, and the proposed action. However, the duration of noise sources during active mining operations and timing of reclamation activities would vary due to the different duration of active mining operations under the alternatives. The analysis of impacts from noise is categorized below by active mining operations and reclamation, noise from traffic, and noise and vibrations from blasting.

Due to the distance of wilderness areas from sources of Pinto Valley Mine noise, no noise impacts on wilderness areas were identified; therefore, effects on primitive recreation use in these areas are not discussed below. The closest wilderness area to the Pinto Valley Mine is the Superstition Wilderness, located approximately 3 miles west of the project boundary. Modeling for a point along the eastern boundary of the Superstition Wilderness area (represented by noise receiver 4, located 5.39 miles west of the Main Gate) demonstrated that mining operations would not increase noise in this area (noise remained near the 30 A-weighted decibels ambient noise level).

3.14.4.2.1 Mining Operations and Reclamation Noise

The results of the noise modeling analysis conducted for the Pinto Valley Mine EIS (WestLand Resources, Inc. 2018c) under conditions representing alternative 1 are also assumed to be applicable to the no-action alternative due to the similar types of activities that would occur. However, the duration of noise sources during active mining operations would be substantially shorter than under alternative 1 and the proposed action.

Areas potentially affected by mine operations and reclamation noise occur along roads and in rural areas adjacent to the Pinto Valley Mine boundary. These areas may be used as locations for dispersed recreation and are likely used as travel routes to access recreation sites, such as Pinto Creek. Noise receivers 1, 2, 3, 5, and 7 are the most likely to be affected by mine-related noise due to their proximity to the mine and associated noise sources (figure 3-14). The other noise receptors did not have any notable modeled noise increases (WestLand Resources, Inc. 2018c). The closest residences are approximately 2.8 miles away in Top of the World and near the Mountain Breeze Cemetery (noise receiver locations 8 and 10 on figure 3-14 above).

Locations affected by active mining operations and reclamation noise under the no-action alternative are generally subject to existing, human-made noise from ongoing mining operation at the Pinto Valley Mine and adjacent Carlota Mine. However, under the no-action alternative, increases in noise levels could occur, primarily related to reclamation activities. The total sound power level associated with reclamation activities and equipment is slightly lower than the sound power level associated with operations activities and equipment, but some reclamation activities occur farther north, which results in greater sound levels projected at locations north of the Pinto Valley Mine project boundary near to potential recreational use areas. Because of the lack of other nearby human-made noises (such as highways) in these locations, during times where passive reclamation is occurring and after the mine is closed, these areas would revert to near ambient noise levels (30 A-weighted decibels).

Members of the public using recreation facilities immediately adjacent to the Pinto Valley Mine boundary would likely experience noise at levels in excess of 40 A-weighted decibels under the no-action alternative during the first 3 years following the record of decision when the majority of reclamation work would be completed (as modeled for alternative 1 and the proposed action and shown in table 3-74). Noise at this level in scenic areas is considered a potential disturbance to recreational users. Recreationists who choose to use sites close to the highly altered and active mine site may have different expectations for noise and disturbance, thus limiting potential impacts. However, it is likely that there would be some reduction in recreation experiences in adjacent areas as a result of noise impacts. Noise sources during phase 1 of reclamation activities include equipment and vehicles (earth-moving equipment, support vehicles, and pickup trucks), and traffic on National Forest System Road 287 and U.S. Highway 60. Reclamation noise during phase 2 would primarily be associated with traffic on U.S. Highway 60 and would generally decrease during phase 2 while tailing storage facilities are consolidated. Reclamation noise would increase again under phase 3 during reclamation of the tailing facilities.

3.14.4.2.2 Traffic Noise

Areas potentially affected by traffic noise include nearby residences and locations along roads used by vehicles traveling in and out of the Pinto Valley Mine. The nearest residences to the mine are currently primarily affected by noise from traffic on U.S. Highway 60. These locations would experience generally increasing levels of noise due to overall projected increases in public use and traffic on this highway over the next several decades. Under the no-action alternative, these closest residences would continue to be affected by traffic along U.S. Highway 60. While residences along U.S. Highway 60 are projected to experience noise in excess of 65 A-weighted decibels (day-night average), which could exceed U.S. Department of Housing and Urban Development noise compatibility standards, such exceedance would not be the result of activities under the no-action alternative. The only identified areas substantially influenced by project-related traffic noise are anticipated to be along National Forest System Road 287 and at the intersection of that road with U.S. Highway 60. After the mine closes and during periods of passive reclamation, noise levels would be consistent with those experienced at other locations along U.S. Highway 60.

3.14.4.2.3 Blasting Noise and Vibrations

Under the no-action alternative, Pinto Valley Mining Corp. does not anticipate the need for blasting unless blasting of active mining faces is needed to stabilize and prepare the mine for closure and reclamation. Pinto Valley Mining Corp. anticipates that few blasting events would occur and would employ the same standards and practices as the current blasting program. Blasting is a single noise event and is therefore calculated using a maximum sound level value versus an averaged 1-hour sound pressure level value. Blasting would not noticeably increase noise levels at the nearest residences, where traffic along U.S. Highway 60 would continue to dominate the noise setting. Only areas along National Forest System Road 287 and National Forest System Road 287B and public recreation areas directly adjacent to the mine to the west, such as at the Iron Bridge crossing of Pinto Creek, would experience noise effects from blasting (WestLand Resources, Inc. 2018c). No noise effects would occur on any nearby wilderness areas.

No vibration effects from blasting that exceed Office of Surface Mining Reclamation and Enforcement regulatory standards are anticipated under the no-action alternative. Airborne and ground vibrations caused by blasting are of concern when they cause property damage (Office of Surface Mining Reclamation and Enforcement blasting performance standards at 30 CFR 816.67). Due to the distance between the blasting location and the nearest residences, vibration impacts on residences are not expected.

3.14.4.3 **Alternative 1 and Proposed Action – Direct and Indirect Impacts**

Due to the relatively similar types of noise sources and activities under alternative 1 and the proposed action, noise impacts from both alternatives are discussed together in the analysis sections below. Potential noise impacts during operational activities would generally continue for approximately 7 more years under alternative 1, compared to the no-action alternative. Under the proposed action, noise impacts during operational activities would last for approximately 19 more years compared to the no-action alternative and 12 more years compared to alternative 1. Due to the extended period of active mining operations, noise impacts would be the greatest under the proposed action, followed by alternative 1, with the no-action alternative having the least potential for noise impacts. However, because the Pinto Valley Mine is an active mine, noise sources and impacts during active mining operations would generally be the same as under existing conditions.

3.14.4.3.1 Mining Operations and Reclamation Noise

Noise modeling for alternative 1 and the proposed action demonstrated no discernable effect from operation and reclamation activities in the Pinto Valley Mine project boundary at nearby residences (WestLand Resources, Inc. 2018c). Similar to the no-action alternative, areas potentially affected by mine operations and reclamation noise occur along roads and in rural areas adjacent to the Pinto Valley Mine boundary and noise receivers 1, 2, 3, 5, and 7 are the most likely to be affected by mine-related noise due to their proximity to the mine and associated noise sources (figure 3-14).

Locations affected by mining operations and reclamation noise under alternative 1 and the proposed action are the same as under the no-action alternative and subject to existing, human-made noise from ongoing mining operation at the Pinto Valley Mine and adjacent Carlota Mine. Increases in noise levels, primarily related to reclamation activities, are also anticipated under alternative 1 and the proposed action. Reclamation and closure activities would generally be the same as under the no-action alternative except that reclamation and closure would commence approximately 7 years later under alternative 1 and 19 years later under the proposed action.

Under alternative 1 and the proposed action, noise impacts on members of the public using recreation facilities immediately adjacent to the Pinto Valley Mine boundary would be the same as under the no-action alternative. As shown on figure 3-15 and in table 3-74, whether recreationists experience noise levels in excess of 40 A-weighted decibels at a given location depends on the project phase. For all alternatives, it is likely that there would be some reduction in recreation experiences in adjacent areas as a result of noise impacts during certain phases. Refer to section 3.5.4 for a description of noise impacts on cultural resources and historic properties.

Table 3-74. Summary of modeled sound pressure levels at selected noise receivers affected by mine operations and reclamation

Noise Receiver Location	Relevance	Range of Projected Sound Pressure Levels (2018–2051) and Phase with Highest Modeled Sound	
		Alternative 1 (1-hour average sound pressure level)	*Proposed Action (1-hour average sound pressure level)*
1	Potential dispersed recreation and travel along National Forest System Road 287	30.0–33.8 A-weighted decibels (highest modeled sound pressure level during phases 4 and 5)	30.0–33.7 A-weighted decibels (highest modeled sound pressure level during phase 8)
2	Potential dispersed recreation; area is generally remote and inaccessible to the public via roads and trails	30.0–58.6 A-weighted decibels (highest modeled sound pressure level during phases 4 and 5)	30.0–58.6 A-weighted decibels (highest modeled sound pressure level during phase 8)
3	Public recreation use area at Iron Bridge	30.0–43.0 A-weighted decibels (highest modeled sound pressure level during phase 2)	30.0–40.1 A-weighted decibels (highest modeled sound pressure level during phases 5 and 6)
5	Limited potential for recreation use along National Forest System Road 287B; public access is blocked at National Forest System Road 608	30.3–42.9 A-weighted decibels (highest modeled sound pressure level during phases 2, 4, and 5)	30.6–42.8 A-weighted decibels (highest modeled sound pressure level during phase 1)
7	Potential dispersed recreation and travel along National Forest System Road 287; immediately adjacent to mine entrance	33.9–52.6 A-weighted decibels (highest modeled sound pressure level during phases 2, 4, and 5)	34.4–52.5 A-weighted decibels (highest modeled sound pressure level during phase 1)

Source: WestLand Resources, Inc. 2018c

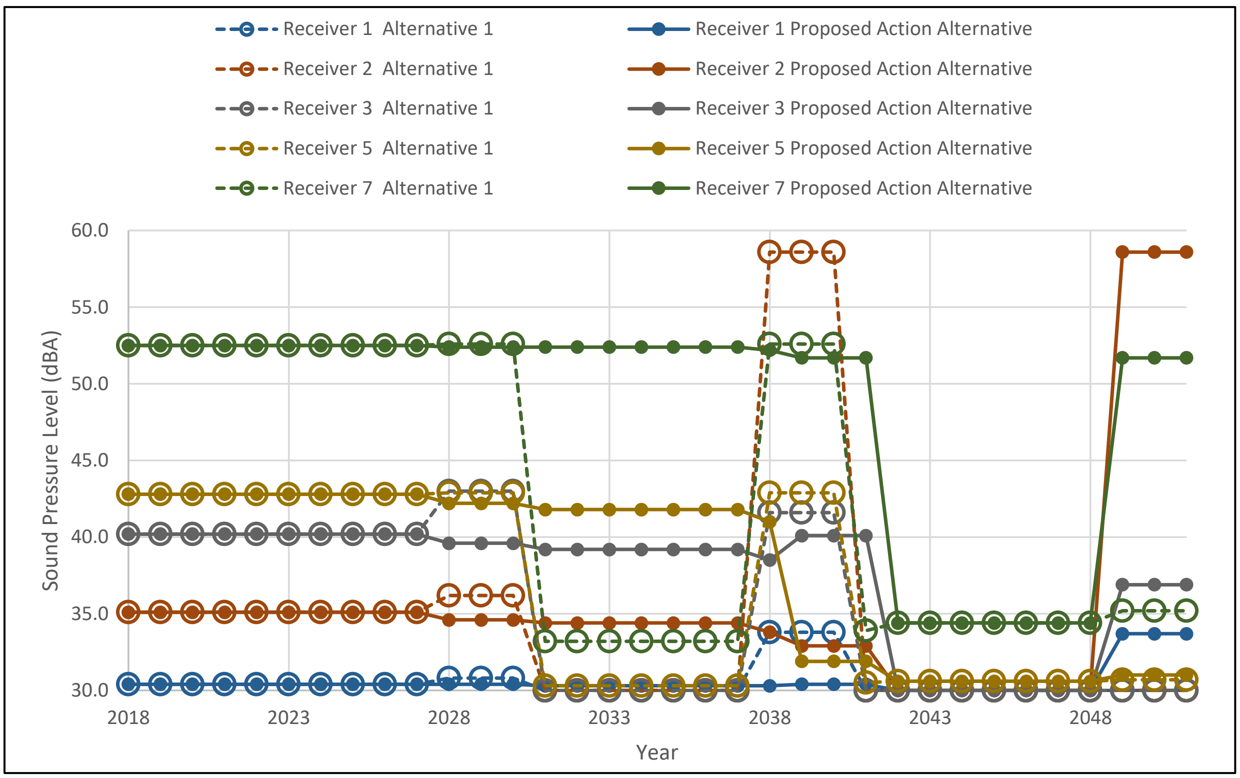

Figure 3-15. Summary of projected noise for receivers 1, 2, 3, 5, and 7

Source: WestLand Resources, Inc. 2018c

3.14.4.3.2 Traffic Noise

Areas potentially affected by traffic noise under alternative 1 and the proposed action are the same as described for the no-action alternative and include nearby residences and locations along roads used by vehicles traveling in and out of the Pinto Valley Mine. The nearest residences to the mine are currently primarily affected by noise from traffic on U.S. Highway 60 (refer to table 3-75). Under both alternative 1 and the proposed action, these closest residences would continue to be primarily affected by traffic along U.S. Highway 60. Under alternative 1 and the proposed action, noise modeling indicated the sound pressure level (1-hour average) at residences closest to the mine would not be affected by changes in vehicle trips associated with the Pinto Valley Mine. Similar to the no-action alternative, residences along U.S. Highway 60 are projected to experience noise in excess of 65 A-weighted decibels (day-night average), which could exceed the U.S. Department of Housing and Urban Development noise compatibility standards. However, similar to the no-action alternative, these potential exceedances would not be the result of mine-related traffic or activities under alternative 1 or the proposed action and would generally be associated with increased traffic and public use over the next several decades.

Similar to the no-action alternative, the only identified areas substantially influenced by project-related traffic noise are anticipated to be along National Forest System Road 287 and at the intersection of that road with U.S. Highway 60. As shown on figure 3-16, during operations and active reclamation under both alternative 1 and the proposed action, traffic noise in these areas would increase (see noise receiver location 9). Similar to the no-action alternative, recreationists using these areas would be affected as described under the “Mining Operations and Reclamation Noise” section above; however, noise impacts would continue for approximately 7 more years under alternative 1 and 19 more years under the proposed action compared to the no-action alternative. After the mine closes and during periods of passive reclamation, noise levels would be consistent with those experienced at other locations along U.S. Highway 60.

Table 3-75. Summary of modeled sound pressure levels at selected noise receivers affected by mine operations and reclamation

Noise Receiver Location	Relevance	Range of Projected Sound Pressure Levels (2018–2051) and Phase with Highest Modeled Sound	
		Alternative 1 (1-hour average sound pressure level)	***Proposed Action (1-hour average sound pressure level)***
6	Along National Forest System Road 287B; limited road traffic but near Carlota Mine and Miami Mine	39.5–44.0 A-weighted decibels (highest modeled sound pressure level during phase 8)	39.5–44.1 A-weighted decibels (highest modeled sound pressure level during phase 8)
8	Residences in Top of the World, representing effects on those closest to the mine and potential effects on residents on U.S. Highway 60 west of Pinto Valley Mine	53.9–59.6 A-weighted decibels (highest modeled sound pressure level during phase 8)	53.9–59.6 A-weighted decibels (highest modeled sound pressure level during phase 8)
9	Road intersection of U.S. Highway 60 and National Forest System Road 287	56.8–61.7 A-weighted decibels (highest modeled sound pressure level during phase 5)	59.1–62.8 A-weighted decibels (highest modeled sound pressure level during phase 8)
10	Residences near Mountain Breeze Cemetery, representing potential effects on residents on U.S. Highway 60 east of Pinto Valley Mine.	61.0–66.7 A-weighted decibels (highest modeled sound pressure level during phase 8)	61.0–66.7 A-weighted decibels (highest modeled sound pressure level during phase 8)

Source: WestLand Resources, Inc. 2018c

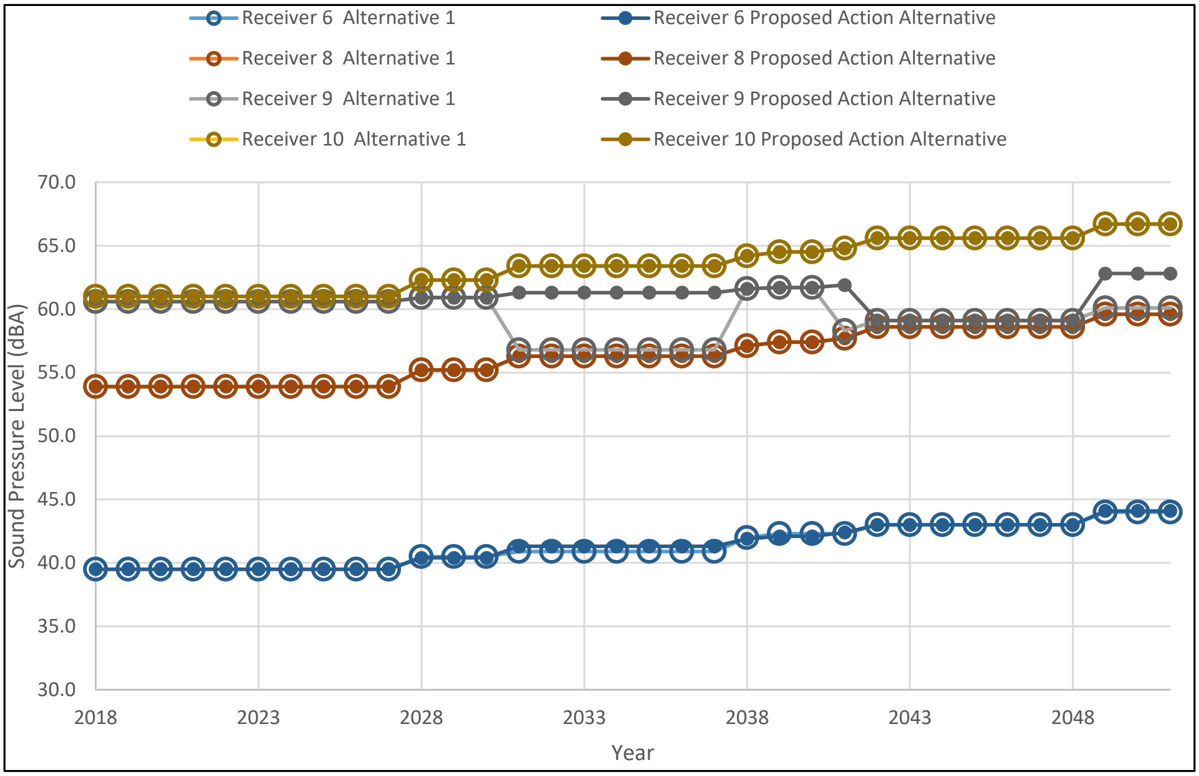

Figure 3-16. Summary of projected noise for receivers 6, 8, 9, and 10

Source: WestLand Resources, Inc. 2018c

3.14.4.3.3 Blasting Noise and Vibrations

The noise impacts from blasting under alternative 1 and the proposed action would be greater compared to the no-action alternative due to the substantial increase in the frequency and duration of blasting under alternative 1 and the proposed action. For both alternative 1 and the proposed action, blasting operations would generally continue to be conducted once daily during daylight hours, typically between 10 a.m. and 2 p.m. Under alternative 1, daily blasting would continue for approximately 7 more years compared to the no-action alternative. Under the proposed action, daily blasting would continue for approximately 19 more years compared to the no-action alternative and 12 more years compared to alternative 1. However, similar to the no-action alternative, only areas along National Forest System Road 287 and National Forest System Road 287B and public recreation areas directly adjacent to the mine to the west, such as at the Iron Bridge crossing of Pinto Creek, would experience noise effects from blasting (WestLand Resources, Inc. 2018c).

Vibration effects from blasting under alternative 1 and the proposed action would be similar and would not exceed Office of Surface Mining Reclamation and Enforcement regulatory standards. Vibration impacts on residences are not anticipated under alternative 1 or the proposed action due to the distance between the blasting location and the nearest residences.

3.14.4.4 <u>Cumulative Impacts</u>

The cumulative impact analysis area for noise includes Pinto Valley Mine and surrounding residential and recreational use areas up to 4 miles from the perimeter of the Pinto Valley Mining Corp. property boundary, extending through portions of Gila County to Pinal County and the Tonto National Forest—

the same area used to analyze direct and indirect effects in section 3.14.4, "Environmental Consequences." The analysis area encompasses approximately 174 square miles (approximately 111,043 acres) and accounts for areas where noise increases could occur due to the project, including blasting activities and truck and equipment traffic on local and access roads. The temporal boundary for analyzing cumulative noise impacts includes the ongoing operation of Pinto Valley Mine and extends through closure and final reclamation.

Section 3.14.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on noise. Within the cumulative impacts analysis area, past and present activities that have contributed to cumulative impacts and the existing noise condition include equipment and vehicles used in the operation of the mine, mills and conveyors, equipment and vehicles associated with reclamation, traffic on U.S. Highway 60 and National Forest System Road 287, and blasting.

The primary ongoing and reasonably foreseeable actions that may contribute to cumulative noise impacts when combined with Pinto Valley Mining Corp.'s proposed action are traffic along U.S. Highway 60 and human-made noise from ongoing mining operations at the Carlota and Freeport-McMoRan Miami copper mines. However, the Carlota Mine operations are currently winding down and, with the use of smaller haul trucks and decline in activity, the Carlota Mine would likely not notably contribute to cumulative noise effects into the future. The analysis of direct and indirect effects on noise in section 3.14.4, "Environmental Consequences," characterized ambient noise levels and, therefore, accounts for cumulative impacts from past and ongoing actions. No other ongoing or reasonably foreseeable future actions are expected to have a cumulative effect on noise due to their distance from Pinto Valley Mine and anticipated noise emissions.

This cumulative analysis considers the present effects of past actions described in section 3.14.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect noise in the future as identified in table 3-3 and further described in table 3-2.

3.14.4.4.1 Mining Operations and Reclamation

Present effects of the relevant past and present actions have resulted in the noise conditions presented in section 3.14.3, "Affected Environment." Present and reasonably foreseeable actions that could contribute to cumulative noise impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative mining operations and reclamation-related noise impacts include human-made noise from ongoing mining operation at the Pinto Valley Mine, Carlota Mine, and Freeport-McMoRan Miami Mine. Noise modeling for the proposed action demonstrated no discernable effect from operation and reclamation activities in the Pinto Valley Mine project boundary at nearby residences (WestLand Resources, Inc. 2018c). Areas potentially affected by mine operations and reclamation noise occur along roads and in rural areas adjacent to the Pinto Valley Mine boundary and noise receivers 1, 2, 3, 5, and 7 are the most likely to be affected by mine-related noise due to their proximity to the mine and associated noise sources (figure 3-14).

The differences in cumulative noise impacts from mining operations and reclamation among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.14.4.2 and 3.14.4.3. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Under the proposed action, noise impacts during operational activities would last for approximately 19 more years compared to the no-action alternative and 12 more years compared to alternative 1.
- Reclamation and closure activities under the proposed action would commence approximately 7 years later than under alternative 1 and 19 years later than under the no-action alternative.

Based on the factors listed above, the proposed action is anticipated to result in a greater potential for cumulative noise impacts from mining and operations than the other alternatives. However, noise modeling for alternative 1 and the proposed action demonstrated no discernable effect from operation and reclamation activities in the Pinto Valley Mine project boundary at nearby residences (WestLand Resources, Inc. 2018c).

3.14.4.4.2 Traffic Noise

Present effects of the relevant past and present actions have resulted in the traffic noise conditions presented in section 3.14.3, "Affected Environment." Present and reasonably foreseeable actions that could contribute to cumulative traffic noise impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative traffic noise impacts include the Pinto Valley Mine, Carlota Mine, and Freeport-McMoRan Miami Mine. The nearest residences to the mine are currently primarily affected by noise from traffic on U.S. Highway 60 (refer to table 3-75). Under the proposed action, these closest residences would continue to be primarily affected by traffic along U.S. Highway 60. Noise modeling indicated the sound pressure level (1-hour average) at residences closest to the mine would not be affected by changes in vehicle trips associated with the Pinto Valley Mine. Residences along U.S. Highway 60 are projected to experience noise in excess of 65 A-weighted decibels (day-night average), which could exceed the U.S. Department of Housing and Urban Development noise compatibility standards. However, these potential exceedances would not be the result of mine-related traffic or activities under the proposed action and would generally be associated with increased traffic and public use over the next several decades.

The differences in cumulative impacts from traffic noise among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.14.4.2 and 3.14.4.3. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Under the proposed action, traffic noise impacts during would last for approximately 19 more years compared to the no-action alternative and 12 more years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater potential for cumulative noise impacts from traffic.

Blasting Noise and Vibrations

Present effects of the relevant past and present actions have resulted in the blasting noise and vibration conditions presented in section 3.14.3, "Affected Environment." Present and reasonably foreseeable actions that could contribute to cumulative blasting noise and vibrations in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative blasting noise and vibration include the Pinto Valley Mine, Carlota Mine, and Freeport-McMoRan Miami Mine. Only areas along National Forest System Road 287 and National Forest System Road 287B and public recreation areas directly adjacent to the mine to the west, such as at the Iron Bridge crossing of Pinto Creek, would experience noise effects from blasting (WestLand Resources, Inc. 2018c). No noise effects would occur on any nearby wilderness areas. Vibration effects from blasting under the proposed action would not exceed Office of Surface Mining Reclamation and Enforcement regulatory standards.

The differences in cumulative impacts from blasting noise and vibrations among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.14.4.2 and 3.14.4.3. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The noise impacts from blasting under alternative 1 and the proposed action would be greater compared to the no-action alternative due to the substantial increase in the frequency and duration of blasting under alternative 1 and the proposed action. For both alternative 1 and the proposed action, blasting operations would generally continue to be conducted once daily during daylight hours, typically between 10 a.m. and 2 p.m.
- Under the proposed action, daily blasting would continue for approximately 19 more years compared to the no-action alternative and 12 more years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater potential for cumulative blasting noise and vibration impacts.

3.15 Public Health and Safety

This section focuses on potential impacts on human health and safety from natural conditions and the operations and proposed expansion of Pinto Valley Mine. Public health and safety can be directly affected by mine operations and by indirect effects related to water quality, geologic risks, hazardous materials, noise, air quality, and traffic and transportation. More detailed information on impacts on each of these resources can be found in their respective sections within this EIS. The affected environment and environmental consequences presented here focus specifically on risks to public health and safety.

The analysis area for direct and indirect effects on public health and safety is the operational areas associated with the Pinto Valley Mine, and National Forest System Road 287 from U.S. Highway 60 through the Pinto Valley Mine project boundary. Although not specifically delineated as part of the analysis area, this section also recognizes potential public health and safety impacts on all other transportation routes used for mine-related traffic, including hazardous materials shipments. The temporal boundary for analyzing direct and indirect effects on public health and safety includes the ongoing operations at Pinto Valley Mine through post-closure of the mine.

3.15.1 Relevant Laws, Regulations, and Policy

3.15.1.1 **Federal Authorities**

3.15.1.1.1 Federal Mine Safety and Health Act of 1977

The Federal Mine Safety and Health Act sets health and safety standards, inspection requirements, and record-keeping requirements for mine operators. Enforcement responsibilities under this act are under the Department of Labor.

3.15.1.1.2 Pollution Prevention Act of 1990

The Pollution Prevention Act requires facilities to adopt pollution source reduction techniques and to submit annually to the Toxics Release Inventory.

3.15.1.1.3 Emergency Planning and Community Right-to-Know Act of 1986

The Emergency Planning and Community Right-to-Know Act directs facilities working with extremely hazardous substances to engage in emergency planning activities and to immediately report accidental releases of hazardous substances.

3.15.1.1.4 Protection of Children from Environmental Health Risks and Safety Risks, Executive Order 13045 of April 21, 1997

Executive Order 13045 directs Federal agencies to ensure any actions do not present disproportionate environmental health or safety risks to children.

3.15.1.1.5 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Executive Order 12898 of February 11, 1994

Executive Order 12898 directs Federal agencies to ensure any actions do not present disproportionate environmental health or safety risks to minority and low-income populations.

3.15.1.1.6 National Dam Safety Program

The National Dam Safety Program is a partnership of states, federal agencies and other stakeholders to encourage and promote the establishment and maintenance of effective federal and state dam safety programs to reduce the risk to human life, property, and the environment from dam related hazards.

3.15.1.2 **Forest Service Regulations, Policies, and Guidance**

3.15.1.2.1 Title 36, Part 228, Subpart A of the Code of Federal Regulations – Forest Service Locatable Mineral Regulations

Locatable mineral regulations at 36 CFR 228 subpart A set forth rules and procedures for maintaining public health and safety associated with locatable mineral operations on National Forest System lands.

3.15.1.2.2 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for public health and safety (Forest Service 1985):

- "Wildland fires or portions of fires will be suppressed when they adversely affect forest resources, endanger public safety or have a potential to damage significant capital investments."
- "Reconstruct arterial roads as needed to provide for public safety."
- "Maintain roads to provide for public safety, commodity haul, and resource protection in accordance with [Forest Service Manual] 7700 and 7730."
- "Use of approved herbicides on a selective basis where brush encroachment is clearly inhibiting forage production for wildlife and domestic livestock."

Public health and safety are managed through resource management directions in the Tonto National Forest Plan for wildland fires, visitor services, trails, roads, and pesticides (Forest Service 1985). Each management direction contributes to the overall management of public health and safety in accordance with the mission and goals of the Tonto National Forest Plan. Protecting public health and safety is consistent with the goal of promoting dependent user stability through direct supply of products as well as providing community stability and enjoyment through both direct and indirect products and opportunities such as recreation. This direction applies to all management areas identified in the Tonto National Forest.

3.15.1.3 State and Local Laws, Regulations, and Policies

3.15.1.3.1 Arizona Health Menaces (Arizona Revised Statute 36-601–Arizona Revised Statute 36-606) and Industrial Sanitation (Arizona Revised Statute 36-641) Laws

These State laws require Arizona facilities to comply with State health requirements and inspections, and to provide proper bathrooms and washrooms in their facilities.

3.15.1.3.2 Arizona Occupational Safety and Health Act State Plan

The Arizona Occupational Safety and Health Act State Plan provides Occupational Safety and Health Act standards and guidance specific to the State of Arizona.

3.15.1.4 Other Guidance and Recommendations

3.15.1.4.1 Arizona Climate and Health Adaptation Plan

This plan was developed "as a tool for State and local agencies to support related public health initiatives" and identifies guidance principles across 10 essential public health services to be incorporated in State decisions in collaboration with partners (Arizona Department of Health Services 2017).

3.15.2 Resource Indicators

Table 3-76 below provides the resource indicators and measures for assessing potential effects on public health and safety.

Table 3-76. Resource indicators and measures for assessing effects on public health and safety

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Physical hazards	Physical hazards at Pinto Valley Mine	Physical access and security features	Yes	Pinto Valley Mining Corp. plan of operations
Blasting	Exclusion of public from blasting areas	Implementation of blasting closure order	Yes	Forest Service blasting closure order
Hazardous and nonhazardous materials	Risk of exposure to hazardous and nonhazardous materials at Pinto Valley Mine, transportation routes and associated areas or facilities supporting mine operations	Phoenix Fire Code hazard classification	Yes	Pinto Valley Mining Corp. inventory of hazardous and nonhazardous materials. Refer to section 3.11, "Hazardous and Nonhazardous Materials."

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Vehicle traffic	Risk of vehicle collisions from mine-related traffic	Mine-related vehicle trips, vehicle crash rate	Yes	Pinto Valley Mining Corp. vehicle trip estimates. Refer to section 3.19, "Traffic and Transportation."
Noise	Change in noise levels for people on site, nearby recreational users, and at nearby residences due to mine-related activity	A-weighted decibels and vibration decibels	Yes	Noise modeling conducted for Pinto Valley Mine EIS. Refer to section 3.14, "Noise."
Water quality	Change in surface water or groundwater quality from mine-related activity	Water quality modeling and analysis	Yes	Water quality analysis for Pinto Valley Mine EIS. Refer to section 3.21, "Water Resources and Hydrogeochemistry."
Air quality	Changes in criteria air pollutant and hazardous air pollutant emissions from mine-related activity	Air quality modeling and analysis	Yes	Air quality modeling and analysis for Pinto Valley Mine EIS. Refer to section 3.2, "Air Quality."
Geotechnical stability	Stability of tailings storage facilities, the Open Pit, and dumps	Stability of facilities	Yes	Stability analyses. Refer to section 3.9, "Geology, Minerals, and Geotechnical Stability."
Geotechnical stability	Pit slope stability hazards	Pit slope stability assessment	Yes	Stability analyses. Refer to section 3.9, "Geology, Minerals, and Geotechnical Stability."

3.15.3 Affected Environment

Table 3-77 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-77. Resource indicators and measures for the existing condition for public health and safety

Resource Element	Resource Indicator	Measure	Existing Condition
Physical hazards	Physical hazards at Pinto Valley Mine	Physical access and security features	Pinto Valley Mine uses security staff, fencing, and physical barriers to restrict public access to mine facilities.
Blasting	Exclusion of public from blasting areas	Implementation of blasting closure order	Pinto Valley Mining Corp. implements a Forest Service blasting closure order, temporarily excluding public access within 1,500 feet from the blasting site.

Resource Element	Resource Indicator	Measure	Existing Condition
Hazardous and nonhazardous materials	Risk of exposure to hazardous and nonhazardous materials at Pinto Valley Mine, transportation routes and associated areas or facilities supporting mine operations	Phoenix Fire Code hazard classification	Pinto Valley Mine operations require transportation, storage, and use of various hazardous and nonhazardous materials. Public health risks are present, but minimized through compliance with laws and regulations.
Vehicle traffic	Risk of vehicle collisions from mine-related traffic	Mine-related vehicle trips, vehicle crash rate	Average of 525 vehicle roundtrips to and from Pinto Valley Mine each day during regular mine operations. Vehicle crash rate on National Forest System Road 287 is 74 percent lower than the nationwide average.
Noise	Change in noise levels for people on site, nearby recreational users, and at nearby residences due to mine-related activity	A-weighted decibels and vibration decibels	Traffic noise from U.S. Highway 60 is the primary human-made noise source at nearest residences to Pinto Valley Mine.
Water quality	Change in surface water or groundwater quality from mine-related activity	Water quality modeling and analysis	The Arizona Department of Environmental Quality has classified segments of Pinto Creek as impaired for copper, or for selenium and copper. Refer to appendix E for more information on impaired segments of Pinto Creek. Parameters that have exceeded permit requirements (once or more for the period) for surface water quality include dissolved selenium and total selenium. The parameters of concern at Pinto Valley Mine that were reported as exceeding the Aquifer Protection Permit requirements were total dissolved solids (alert level), sulfate (alert level), and gross alpha (aquifer quality limit). Monitoring wells located downgradient from Tailings Storage Facility Nos. 1 and 2, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4 have high concentrations of total dissolved solids and sulfate that exceed the non-enforceable National Secondary maximum contaminant levels. Refer to appendix E for more information.
Air quality	Changes in criteria air pollutant and hazardous air pollutant emissions from mine-related activity	Air quality modeling and analysis	From 2015 to 2017, levels of carbon monoxide, lead, nitrogen dioxide, PM_{10}, and sulfur dioxide (1-hour average) and $PM_{2.5}$ were within National Ambient Air Quality Standards; only ozone exceeded National Ambient Air Quality Standards. Refer to section 3.2, “Air Quality,” for more information.
Geotechnical stability	Stability of tailings storage facilities, the Open Pit, and dumps	Stability of facilities	Tailings Storage Facilities No. 3 and No. 4 meet Best Available Demonstrated Control Technology design criteria.
Geotechnical stability	Pit slope stability hazards	Pit slope stability assessment	Slope stability factors safety for both static and pseudo-static (seismic) loading conditions were shown to meet the Best Available Demonstrated Control Technology design criteria.

3.15.3.1 Physical Hazards

The close proximity of recreationists and mine facilities may pose safety concerns, as there are a number of physical hazards associated with an active mine site including electrical power lines, pipelines, and pumping systems. There is a Pinto Valley Mine identification sign on National Forest System lands at the corner of U.S. Highway 60 and National Forest System Road 287, which alerts the public to the mine's presence. Pinto Valley Mine has security staff on site at all times including security personnel posted at the main entrance gate. Six-foot chain link fencing with three strands of barbed wire is in place in pedestrian corridors and parking lots. Other barriers, including earthen berms and natural terrain, lockable gates at access points along National Forest System Road 287, and restricted access signage, are used throughout Pinto Valley Mine to deter any accidental public access.

3.15.3.2 Blasting

Pinto Valley Mining Corp. utilizes conventional open-pit hard rock mining methods employing drilling, blasting, loading, and hauling to extract copper-bearing sulfide ore. To uncover the rock and ore-bearing minerals in the Open Pit, blasting of the waste rock and sulfide ore is performed approximately 124 times per year for waste rock and slightly more frequently at 136 times per year for the sulfide ore. Blasting typically occurs at noon but always between 10 a.m. and 2 p.m. Pursuant to 16 U.S. Code 551 and 36 CFR 261.50(a) and (b), the Forest Service implements a blasting closure order that legally prohibits the public from entering areas abutting the eastern portion of the mine. Prior to blasting, Pinto Valley Mining Corp. will implement the blasting closure order and establish an exclusion zone of 1,500 feet from the blasting site, extending onto National Forest System lands. This exclusion zone includes segments of National Forest System Road 287B for a distance of 0.4 mile, National Forest System Road 2607 for a distance of 0.3 mile, National Forest System Road 2600 for a distance of 1.2 miles, and National Forest System Road 2608 for a distance of 0.4 mile. This closure was implemented from May 2017 through May 2019, and has been renewed starting in June 2020 (Forest Service 2020e).

Blasting generally releases toxic gases, primarily oxides of nitrogen and carbon monoxide. Nitric oxide and nitrogen dioxide are produced by large surface blasts in which the explosive does not detonate properly. Nitric oxide released by the blasting oxidizes to nitrogen dioxide as the fumes mix with the atmosphere. Excessive nitrogen dioxide production is apparent as an orange cloud that forms above the blasting site. Nitrogen dioxide is extremely toxic. Following a blast, workers must wait long enough to allow the fumes to dissipate, using a portable gas monitor to ensure that the air near the blast site is safe to breathe before proceeding. Mine workers may become ill or die if they remain in an area where toxic fumes levels are high. Between 1994 and 2005, eight miners in the U.S. were injured by exposure to blasting fumes (Centers for Disease Control and Prevention 2017). Blasting personnel are specifically trained on this task and closely comply with Mine Safety and Health Administration and Bureau of Alcohol, Tobacco, Firearms and Explosives standards.

3.15.3.3 Hazardous and Nonhazardous Materials

A variety of hazardous and nonhazardous materials are transported to and from Pinto Valley Mine and stored for use in mine operations. Hazardous materials, when released uncontrolled into the environment, can affect public health and safety. Acute exposure to hazardous materials can result in health hazards. Chronic exposure to hazardous materials, as might occur from contamination or airborne pollutants, can also result in severe adverse health effects or impairment or destruction of natural resources used by the public. Nonhazardous materials are not subject to the same level of regulation, but include mining overburden and inherently waste-like materials that may be capable of causing harm to the environment and human health if mismanaged. Each material stored or used on site at Pinto Valley Mine has been assigned a corresponding Phoenix Fire Code hazard classification, as identified in appendix G, “Hazardous and Nonhazardous Materials Inventory.” These classifications specify potential physical and health hazards from exposure. Acute exposure to certain hazardous materials could cause skin irritation and sensitization or asphyxiation. Other hazardous materials contain toxic elements that could target certain body organs or act as a carcinogen to the exposed individual. Other materials are combustible and may threaten human safety if they were to catch fire. Pinto Valley Mining Corp.’s safety protocols and staff training, as well as adherence to all laws and regulations applicable to the transport, storage, use, and disposal of hazardous and nonhazardous materials, minimizes the potential for human exposure to materials that cause adverse health effects.

Mine tailings can threaten public health and safety if released from their storage facilities within the mine. A dam break at Pinto Valley Mine in 1997 released 370,000 cubic yards of tailings and non-mineralized waste rock from Tailings Storage Facility No. 1 and Tailings Storage Facility No. 2. The released material traveled into Pinto Creek. All materials were removed from National Forest System lands and a stabilization buttress was constructed to restore the integrity of these tailings storage facilities. Monitoring programs revealed that the incident did not cause unacceptable risk to human health or the environment (BHP Copper, Inc. 1999).

Refer to section 3.11, “Hazardous and Nonhazardous Materials,” and appendix G, “Hazardous and Nonhazardous Materials Inventory,” for more information on the types, locations, and amounts of these materials at Pinto Valley Mine.

3.15.3.4 Vehicle Traffic

National Forest System Road 287 is the primary access route to Pinto Valley Mine from U.S. Highway 60. The predominant use of National Forest System Road 287 is for mine-related vehicle trips including access to the Carlota Mine, and it also provides access for other public and private uses such as recreation and ranching. Ongoing mine operations generate an estimated average of 525 vehicle roundtrips per day (or 990 total one-way vehicle trips per day) to and from Pinto Valley Mine. A traffic count conducted on National Forest System Road 287 recorded an average daily traffic volume of up to 1,248 vehicles per day over a 3-day period in September 2016 (AMEC 2018b). The vehicle crash rate on National Forest System Road 287 is 44 per 100 million vehicle miles traveled, 74 percent lower than the nationwide average (AMEC 2018b). Average daily traffic for U.S. Highway 60 can reach up to 29,677 vehicles per day, as recorded in 2016. The vehicle crash rate on U.S. Highway 60 is 133 per 100 million vehicle miles traveled. Refer to section 3.19, “Traffic and Transportation,” for additional information about vehicle traffic and crash rates.

3.15.3.5 Noise

High noise levels could affect public health by leading to both auditory and nonauditory health effects such as hypertension and changes in blood pressure and heart rate, impairment of cognitive performance, and sleep interference (Basner et al. 2014). Noise levels resulting from proposed mine operations are a key resource indicator, as there is a direct correlation between increased noise levels and increased human health risks. Noise levels were measured in October and November of 2017. The average sound levels at Top of the World and at the residences near Mountain Breeze Cemetery were 45.0 A-weighted decibels and 66.5 A-weighted decibels, respectively. These locations represent the closest public residences to Pinto Valley Mine and the areas with the greatest potential to experience public health impacts. The predominant noise source at both locations was the traffic on U.S. Highway

60 and not Pinto Valley Mine operations. The measured noise values at these locations fall in the equivalent range of a dishwasher running in the next room to normal speech from a distance of 3 feet. These values are lower than the noise levels at which action may be taken to protect public health (Basner et al. 2014), indicating that public health in nearby communities is not currently threatened by noise. Refer to section 3.14, “Noise,” for more information on existing noise levels and potential impacts.

3.15.3.6 **Water Quality**

Surface water and groundwater quality in the Pinto Creek watershed and Roosevelt Lake downstream of Pinto Valley Mine affect use of these waters for recreation and as public water supplies. Pinto Valley Mining Corp. conducts water quality monitoring in accordance with its Aquifer Protection Permit (Arizona Department of Environmental Quality 2019a) and all State and Federal laws. Staff who perform this monitoring are trained in water sampling and take samples at 14 locations throughout the analysis area, including groundwater wells and springs. Each sample is analyzed for compliance quarterly. Refer to section 3.21, “Water Resources and Hydrogeochemistry,” for more information on existing surface water and groundwater quality.

3.15.3.7 **Air Quality**

Air quality is regulated for two general classes of pollutants: criteria pollutants and hazardous air pollutants. Criteria pollutants are those pollutants for which National Ambient Air Quality Standards have been established to protect public health, and include carbon monoxide, nitrogen dioxide, ozone, $PM_{2.5}$ and PM_{10}, sulfur dioxide, and lead (40 CFR 50). Hazardous air pollutants consist of almost 200 toxic compounds that may cause cancer or other serious health impacts, or that may cause adverse environmental and ecological effects (U.S. Environmental Protection Agency 2017). Hazardous air pollutants are regulated under the National Emission Standards for Hazardous Air Pollutants (40 CFR 61 and 63). Local and regional air quality impacts from emissions of criteria pollutants and hazardous air pollutants at Pinto Valley Mine could affect public health. Refer to section 3.2, “Air Quality,” for more information on existing air quality.

3.15.3.8 **Geotechnical Stability**

. Pinto Valley Mining Corp. maintains and applies a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). Refer to section 3.9, “Geology, Minerals, and Geotechnical Stability,” for additional information.

Public access to the Open Pit is restricted to provide for public safety. Pinto Valley Mining Corp. maintains a daily pit slope monitoring program to protect against any failures that could affect worker safety. Precautionary monitoring protocols include visual inspections, radar monitoring, light detection and ranging scanning, and piezometers. Refer to section 3.9, “Geology, Minerals, and Geotechnical Stability,” for additional information.

3.15.4 Environmental Consequences

3.15.4.1 **Analysis Methodology and Assumptions**

The analysis of impacts on public health and safety applies the following methods:

- Assessment of impacts associated with potential exposure to materials using the Phoenix Fire Code hazard classification and description of systems in place to reduce these impacts.
- Quantification of the potential for vehicle accidents based on the volume of mine-related vehicle trips.
- Assessment of impacts on public health and safety from geologic hazards, noise, potential tailings storage facility or pit slope failure, and degradation of air or water quality. Assessments draw upon resource-specific modeling when available.

The analysis of impacts on public health and safety includes the following assumptions:

- Hazardous and nonhazardous materials would be transported to and from Pinto Valley Mine by the same shipment routes as currently used in operation (National Forest System Road 287 from U.S. Highway 60).
- Pinto Valley Mining Corp. would follow all existing contingency plans in the case of an unplanned release of hazardous materials.
- In the event of a breach of the tailings storage facilities, Pinto Valley Mining Corp. would implement an emergency action plan (Wood 2019a) to guide tailing storage facility operating personnel in identifying, monitoring, and responding to situations involving failure, potential failure, or other serious conditions at the Pinto Valley Mine tailing storage facilities. Pinto Valley Mining Corp. would implement fire-suppression activities when necessary to ensure public safety.
- Demand for recreational opportunities near Pinto Valley Mine will increase with population growth.

3.15.4.2 **No-action Alternative – Direct and Indirect Impacts**

3.15.4.2.1 Physical Hazards

All existing mine identification and security features would remain in place and be maintained at Pinto Valley Mine under the no-action alternative. An additional security fence and access road would be installed on Pinto Valley Mining Corp. private property around the Open Pit during final reclamation, which would deter any public access to the Open Pit. This security fence would be monitored regularly throughout the post-closure period. The no-action alternative generally represents a continuation of current risks to public health and safety, which are limited because the current footprint of the Open Pit itself (with exception of several pertinent facilities) does not extend onto National Forest System lands and the general public does not have authorized access to the mine facilities.

3.15.4.2.2 Blasting

As stated above in section 3.15.3, blasting involves inherent risks associated with toxic fumes (nitric oxide and nitrogen dioxide). Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize and ready the mine for closure and reclamation, Pinto Valley Mining Corp. anticipates that the blasting events would be limited and would employ the same standards and practices as the current blasting program. If blasting is needed, the mine would implement personnel exclusion zones near blasting sites and the Forest Service would continue to implement a blasting closure order prohibiting public access to the area east of the mine (Forest Service 2020e), and the mine would apply other standard operating procedures (such as signage) to prevent impacts on the safety of mine workers and the public from blasting. Due to these preventative safety measures employed by the mine and Forest Service, impacts from potential blasting on public health and safety under the no-action alternative are expected to be negligible.

3.15.4.2.3 Hazardous and Nonhazardous Materials

No changes to the types or quantities of hazardous and nonhazardous materials used and stored at Pinto Valley Mine are anticipated under the no-action alternative. The types and amounts of hazardous and nonhazardous materials stored at Pinto Valley Mine during the 6-month transition period from active operations to the start of mine closure would be essentially the same as under the existing conditions described in section 3.15.3, "Affected Environment." Therefore, there would be no change to the existing risk to Pinto Valley Mine employee or public health from potential exposure to these materials until mining operations cease and the majority of substances are removed from the mine site. Pinto Valley Mining Corp. would implement preventative measures with its current level of diligence and in accordance with laws and regulations and would continue to train staff involved with reclamation and closure activities on proper material management. Refer to section 3.11, "Hazardous and Nonhazardous Materials," and appendix G, "Hazardous and Nonhazardous Materials Inventory," for additional information.

3.15.4.2.4 Vehicle Traffic

Pinto Valley Mining Corp. would continue to use approximately 29.8 miles of existing National Forest System roads and 15.2 miles of access roads under the no-action alternative to support the cessation of active mining operations. Use of all National Forest System roads, except National Forest System Road 287, would generally cease within 36 months of mine closure. Total vehicle trips would decrease during the 6-month transition period with the reduction of 400 nonessential personnel and personnel expected to be laid off within 3 months after issuance of the record of decision. As the mine fully transitions from active mining operations to reclamation and closure, vehicle trips would be further reduced in proportion to the overall workforce and operational reductions during these phases, which could decrease traffic counts and risk of vehicle crash compared to existing conditions. Refer to section 3.19, "Traffic and Transportation," for additional information on potential impacts.

3.15.4.2.5 Noise

At the Mountain Breeze Cemetery and Top of the World, the closest public noise receptors, noise levels would remain in the same equivalent range as existing conditions during the first 2 months of the 6-month transition period. Following the first 2 months of the 6-month transition period, project-related noise would be reduced compared to existing conditions as the mine transitions from active mining operations to reclamation and closure. Therefore, public health is not anticipated to be affected by noise during active mining operations at the Pinto Valley Mine. Maximum modeled noise levels during post-closure were 59.6 A-weighted decibels for Top of the World and 66.7 A-weighted decibels for the residences near Mountain Breeze Cemetery. As mine operations will have ceased, the source of this noise would be the anticipated increases in traffic on U.S. Highway 60, which is anticipated to increase independent of the Pinto Valley Mine. Refer to section 3.14, "Noise," for more information on existing noise levels and potential impacts under the alternatives.

3.15.4.2.6 Water Quality

Under the no-action alternative, active mining operations would continue at the Pinto Valley Mine for approximately 2 months following issuance of the record of decision. In general, impacts on water quality would be similar to those under existing conditions. Pinto Valley Mining Corp. would continue to sample and monitor water quality throughout mine operations and the post-closure period to minimize the risks of undetected public health threats. Refer to section 3.21, “Water Resources and Hydrogeochemistry,” for more information on potential impacts on water quality.

3.15.4.2.7 Air Quality

Emissions of air pollutants from Pinto Valley Mine would remain constant as required by Pinto Valley Mining Corp.’s air quality permit. Additionally, due to increasingly stringent regulation of emissions sources, ambient pollutant concentrations in the region are expected to remain constant or decrease slowly over time. As a result, air quality emission and effects under the no-action alternative are not expected to result in impacts on public health and safety.

3.15.4.2.8 Geotechnical Stability

Geotechnical Stability of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

Slope stability factors of safety have been computed for various configurations of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (table 3-53). Slope stability was evaluated using a range of assumptions to simulate drained and undrained strength behavior of the in-place tailings materials. The lowest calculated factors of safety for both static and pseudo-static loading for the no-action alternative, summarized in table 3-53, were found at Tailings Storage Facility No. 3. The lowest result for static loading was a factor of safety of 1.44 computed for an undrained response assumption, which is above the 1.3 minimum factor of safety based on the best available demonstrated control technology (table 3-53). The lowest result for pseudo-static loading was also found on Tailings Storage Facility No. 3, with a computed factor of safety of 1.08, which is above the 1.0 minimum factor of safety.

Refer to section 3.9.4.6, “Tailings Dam Breach Run-out Analysis,” for a description of potential effects on downstream resources in the event of a tailings dam breach. In the event of a breach of the tailings storage facilities, Pinto Valley Mining Corp. would implement an emergency action plan (Wood 2019a) to ensure that response actions are effectively implemented.

Pit Slope Stability

As described in section 3.9, “Geology, Minerals, and Geotechnical Stability,” during the post-closure period, active measures to control pore pressures in the pit slope, surface water management, and geotechnical monitoring would not continue and the pit slopes would be allowed to fail over time until they reach a long-term stable configuration.

During final reclamation, a regularly monitored additional perimeter security fence and warning signs would be installed around the Open Pit to deter public access. The perimeter security fence will be installed at a sufficient distance from the pit rim to avoid adverse effects on public safety.

3.15.4.3 Alternative 1 – Direct and Indirect Impacts

3.15.4.3.1 Physical Hazards

Physical hazards would be essentially the same as under the no-action alternative, except that any hazards associated with active mining operations would continue for approximately 7 more years than the no-action alternative. The additional perimeter fence around the Open Pit would be installed and monitored approximately 7 years later than under the no-action alternative. Pinto Valley Mining Corp. would continue to manage public access to mine facilities and no increased risk to public health or safety is anticipated.

3.15.4.3.2 Blasting

As stated above in section 3.15.3, blasting involves inherent risks associated with toxic fumes (nitric oxide and nitrogen dioxide). Under alternative 1, Pinto Valley Mining Corp. anticipates the need for blasting to excavate the ore and waste rock in the Open Pit, which would occur once daily during daylight hours, between 10 a.m. and 2 p.m. Under alternative 1, the mine would implement personnel exclusion zones near blasting sites and the Forest Service would implement a blasting closure order prohibiting public access to the area east of the mine (Forest Service 2020e). Explosives would not be stored on National Forest System lands and the mine would apply other standard operating procedures (such as signage) to prevent impacts on the safety of mine workers and the public from blasting. Impacts from blasting on public health and safety under alternative 1 are expected to increase compared to the no-action alternative due to the increased frequency and duration of blasting. However, potential impacts on public safety from blasting would still be negligible due to the preventative safety measures employed by the mine and Forest Service.

3.15.4.3.3 Hazardous and Nonhazardous Materials

Potential risk to public health and safety from hazardous and nonhazardous materials used and stored at Pinto Valley Mine would be similar to that under the no-action alternative; however, the volume of materials stored onsite and the duration during which hazardous and nonhazardous materials would be used and stored during active mining operations would be approximately 7 years longer than under the no-action alternative. As a result, potential impacts from accidental releases of hazardous materials during active mining operations would increase compared to the no-action alternative. Pinto Valley Mining Corp. would continue to train staff on proper material management and implement preventative measures with its current level of diligence and in accordance with applicable laws and regulations. Refer to section 3.11, “Hazardous and Nonhazardous Materials,” and appendix G, “Hazardous and Nonhazardous Materials Inventory,” for additional information.

3.15.4.3.4 Vehicle Traffic

Under alternative 1, Pinto Valley Mining Corp. would continue use of the same roads as under the no-action alternative except a potential realignment of National Forest System Road 287 would be considered, if needed. Although public users may encounter minor delays or reroutes due to potential realignments of National Forest System Road 287, public safety risk would not be increased compared to the no-action alternative. Similar to the no-action alternative, the volume of employee and contractor vehicles entering and exiting Pinto Valley Mine would continue at approximately the current levels estimated in section 3.1.4; however, the operational period of the mine and the associated traffic would extend for approximately 7 more years than under the no-action alternative. As a result, potential degradation of roads associated with use and vehicle trips during active mining operations could increase compared to the proposed action. However, under Mitigation Measure TR-1, Pinto Valley

Mining Corp. would operate under a road use permit for commercial use and maintenance of National Forest System roads. The road use permit will outline Pinto Valley Mining Corp.'s expected annual use, the calculated fee, and potential credits for maintenance conducted by Pinto Valley Mining Corp. as approved by the Forest Service. Refer to section 3.19, "Traffic and Transportation," for additional information on potential impacts.

3.15.4.3.5 Noise

Under alternative 1, modeled noise levels and impacts on public health would be similar to that described under the no-action alternative, except that the mine would operate for approximately 7 more years under alternative 1, increasing the amount of time noise levels would be increased from Pinto Valley Mine active operations. Refer to section 3.14, "Noise," for more information on existing noise levels and potential impacts.

3.15.4.3.6 Water Quality

Impacts on water quality under alternative 1 would be similar to those under the no-action alternative, but would continue for approximately 7 more years due to the extended period of active mining operations under alternative 1. Pinto Valley Mining Corp. would continue water quality sampling and monitoring throughout mine operations and the post-closure period to minimize the risk of undetected public health threats. Refer to section 3.21, "Water Resources and Hydrogeochemistry," for more information on potential impacts on water quality.

3.15.4.3.7 Air Quality

Similar to the no-action alternative, emissions of air pollutants from Pinto Valley Mine under alternative 1 would remain constant as required by Pinto Valley Mining Corp.'s air quality permit with the primary difference being that the mine would operate for approximately 7 more years under alternative 1. Air quality modeling for the proposed action shows that pollutant concentrations would not exceed the National Ambient Air Quality Standards. Because emissions with alternative 1 would be less than with the proposed action, pollutant concentrations with alternative 1 also would not exceed the National Ambient Air Quality Standards. As a result, air quality emission and effects under alternative 1 are not expected to result in impacts on public health and safety.

Refer to section 3.2, "Air Quality," for more information on potential impacts.

3.15.4.3.8 Geotechnical Stability

Geotechnical Stability of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

Slope stability factors of safety have been computed for various configurations of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (table 3-53). The range of minimum factors of safety computed for the different cases analyzed for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 for alternative 1 is summarized in table 3-53. For alternative 1, the slope stability factors of safety for both static and pseudo-static (seismic) loading conditions were shown to meet the State of Arizona design criteria shown in table 3-52 for the minimum factors of safety.

Similar to the no-action alternative, Pinto Valley Mining Corp. maintains and applies a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). Continued application of this manual would reduce potential instability issues at the tailings storage facilities.

Refer to section 3.9, “Geology, Minerals, and Geotechnical Stability,” for additional information on potential impacts on public health and safety associated with geotechnical stability. Refer to section 3.9.4.6, “Tailings Dam Breach Run-out Analysis,” for a description of potential effects on downstream resources in the event of a tailings dam breach. In the event of a breach of the tailings storage facilities, Pinto Valley Mining Corp. would implement an emergency action plan (Wood 2019a) to ensure that response actions are effectively implemented.

Pit Slope Stability

At the end of active mining operations, alternative 1 would increase the footprint of the Open Pit on private property to approximately 965 acres, an expansion of 219 acres compared to the no-action alternative. Although the size of the Open Pit would be larger under the proposed action, the risk to public safety from pit slope stability hazards would be similar to that under the no-action alternative with the primary difference being that the mine would operate for approximately 7 more years under alternative 1. However, risk to public safety from pit slope stability hazards would generally be the same as described for the no-action alternative due to routine monitoring and installation of security fencing around the perimeter of the Open Pit during final reclamation.

3.15.4.4 **Proposed Action – Direct and Indirect Impacts**

3.15.4.4.1 Physical Hazards

Mine identification and security features would not change between the no-action alternative, alternative 1, and proposed action. Physical hazards would be essentially the same as under the no-action alternative and alternative 1, except that any hazards associated with active mining operations would be expanded on an additional 229 acres of National Forest System lands, and would continue for an additional 19 years compared to the no-action alternative and 12 years compared to alternative 1. Furthermore, the additional perimeter fence around the Open Pit would be installed approximately 12 years later than under the no-action alternative and 19 years later than under the proposed action. Pinto Valley Mining Corp. would continue to manage public access to mine facilities and no increased risk to public health or safety is anticipated.

3.15.4.4.2 Blasting

Blasting activities would continue for an estimated 19 more years under the proposed action compared to the no-action alternative and 12 more years compared to alternative 1. As a result, the time period during which mine workers and the public could be exposed to risks from blasting would be increased under the proposed action. The proposed action would also increase potential risks on an additional 229 acres of National Forest System lands compared to the no-action alternative and alternative 1. However, the mine implements personnel exclusion zones near blasting sites, the Forest Service implements a blasting closure order prohibiting public access in the area immediately east of the mine (Forest Service 2020e), and the mine applies other standard operating procedures (such as signage) to prevent impacts on public safety from blasting. Due to these preventative safety measures employed by the mine and Forest Service, impacts from blasting on public health and safety under the proposed action are expected to be negligible despite the increased timeframe during which blasting is anticipated to occur under the proposed action.

3.15.4.4.3 Hazardous and Nonhazardous Materials

Extension of the mine life under the proposed action would increased the volume of materials stored at the mine and would extend the duration of use of hazardous materials on the Pinto Valley Mine site by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1. The proposed action would also expand the use of hazardous and nonhazardous materials on 229 additional acres compared to the no-action alternative and alternative 1. As a result, potential impacts from accidental releases of hazardous materials during active mining operations would increase compared to the no-action alternative and alternative 1. Pinto Valley Mining Corp. would continue to minimize the public health risks by providing hazardous materials management training to its staff and implementing precautionary containment measures. Refer to section 3.11, “Hazardous and Nonhazardous Materials,” and appendix G, “Hazardous and Nonhazardous Materials Inventory,” for additional information.

3.15.4.4.4 Vehicle Traffic

Similar to the no-action alternative and alternative 1, traffic along the current transportation system under the proposed action are not anticipated to result in impacts on public safety. Extending the mine life would extend the duration of mine-related traffic during active mining operations by approximately 19 years compared to the no-action alternative and 12 years compared to alternative 1. Due to the extended use of roads during active mining operations, the proposed action could increase the potential for road degradation compared to the no-action alternative and alternative 1. However, under Mitigation Measure TR-1, Pinto Valley Mining Corp. would operate under a road use permit for commercial use and maintenance of National Forest System roads. The road use permit will outline Pinto Valley Mining Corp.’s expected annual use, the calculated fee, and potential credits for maintenance conducted by Pinto Valley Mining Corp. as approved by the Forest Service. Refer to section 3.19, “Traffic and Transportation,” for additional information on potential impacts.

3.15.4.4.5 Noise

Operation of Pinto Valley Mine and expansion of activities onto National Forest System lands for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 would extend the duration of impacts from noise during active mining operations. Noise levels during proposed action mine operations could reach 57.1 A-weighted decibels at Top of the World and 64.2 A-weighted decibels at the residences near Mountain Breeze Cemetery (WestLand Resources, Inc. 2018c). These noise levels would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 but would remain below the threshold to take action to protect public health (Basner et al. 2014). The maximum modeled noise levels for the proposed action were the same as those for the no-action alternative and alternative 1 and resulting primarily from increased use and traffic on U.S. Highway 60 independent of the mine. Refer to section 3.14, “Noise,” for more information on potential impacts.

3.15.4.4.6 Water Quality

The proposed action would increase the potential for impacts on water quality, as mine facilities would be expanded on National Forest System lands and active mine operations and associated water use would continue for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. However, Pinto Valley Mining Corp. would continue to monitor water quality at the same frequency and for the same length of time following mine closure, which minimizes the risks of water quality affecting public health. Refer to section 3.21, “Water Resources and Hydrogeochemistry,” for more information on potential impacts.

3.15.4.4.7 Air Quality

Extending the mine life and expanding the mining facilities onto National Forest System lands would increase the criteria and hazardous air pollutant emissions compared to the no-action alternative and alternative 1. These emissions would primarily be associated with an increase in haul truck activity. Pollutant concentrations with the proposed action would not exceed the National Ambient Air Quality Standards. As a result, air quality emission and effects under the proposed action are not expected to result in impacts on public health and safety.

Refer to section 3.2, “Air Quality,” for more information on potential impacts.

3.15.4.4.8 Geotechnical Stability

Geotechnical Stability of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4

The lowest calculated factors of safety for both static and pseudo-static loading for the proposed action, summarized in table 3-53, were found on section B at Tailings Storage Facilities No. 3. The lowest result for static loading was a factor of safety of 1.30 for static loading and 1.0 for pseudo-static loading, which are the minimum factors allowed under the Best Available Demonstrated Control Technology (table 3-53). The lowest result for Tailings Storage Facility No. 4 was 1.34 for static loading and 1.08 for pseudo-static loading. These results warrant diligent monitoring of both facilities to ensure that the pore pressure response and shear strength assumptions used in the geotechnical analyses are valid.

Pinto Valley Mining Corp. maintains and applies a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). Continued application of this manual would reduce potential instability issues at the tailings storage facilities.

Refer to section 3.9, “Geology, Minerals, and Geotechnical Stability,” for additional information on potential impacts on public health and safety associated with geotechnical stability. Refer to section 3.9.4.6, “Tailings Dam Breach Run-out Analysis,” for a description of potential effects on downstream resources in the event of a tailings dam breach. In the event of a breach of the tailings storage facilities, Pinto Valley Mining Corp. would implement an emergency action plan (Wood 2019a) to ensure that response actions are effectively implemented.

Pit Slope Stability

Under the proposed action, the Open Pit would be extended to the north and west onto 219 additional acres of private land, and to the east onto approximately 19 acres of National Forest System lands by the end of the operational life of the mine. Although the size of the Open Pit would be larger, and the mine would operate longer under the proposed action, risk to public safety from pit slope stability hazards would be the same as described for the no-action alternative and alternative 1 due to routine monitoring and installation of security fencing around the perimeter of the Open Pit during final reclamation.

The pit wall stability model for the proposed action indicates that the probability of a deep-seated pit wall failure extending to the pit bottom occurring during the life of mine and the post-closure periods such that it would cause unplanned disturbance to National Forest System land is very low. However, creep and continued movement of Pinal Schist within the Schist Hill Creep Monitoring Zone is considered likely. The creep would occur in previously mined areas and on the native slopes south of the Open Pit extending onto National Forest System land (SRK Consulting, Inc. 2020c).

3.15.4.5 Cumulative Impacts

The cumulative impact analysis area for public health and safety is the same area analyzed for direct and indirect effects: the operational areas of Pinto Valley Mine and National Forest System Road 287 from U.S. Highway 60 through the Pinto Valley Mine project boundary. The cumulative impacts analysis area represents the extent of the area that could be affected by the proposed action and alternatives and thus the extent of potential cumulative impacts. The temporal boundary for cumulative impacts on public health and safety encompasses the period of active mining operations through the post-closure period of the mine.

Section 3.15.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on public health and safety. A variety of public health and safety risks are present at Pinto Valley Mine including direct effects from ongoing mine operations and indirect effects related to water quality, geologic risks, hazardous materials, noise, air quality, and traffic and transportation. The proposed action would generally represent a continuation of existing public health and safety hazards at Pinto Valley Mine. Existing mine identification and security features would remain in place at Pinto Valley Mine and there would be no change to the existing risk to Pinto Valley Mine employees or public health from potential exposure to hazardous or nonhazardous materials.

No ongoing or reasonably foreseeable future actions are expected to have a cumulative effect on the elements analyzed for public health and safety in section 3.15.4, “Environmental Consequences,” with the exception of vehicle traffic. Ongoing and reasonably foreseeable actions that, in combination with Pinto Valley Mining Corp.’s proposed action, may contribute incrementally to cumulative impacts on vehicle traffic include improvements to National Forest System Road 287 and the Tonto National Forest Motorized Travel Management Plan. A discussion of these impacts is provided in section 3.19, “Traffic and Transportation.”

The differences in cumulative public health and safety hazards among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.15.4.2 through 3.15.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would result in an additional 229 acres of National Forest System lands would be that would be subject to hazards associated with active mining operations.
- Public health and safety hazards associated with active mining operation under the proposed action would continue for approximately 19 more years than under the no-action alternative (and would include blasting) and 12 more years than under alternative 1, resulting in increased volume of materials stored on site and a longer duration of material use during active mining operations.
- Final reclamation and facility stabilization activities and installation of the security fence around the Open Pit would begin approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative public health and safety impacts compared to the other alternatives.

3.15.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on public health and safety associated with long-term physical hazards that would persist after mine closure. This section provides a summary of the mitigation measure for public health and safety. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.9, “Public Health and Safety,” for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measure PH-1: Health and Safety Plan.** This measure addresses the potential impacts on the health and safety of the general public, and other resources (such as wildlife) from project-related facilities and the use, storage, and transport of hazardous and nonhazardous materials at the Pinto Valley Mine. As part of the mining plan of operations approval, Pinto Valley Mining Corp. will prepare a health and safety plan for the facilities on National Forest System lands and the use, transport, and storage of materials on National Forest System land. The main components of the health and safety plan would include, but not be limited to, identification of applicable regulatory standards and requirements; description of how hazardous and nonhazardous materials are managed during operations, closure, and post-closure; identification of hazardous and nonhazardous materials that are transported, used, and stored on National Forest System lands; and a description of activities and procedures for reducing health and safety hazards from project activities and facilities during the operation, closure, and post-closure periods (such as blasting, fencing around the open pit, and access limitations). The plan would describe fencing and other exclosures during operations, closure, and post-closure to ensure that a perimeter security fence will be installed at a sufficient distance from the rim of the Open Pit to prevent unintentional public access.

3.16 Recreation and Wilderness

This section describes the affected environment for recreation and wilderness and potential effects of activities at Pinto Valley Mine on recreation opportunities, access, and settings and wilderness character.

The analysis area for analyzing direct and indirect effects on recreation and wilderness consists of the portion of the Tonto National Forest Globe Ranger District west of State Route 188 and the portion of the Superstition Wilderness including and east of the Arizona National Scenic Trail (map 3-14 in appendix A). This boundary was chosen because it includes recreation and wilderness areas that could be affected by surface disturbance, vehicle traffic, noise, or visual alterations associated with activities at Pinto Valley Mine. As shown on map 3-14 in appendix A, several wilderness areas are located within the Tonto National Forest north of Pinto Valley Mine. With the exception of the Superstition Wilderness, no other wilderness areas were included within the analysis area because results of the air quality, noise, and visual analyses conducted for this EIS did not identify potential effects on wilderness character in those areas resulting from activities at Pinto Valley Mine.

The temporal boundary for analyzing direct and indirect impacts on recreation and wilderness includes the ongoing operations at Pinto Valley Mine and extends through the post-closure period.

The description of environmental consequences for recreation and wilderness was informed by and references the following sections in this EIS: section 3.2, “Air Quality,” section 3.14, “Noise,” section 3.19, “Traffic and Transportation,” and section 3.20 “Visual Resources.” Public health and safety concerns related to use of National Forest System lands surrounding Pinto Valley Mine for recreation are discussed in section 3.15, "Public Health and Safety."

3.16.1 Relevant Laws, Regulations, and Policy

3.16.1.1 **Federal Authorities**

3.16.1.1.1 Multiple-Use Sustained-Yield Act of 1960

The Multiple-Use Sustained-Yield Act of 1960 (16 U.S. Code 528–531) establishes the "policy of Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes," while stating that the act shall not "be construed so as to affect the use or administration of the mineral resources of national forest lands."

3.16.1.1.2 Wilderness Act of 1964

The Wilderness Act of 1964 (16 U.S. Code 1131–1136), as amended by the Arizona Wilderness Act of 1984 (Public Law 98-406), establishes and defines wilderness areas and provisions for their management.

3.16.1.1.3 National Trails System Act of 1968

The National Trails System Act of 1968 (16 U.S. Code 1241–1249), as amended by the Arizona National Scenic Trail Act (Public Law 111-11), designates the Arizona National Scenic Trail and provides for the "conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass." The Arizona National Scenic Trail is administered by the Forest Service in partnership with the Bureau of Land Management, the National Park Service, Arizona State Parks, the Arizona Trail Association, and several counties and municipalities.

3.16.1.2 **Forest Service Regulations, Policies, and Guidance**

3.16.1.2.1 Special Use Regulations (Title 36, Part 251 of the Code of Federal Regulations)

36 CFR 251 authorizes the Forest Service to issue authorizations for use and occupancy of National Forest System lands.

3.16.1.2.2 Wilderness and Primitive Areas (Title 36, Part 293 of the Code of Federal Regulations)

36 CFR 293 governs wilderness and primitive areas on National Forest System lands.

3.16.1.2.3 Special Areas (Title 36, Part 294 of the Code of Federal Regulations)

36 CFR 294 governs special areas on National Forest System lands.

3.16.1.2.4 Forest Service Manual 2300

Forest Service Manual 2300, "Recreation, Wilderness, and Related Resource Management," guides management of recreation and wilderness on National Forest System lands to provide a range of social, economic, and environmental benefits, while preserving and protecting the character of the lands.

3.16.1.2.5 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for recreation (Forest Service 1985):

- "Maintain and enhance visual resource values by emphasizing recreation resource management which will increase opportunities for a variety of developed and dispersed experiences."
- "Manage Recreation Opportunity Spectrum classes according to the existing inventory."

The Tonto National Forest Plan provides standards and guidelines for the Superstition Wilderness (management area 2A). In general, the Superstition Wilderness is to be managed for wilderness values, wildlife habitats, and natural ecological processes while allowing livestock grazing and recreation opportunities that are compatible with maintaining these values and processes.

The Forest Service Southwestern Region is the lead agency preparing a comprehensive plan for the Arizona National Scenic Trail to guide effective management and protection of the trail's unique values. The plan is still under development.

The desired condition for recreation consists of managing National Forest System lands according to the recreation opportunity spectrum classes identified in the Tonto National Forest Plan (Forest Service 1985). The recreation opportunity spectrum is a tool used by the Forest Service to classify National Forest System lands into management categories based on their settings and the probable recreation experiences they afford.

The desired condition of wilderness areas is to preserve their wilderness character and manage them for public purposes in accordance with the Wilderness Act of 1964.

3.16.1.3 **State and Local Laws, Regulations, and Policies**

3.16.1.3.1 Arizona Hunting and Fishing Regulations

The Arizona Game and Fish Department issues hunting regulations establishing season dates, bag limits, hunt types, open areas, rules, regulations, drawing application details, and other requirements for the hunting of most big game, small game, other wildlife in Arizona (Arizona Game and Fish Department 2018d).

3.16.2 Resource Indicators

Table 3-78 below provides the resource indicators and measures for assessing potential effects on recreation and wilderness.

Table 3-78. Resource indicators and measures for assessing effects on recreation and wilderness

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address purpose and need or key issue?	Source
Recreation opportunity spectrum	Tonto National Forest recreation opportunity spectrum classifications	Acres of proposed new surface disturbance in each recreation opportunity spectrum class	Yes	Tonto National Forest Plan and associated geographic information system data

Resource Element	Resource Indicator	Measure (Quantify if possible)	Used to address purpose and need or key issue?	Source
Recreation access	Mine-related traffic or road construction and improvement projects on National Forest System roads providing public access to dispersed recreation areas	Qualitative description	Yes	Pinto Valley Mine EIS traffic and transportation analysis
Recreation settings and wilderness	Potential impacts on noise, visibility, and scenery from Pinto Valley Mine activities on recreation settings on adjacent National Forest System lands, in the Superstition Wilderness, and along the Arizona National Scenic Trail	Qualitative description	Yes	Pinto Valley Mine EIS analyses for noise, air quality, and visual resources

3.16.3 Affected Environment

Table 3-79 summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-79. Resource indicators and measures for the existing condition for recreation and wilderness

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Recreation opportunity spectrum	Tonto National Forest recreation opportunity spectrum classifications	Acres of proposed new surface disturbance in each recreation opportunity spectrum class	Over half (57 percent) of National Forest System lands within the Pinto Valley Mine project boundary classified as "roaded natural."
Recreation access	Mine-related traffic or road construction and improvement projects on National Forest System roads providing public access to dispersed recreation areas	Qualitative description	Public use of National Forest System roads for recreational access to Pinto Creek, Haunted Canyon, and other recreation sites. Public and mine-related traffic share use of National Forest System Road 287.
Recreation settings and wilderness	Potential impacts on noise, visibility, and scenery from Pinto Valley Mine activities on recreation settings on adjacent National Forest System lands, in the Superstition Wilderness, and along the Arizona National Scenic Trail	Qualitative description	Topography and vegetation screening limit noise and visual effects from mining activities on dispersed recreation areas along National Forest System Road 287 north of Pinto Valley Mine. Portions of Pinto Valley Mine may be visible from Superstition Wilderness and Arizona National Scenic Trail.

3.16.3.1 Recreation Opportunity Spectrum

The Forest Service applies a recreation opportunity spectrum consisting of six classes as a framework for "stratifying and defining classes of outdoor recreation opportunity environments" (Forest Service 2020f). Table 3-80 provides approximate acreages allocated to each recreation opportunity spectrum class within the analysis area, as allocated by the Tonto National Forest Plan (Forest Service 1985) and map 3-14 in appendix A depicts the recreation opportunity spectrum classes. Landscape modifications from operation and expansion of facilities at Pinto Valley Mine prior to and since 1985 have decreased the degree of naturalness and converted much of the area within the Pinto Valley Mine project boundary to a condition most consistent with the "urban" recreation opportunity spectrum class; there is no specific class for mined lands. Approximately 308 acres, or nearly half of existing disturbance on National Forest System lands, are located within the "urban" class. The remaining 252 acres of National Forest System lands are within the "roaded natural," "semiprimitive motorized," or "semiprimitive nonmotorized" classes. Note that some of these existing disturbances predate the establishment of recreation opportunity spectrum classifications in the 1985 forest plan. Additionally, mapping of recreation opportunity spectrum classes for the 1985 forest plan (now represented with geospatial information system data) portrays broad, landscape-scale recreation opportunities and was not intended for detailed acre-by-acre accounting of these opportunities at specific project sites such as the Pinto Valley Mine.

Table 3-80. Recreation opportunity spectrum class acreages on National Forest System lands within the recreation and wilderness analysis area

Recreation Opportunity Spectrum Class	Total Acres in Recreation Analysis Area	Percentage of Total Acres in Recreation Analysis Area	Acres of Existing Disturbance from Pinto Valley Mine in Analysis Area
Primitive	5,816	2%	0
Semiprimitive Nonmotorized	46,176	18%	25
Semiprimitive Motorized	88,763	34%	40
Roaded Natural	67,274	26%	187
Rural	2,422	1%	0
Urban	5,391	2%	308
National Forest System lands within Superstition Wilderness (no recreation opportunity spectrum designations)	20,529	8%	0
Lands outside of National Forest System (no recreation opportunity spectrum designations)	21,232	8%	0
Total	**257,603**	**100%**	**560**

Source: Forest Service 1985

Note: Acreages of individual features within a column may not sum to column total due to independent rounding. Additionally, total existing disturbance is slightly lower than reported in chapter 2 due to alignment of geospatial data layers.

3.16.3.2 Recreation Access

Private lands within the Pinto Valley Mine project boundary are not available for public recreation due to private land ownership; National Forest System lands in this area are not known to be used for recreational activities, likely due to their proximity to the active mine and absence of trails and facilities. However, several National Forest System roads that pass through or along the border of Pinto Valley Mine are used by the public to access nearby destinations for hunting, off-highway vehicle use, hiking, and dispersed camping. In particular, National Forest System Road 287 extends north from U.S. Highway 60 to the Pinto Valley Mine gate, passes through private Pinto Valley Mining Corp. property, and continues within the Tonto National Forest west and north of the mine, providing access to dispersed recreation areas along Pinto Creek and Haunted Canyon. Pinto Valley Mining Corp. maintains the segment of National Forest System Road 287 through the mine property. The segments of National Forest System Road 287 on National Forest System lands are maintained by the Forest Service.

Other National Forest System roads in the vicinity of Pinto Valley Mine are maintained by the Forest Service for use by passenger cars or high-clearance vehicles and may experience occasional public use to access National Forest System lands for dispersed recreation uses. Pinto Valley Mining Corp. also conducts periodic maintenance on segments of unpaved National Forest System roads to access mining facilities to a level suitable for use by Pinto Valley Mining Corp. Public access to National Forest System Road 287B, which leads to the southeastern corner of the Open Pit, has been blocked at the intersection with National Forest System Road 608 for several decades due to safety and security concerns. A 0.4-mile portion of National Forest System Road 287B is also subject to a closure order to minimize risks and incidents with activities surrounding blasting in the Open Pit.

Pinto Valley Mining Corp. and its predecessors have also constructed access roads crossing National Forest System lands and on Pinto Valley Mining Corp.'s private property to provide direct access to specific mine facilities. These roads include a variety of signage and gates to help direct public use of routes away from active mining areas and are generally not used by the public, although there may not be any physical controls in place to prevent public access.

3.16.3.3 **Recreation Settings and Wilderness**

3.16.3.3.1 Dispersed Recreation Areas

National Forest System lands within the Globe Ranger District along National Forest System Road 287 and in the vicinity of Pinto Valley Mine offer opportunities for dispersed recreation. Recreational use of National Forest System lands surrounding Pinto Valley Mine is generally not tracked or monitored, but primary recreational uses of nearby lands identified by Forest Service staff (Cormack 2017) include:

- Obtaining outfitting, guiding, or hunting permits for lands bordering Pinto Valley Mine.
- Use of areas near the Iron Bridge as an off-highway vehicle staging point, day use, and dispersed camping.
- Hiking the Haunted Canyon Trail 203 and connecting roads and trails from the trailhead along Pinto Creek.

These recreational uses occur primarily from September to May due to high temperatures in June through August and coincide with mule deer hunting seasons, which occur predominantly in the fall. National Forest System lands directly adjacent to Pinto Valley Mine experience limited recreational use compared to nearby recreation designations in the Globe Ranger District with maintained trails, campsites, day-use areas, and other amenities.

Based on observations by Forest Service staff, most dispersed recreation in the vicinity of Pinto Valley Mine is likely to occur on National Forest System lands along National Forest System Road 287 north of the mine site. Existing roads and trails in this area are located within canyons or low-lying areas, where the upward viewing angle, topography, and vegetation screen much of Pinto Valley Mine from view. The primary mine features that may be visible from these areas are the embankments of Tailings Storage Facilities No. 3 and No. 4 and the Leach Piles.

A noise study conducted by WestLand Resources, Inc. (2018c) measured ambient noise levels at various locations in the vicinity of Pinto Valley Mine. Based on the study, the predominant noise sources in potential dispersed recreation areas on the north side of Pinto Valley Mine were birds, insects, flowing water, and wind through vegetation. Ambient sound levels on National Forest System lands to the south and southeast of Pinto Valley Mine that generally offer more limited opportunities for dispersed recreation were predominated by Pinto Valley Mine mining equipment and vehicle traffic on U.S. Highway 60 and National Forest System roads. See section 3.14, “Noise,” for more information.

3.16.3.3.2 Superstition Wilderness

The Superstition Wilderness was established as a primitive area in 1933, named a pre-Wilderness Act “wilderness” in 1940, then designated as an official wilderness by the U.S. Congress in 1964. The wilderness was expanded to its present size of 160,236 acres in 1984. The Forest Service manages the Superstition Wilderness, including approximately 180 miles of trails that vary widely in condition and use. The nearest boundary of the Superstition Wilderness is approximately 3 miles west of Pinto Valley Mine (map 3-14 in appendix A).

Based on the viewshed analysis conducted for the Pinto Valley Mine EIS (see section 3.20, “Visual Resources,” for more information), portions of Pinto Valley Mine may be visible from east- to southeast-facing hilltops and ridgelines in the southeastern portion of the Superstition Wilderness.

Ambient sound level measurements at one location along the eastern boundary of Superstition Wilderness consisted primarily of wind through vegetation (WestLand Resources, Inc. 2018c). See section 3.14, “Noise,” for more information.

3.16.3.3.3 Arizona National Scenic Trail

The approximately 800-mile Arizona National Scenic Trail was designated in 2009, providing a nonmotorized path running generally north to south across Arizona from Mexico to Utah. The trail runs approximately 8 miles west of Pinto Valley Mine through the Superstition Wilderness (map 3-14 in appendix A). Based on the viewshed analysis conducted for the Pinto Valley Mine EIS (see section 3.20, “Visual Resources,” for more information), some existing facilities at Pinto Valley Mine may be visible from several locations along the trail with unobstructed views to the east. Noises from all activities at Pinto Valley Mine are anticipated to be faint or inaudible from the Arizona National Scenic Trail.

3.16.4 Environmental Consequences

3.16.4.1 **Analysis Methodology and Assumptions**

The following types of impacts are described and compared across the alternatives:

- Potential impacts on recreational opportunities in the analysis area due to proposed activities at Pinto Valley Mine.
- Traffic from vehicles traveling to and from the mine and potential temporary access restrictions and changes in road conditions that could affect public access to recreation sites along National Forest System Road 287.
- Degraded recreation settings and potential adverse effects on wilderness areas due to noise, visibility, and scenery impacts from mining activities.

3.16.4.2 **No-action Alternative – Direct and Indirect Impacts**

3.16.4.2.1 Recreation Opportunity Spectrum

Under the no-action alternative, closure and reclamation of most facilities at Pinto Valley Mine are expected to begin after the 6-month transition period following release of the record of decision. Existing disturbances from mining facilities on National Forest System lands would gradually transition toward more primitive recreation opportunity spectrum classes as mining facilities are decommissioned or removed and disturbed areas are recontoured, revegetated, and reclaimed in accordance with the reclamation plan for National Forest System lands.

3.16.4.2.2 Recreation Access

Public use of National Forest System roads for recreational access would continue under the no-action alternative in the same manner as their present use. The portion of National Forest System Road 287B currently closed to public use due to safety and security concerns would remain closed under the no-action alternative. As described in section 3.19, “Traffic and Transportation,” average annual mine-related vehicle trips on National Forest System Road 287 would decrease substantially after cessation of active mine operations, decreasing the potential for conflicts with or impediments to public recreational access.

Pinto Valley Mining Corp. would install security fencing around the perimeter of the pit during mine closure to prevent unintentional public entry. The exact location of the fencing relative to the National Forest System lands boundary has not been determined; however, the fence around the Open Pit would generally consist of a minimum 6-foot high chain link fence with three strands of barbed wire around the perimeter of the Open Pit.

The proposed mining plan of operations identifies proposed reclamation practices and a range of potential post-closure land uses for National Forest System lands currently within Pinto Valley Mine, including recreation (hunting, hiking, horseback riding, and camping), livestock grazing, and wildlife habitat (Capstone Mining Corp. 2016a). Under the no-action alternative, reclamation would begin after the 6-month transition period and continue for approximately 12 years, with additional post-closure activities continuing for up to 30 years. Reclamation of Pinto Valley Mine facilities after the end of active mining operations could allow for post-closure recreation use in some areas of the former mine site on National Forest System lands, provided that the reclaimed mine lands do not pose hazards to public health and safety and the use is consistent with the Forest Service land and resource management plan in effect at the time. The Forest Service has not identified specific post-closure reclamation objectives or uses at this time, but reclaimed National Forest System lands would most likely be available for dispersed recreation, similar to existing uses of adjacent public lands.

3.16.4.2.3 Recreation Settings and Wilderness

Under the no-action alternative, there would be an estimated 367 acres of surface disturbance on private land, including 10 acres of disturbance associated with continued deposition of tailings in Tailings Storage Facility No. 4 and 357 acres of disturbance associated with excavation of borrow and riprap sources for use in reclamation. Due to the upward viewing angle and screening by topography and vegetation, visual effects on dispersed recreation areas along the northern portion of Pinto Valley Mine from these disturbances are expected to be minimal, if visible, and would not change the overall scenic quality of the recreation areas, from which evidence of a large-scale mining operation has been visible for decades.

Areas excavated for new borrow and riprap sources under the no-action alternative may be visible from locations in the Superstition Wilderness and along the Arizona National Scenic Trail, but would not change the overall scenic quality from these distant observation points, which already exhibits a high degree of visual change from decades of mining. The incremental nature of mine facility expansion, relatively distant viewing locations, and likelihood that only portions of Pinto Valley Mine could be seen from each viewing location would also minimize the potential for scenic quality impacts perceived by recreationists. As described in section 3.2.4, “Environmental Consequences,” air quality-related visibility trends in the region surrounding Pinto Valley Mine is expected to continue to improve slowly over time under the no-action alternative, which could result in improved scenic quality as perceived by recreationists from viewing locations in the Superstition Wilderness and along the Arizona National Scenic Trail. Refer to section 3.20.4, "Environmental Consequences," for additional information on the visual resources analysis conducted for this EIS.

The results of the noise modeling analysis conducted for the Pinto Valley Mine EIS (WestLand Resources, Inc. 2018c) under conditions representing alternative 1 are also assumed to be applicable to the no-action alternative due to the similar types of activities that would occur, but with a substantially shorter operational phase for the no-action alternative and a reclamation phase beginning approximately 7 years earlier. The noise modeling demonstrated that members of the public using recreation facilities immediately adjacent to the Pinto Valley Mine boundary would likely experience noise at levels in excess of 40 A-weighted decibels. Noise at this level in scenic areas is considered a potential disturbance to recreationists. As shown on figure 3-15 and in table 3-74 in section 3.14, "Noise," whether such exceedances occur at a given location depends on the project phase and the extent of operations and activities occurring during that phase. The highest noise levels are expected to occur during periods of active reclamation. With only 2 months of operational noise from ongoing operational activity under the no-action alternative, the potential for noise-related effects on recreation would be greatest during periods of active reclamation. Recreationists who choose to use sites close to the highly altered and active mine site may have different expectations for noise and disturbance, thus limiting potential impacts. Because of the lack of other nearby human-made noises (such as highways) in these locations, noise in these areas would likely revert to background ambient levels (30 A-weighted decibels) during times where passive reclamation is occurring and during the post-closure period.

The noise modeling predicted that activities at Pinto Valley Mine would not increase noise pollution at a point along the eastern boundary of the Superstition Wilderness (WestLand Resources, Inc. 2018c). As a result, noise from activities at Pinto Valley Mine is not expected to affect primitive recreation use, recreation settings, or wilderness character of the Superstition Wilderness and the Arizona National Scenic Trail. Refer to section 3.14, "Noise," for additional information on the noise modeling study conducted for this EIS.

3.16.4.3 **<u>Alternative 1 – Direct and Indirect Impacts</u>**

3.16.4.3.1 Recreation Opportunity Spectrum

Under alternative 1, existing uses of National Forest System lands for active mining operations at the Pinto Valley Mine are expected to continue for approximately 7 more years than under the no-action alternative. Because there would be no new uses of National Forest System lands under alternative 1, the condition of National Forest System lands relative to recreation opportunity spectrum classifications made in 1985 would not change during the continued operational period of Pinto Valley Mine relative to the existing baseline conditions described in section 3.1.4, "Affected Environment."

Under alternative 1, closure and reclamation of most facilities at Pinto Valley Mine is expected to last for 12 years following the end of the 6-month transition period, with additional post-closure activities continuing for up to 30 years. The reclamation practices and estimated duration of reclamation activities for alternative 1 would be generally consistent with the no-action alternative but would begin approximately 7 years later. Similar to the no-action alternative, existing disturbances from mining facilities on National Forest System lands would gradually transition toward more primitive recreation opportunity spectrum classes as mining facilities are decommissioned or removed and disturbed areas are recontoured, revegetated, and reclaimed in accordance with the reclamation plan for National Forest System lands.

3.16.4.3.2 Recreation Access

Continued public use of National Forest System roads for recreational access and installation of security fencing around the perimeter of the Open Pit would be the same as described under the no-action alternative, except the operational life of the mine would continue for approximately 7 more years, resulting in a longer period during which mine-related traffic has the potential to conflict with or impede recreational access. Periodic realignments of National Forest System Road 287 through Pinto Valley Mine private property to accommodate mine development may occur during the operational life of the mine and cause short-term detours and construction-related delays, but would not restrict public access to Pinto Creek, Haunted Canyon, or other National Forest System lands available for dispersed recreation use.

Potential post-closure land uses for National Forest System lands currently within Pinto Valley Mine under alternative 1 would be the same as described for the no-action alternative, but would not be available until approximately 7 years later than the no-action alternative.

3.16.4.3.3 Recreation Settings and Wilderness

Continuation of mining activities under alternative 1, including expansion of certain mine facilities onto an additional estimated 909 acres of private lands and raising of waste rock dumps and tailings storage dams, could result in visual alterations to recreation settings. Due to the upward viewing angle and screening by topography and vegetation, visual effects on dispersed recreation areas along the northern portion of Pinto Valley Mine are anticipated to result primarily from the expansion and raising of embankments of Tailings Storage Facilities No. 3 and No. 4. These alterations may increase the scale of mine features, especially the embankments, relative to other landscape elements and would increase surface disturbance by 542 acres compared to the no-action alternative, but would not change the overall scenic quality of the recreation areas, from which evidence of a large-scale mining operation has been visible for decades.

Similarly, expansion and modification of existing mine features resulting from continued operation of Pinto Valley Mine under alternative 1 may be visible from locations in the Superstition Wilderness and along the Arizona National Scenic Trail, but would not change the overall scenic quality from these distant observation points, which already exhibits a high degree of visual change from decades of mining. The incremental nature of mine facility expansion, relatively distant viewing locations, and likelihood that only portions of Pinto Valley Mine could be seen from each viewing location would also minimize the potential for scenic quality impacts perceived by recreationists. Similar to the no-action alternative, anticipated gradual improvement in air quality-related visibility in the region surrounding Pinto Valley Mine could result in improved scenic quality as perceived by recreationists from viewing locations in the Superstition Wilderness and along the Arizona National Scenic Trail. Refer to section 3.20.4 for additional information on the visual resource analysis conducted for this EIS.

The potential for noise-related disturbances to recreation sites and wilderness areas would be the same as described for the no-action alternative, except noise impacts during active mining operations would continue for approximately 7 more years compared to the no-action alternative. Refer to section 3.14, “Noise,” for additional information on the noise modeling study conducted for this EIS.

3.16.4.4 **Proposed Action – Direct and Indirect Impacts**

3.16.4.4.1 Recreation Opportunity Spectrum

Proposed expansion of mine facility footprints onto 19 acres of National Forest System lands classified as "urban" on the recreation opportunity spectrum would contribute to a highly modified landscape characteristic of the urban class; this includes National Forest System lands that would be modified by expansion of the Open Pit. An additional 210 acres of National Forest System lands that could be disturbed or modified by excavation of potential borrow and riprap sources and construction of Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 are classified as "roaded natural" on the recreation opportunity spectrum. "Roaded natural" areas are "characterized by predominantly natural-appearing environments with moderate evidences of sight and sounds of man" (Forest Service 1985). As indicated previously, mapping of recreation opportunity spectrum classes for the 1985 forest plan (now represented with geospatial information system data) portrays broad, landscape-scale recreation opportunities and was not intended for detailed acre-by-acre accounting of these opportunities at specific project sites such as the Pinto Valley Mine. Additionally, recreation opportunities within proposed areas of new disturbance have been previously diminished by decades of mining activities on adjacent lands. Neither existing recreation opportunities nor the overall landscape character would change notably relative to the existing conditions.

The reclamation practices and estimated duration of reclamation activities for the proposed action would be generally consistent with the no-action alternative and alternative 1 but would begin approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1. Similar to the no-action alternative and alternative 1, the condition of National Forest System lands is expected to gradually transition toward more primitive recreation opportunity spectrum classes as mining facilities are decommissioned or removed and disturbed areas are recontoured, revegetated, and reclaimed in accordance with the reclamation plan for National Forest System lands.

3.16.4.4.2 Recreation Access

Continued public use of National Forest System roads for recreational access would be the same as described under the no-action alternative and alternative 1, except the operational life of the mine would continue for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1. The longer operational period of the proposed action would result in a longer period during which mine-related traffic has the potential to conflict with or impede recreational access. Periodic realignments of National Forest System Road 287 through Pinto Valley Mine private property to accommodate mine development may occur during the operational life of the mine and cause short-term detours and construction-related delays, but would not restrict public access to Pinto Creek, Haunted Canyon, or other National Forest System lands available for dispersed recreation use.

The area affected by expansion of the Open Pit onto approximately 19 acres of National Forest System lands under the proposed action would generally not be reclaimed at the end of the mine life and would be permanently unavailable for recreation use. Pinto Valley Mining Corp. would install a 6-foot-high chain-link security fence topped with three strands of barbed wire and posted with warning signs around the perimeter of the pit to prevent unintentional public entry, and will monitor and maintain the fence during the post-closure period.

The proposed action would extend the operational life of the mine, extending the length of time required for reclamation to reach post-closure conditions that may enable use of reclaimed National

Forest System lands for public recreation by approximately 19 years compared to the no-action alternative and approximately 12 years compared to alternative 1.

3.16.4.4.3 Recreation Settings and Wilderness

Potential scenic quality impacts, as viewed by recreationists from National Forest System lands adjacent to Pinto Valley Mine, the Superstition Wilderness, and the Arizona National Scenic Trail, would be similar to those described under alternative 1, except the proposed action would result in a 1,317-acre increase in surface disturbance compared to existing conditions. This represents an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. Increased surface disturbance under the proposed action and higher maximum elevations of waste rock dumps and tailings storage dams would create a higher degree of visual change than the no-action alternative and alternative 1; however, the overall scenic quality of the landscape as seen and perceived by recreationists due to screening by topography and vegetation (from observation points north of Pinto Valley Mine) or due to the relatively distant viewing locations (from observation points in the Superstition Wilderness or along the Arizona National Scenic Trail) is not anticipated to change. As described in section 3.2.4, the potential for visibility impairment in the Superstition Wilderness due to visible plumes of particulate matter emitted by activities at Pinto Valley Mine is relatively low, but greater than under the no-action alternative and alternative 1. Refer to section 3.20.4 for additional information on the visual resource analysis conducted for this EIS.

The types and levels of noise sources are expected to be similar to those under alternative 1. However, the duration of potential noise-related effects from Pinto Valley Mine on nearby dispersed recreation areas during active mining operations would be approximately 19 years longer than under the no-action alternative and approximately 12 years longer than under alternative 1. Refer to section 3.14, “Noise,” for additional information on the noise modeling study conducted for this EIS.

3.16.4.5 **Cumulative Impacts**

The cumulative impact analysis area for recreation and wilderness consists of the portion of the Tonto National Forest Globe Ranger District west of State Route 188 and the portion of the Superstition Wilderness including and east of the Arizona National Scenic Trail (map 3-14 in appendix A)—the same area used to analyze direct and indirect effects in section 3.16.4, “Environmental Consequences.” This analysis area encompasses approximately 403 square miles (approximately 257,603 acres) and is the extent of the area that could experience direct and indirect effects from the proposed action that could combine with effects from other past, ongoing, and reasonably foreseeable actions, resulting in cumulative effects. The temporal boundary for analyzing cumulative impacts on recreation and wilderness includes the ongoing operations at Pinto Valley Mine and extends through the post-closure period.

Section 3.16.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on recreation and wilderness. Within the cumulative impacts analysis area, the Tonto National Forest Plan, Carlota Mine, and Pinto Valley Mine are the primary past and present activities that have contributed to cumulative impacts and the existing condition of recreation and wilderness described in section 3.16.3, “Affected Environment.”

Existing surface disturbance on National Forest System lands within the recreation and wilderness cumulative impacts analysis area encompasses an estimated 2,694 acres, which represents approximately 1 percent of the 257,603 acres in the cumulative impacts analysis area. The proposed action would result in an estimated total of 229 acres of additional surface disturbance in the cumulative impacts analysis area. The Resolution Copper Project and Land Exchange (3,497 acres of estimated disturbance on National Forest System lands) and Superior West Exploration Drilling Project (7 acres of estimated disturbance on National Forest System lands) would contribute to future cumulative surface disturbance in the cumulative impacts analysis area. As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 6,427 acres, which is approximately 3 percent of the cumulative impacts analysis area.

This cumulative analysis considers the present effects of past actions described in section 3.16.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect recreation and wilderness in the future as identified in table 3-3 and further described in table 3-2.

3.16.4.5.1 Recreation Opportunity Spectrum

Present effects of the relevant past and present actions have resulted in the recreation opportunity spectrum conditions presented in section 3.16.3, “Affected Environment.” Present and reasonably foreseeable actions that could contribute to cumulative recreation opportunity spectrum impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable action that could contribute to cumulative impacts on the recreation opportunity spectrum is the Resolution Copper Project and Land Exchange. Landscape modifications from operation and expansion of facilities at Pinto Valley Mine prior to and since 1985 have decreased the degree of naturalness and converted much of the area within the Pinto Valley Mine project boundary to a condition most consistent with the “urban” recreation opportunity spectrum class; there is no specific class for mined lands.

Under the proposed action, expansion of mine facility footprints onto 19 acres of National Forest System lands classified as “urban” and 210 acres classified as “roaded natural” on the recreation opportunity spectrum. Present and reasonably foreseeable actions in the cumulative analysis area would contribute to cumulative surface disturbance within the “roaded natural” class type. These disturbances, depending on their specific character and context within the landscape, may reduce the total area providing “roaded natural” recreation opportunities as designated at a planning level by the Tonto National Forest Plan until disturbed areas are successfully reclaimed and revegetated.

The Tonto National Forest is currently revising its forest plan. The final Tonto National Forest Plan will contain updated recreation opportunity spectrum classifications for lands within the Tonto National Forest. Recreation opportunity spectrum classifications may be revised through this process to more accurately reflect existing conditions related to recreation opportunities.

The differences in cumulative impacts on recreation opportunity spectrum among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.16.4.2 through 3.16.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action is the only alternative that would result in new surface disturbance on National Forest System lands during the operational life of Pinto Valley Mine, which would increase the acreage of National Forest System lands on which mining is the dominant activity .
- The reclamation practices and estimated duration of reclamation activities for the proposed action would be generally consistent with the no-action alternative and alternative 1 but would begin approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on recreation opportunity spectrum classes compared to the other alternatives.

3.16.4.5.2 Recreation Access

Present effects of the relevant past and present actions have resulted in the recreation access conditions presented in section 3.16.3, “Affected Environment.” Private lands within the Pinto Valley Mine project boundary are not available for public recreation due to private land ownership; National Forest System lands in this area are not known to be used for recreational activities, likely due to their proximity to the active mine and absence of trails and facilities. However, several National Forest System roads that pass through or along the border of Pinto Valley Mine are used by the public to access nearby recreational destinations. In particular, National Forest System Road 287 extends north from U.S. Highway 60 to the Pinto Valley Mine gate, passes through private Pinto Valley Mining Corp. property, and continues within the Tonto National Forest west and north of the mine, providing access to dispersed recreation areas along Pinto Creek and Haunted Canyon. Pinto Valley Mining Corp. maintains the segment of National Forest System Road 287 through the mine property. The segments of National Forest System Road 287 on National Forest System lands are maintained by the Forest Service.

Mining and processing activities at Carlota Copper Mine may continue for several more years, during which time an approximately 2.6-mile segment of National Forest System Road 287 from U.S. Highway 60 to Carlota Copper Mine Access Road would continue to serve as an access road for both Pinto Valley Mine and Carlota Copper Mine. There would be additional mine-related traffic on this segment of National Forest System Road 287 while both mines are operating, which would decrease substantially after closure of the Carlota Mine and Pinto Valley Mine. National Forest System Road 287 would continue to remain open to the public, providing public access to Pinto Creek, Haunted Canyon, or other recreation sites. Public use of National Forest System roads for recreational access would continue under the proposed action in the same manner as their present use.

Loss of the Oak Flat Campground due to construction of the Resolution Copper Mine could displace some existing recreation use to other nearby locations, such as the National Forest System Road 287 corridor, or increase dispersed camping near the Iron Bridge; however, other developed recreation sites in the Pinal Mountains provide a similar setting and amenities to those of Oak Flat Campground.

The differences in cumulative impacts on recreation access among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.16.4.2 through 3.16.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would extend the operational life of the mine, extending the length of time required for reclamation to reach post-closure conditions that may enable use of reclaimed National Forest System lands for public recreation by approximately 19 years compared to the no-action alternative and approximately 12 years compared to alternative 1.
- The area affected by expansion of the Open Pit onto approximately 19 acres of National Forest System lands under the proposed action would generally not be reclaimed at the end of the mine life and would be permanently unavailable for recreation use.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on recreation access compared to the other alternatives.

3.16.4.5.3 Recreation Settings and Wilderness

Present effects of the relevant past and present actions have resulted in the recreation settings and wilderness conditions presented in section 3.16.3, "Affected Environment," including recreation uses of dispersed recreation areas, the Superstition Wilderness, and the Arizona National Scenic Trail. The proposed action would contribute to potential scenic quality impacts, as viewed by recreationists from National Forest System lands adjacent to Pinto Valley Mine, the Superstition Wilderness, and the Arizona National Scenic Trail. However, the overall scenic quality of the recreation areas, from which evidence of a large-scale mining operation has been visible for decades, is not anticipated to change primarily due to the upward viewing angle and screening by topography and vegetation as perceived by recreationists (from observation points north of Pinto Valley Mine) or due to the relatively distant viewing locations (from observation points in the Superstition Wilderness or along the Arizona National Scenic Trail). The noise modeling predicted that activities at Pinto Valley Mine would not increase noise pollution at a point along the eastern boundary of the Superstition Wilderness (WestLand Resources, Inc. 2018c). As a result, noise from activities at Pinto Valley Mine is not expected to affect primitive recreation use, recreation settings, or wilderness character of the Superstition Wilderness and the Arizona National Scenic Trail.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on recreation settings, as indicated in table 3-3 in section 3.1.5.3, "Past, Present, and Reasonably Foreseeable Future Actions." Due to the low potential for the proposed action to affect visibility and scenic quality in the Superstition Wilderness and Arizona National Scenic Trail, existing disturbances at Carlota Mine and existing and proposed new disturbances at Pinto Valley Mine are unlikely to change the overall scenic quality of the landscape as seen and perceived by recreationists from relatively distant viewing locations (3 to 10 miles). Facilities that would be developed under the proposed Resolution Copper Project and Land Exchange, including portions of a new pipeline and power line corridor, could contribute to cumulative effects on scenic quality from observation points in the Superstition Wilderness and along the Arizona National Scenic Trail. A comprehensive plan for the Arizona National Scenic Trail is currently being developed for the entire 800-mile trail. The comprehensive plan includes developing a vision for long-term administration of the trail and coordinated management across Federal and non-Federal lands in order to protect the nature and purposes of the trail; the significant natural, historic, scenic, and cultural resources within the trail corridor; and the nationally significant recreation experience for which the trail was designated.

The differences in cumulative impacts on recreation settings and wilderness among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.16.4.2 through 3.16.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The duration of potential noise-related effects from Pinto Valley Mine on nearby dispersed recreation areas during active mining operations would be approximately 19 years longer than under the no-action alternative and approximately 12 years longer than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on recreation settings and wilderness compared to the other alternatives.

3.17 Socioeconomic Conditions

Social and economic conditions are referred to collectively as “socioeconomic” conditions. Potential direct and indirect economic impacts of the proposed action include changes in employment, income, business costs, and tax revenue to local, State, and Federal government entities. Changes in employment and income can result in indirect socioeconomic impacts, such as changes in population, which can lead to community impacts on housing, infrastructure, and other government services. The annual economic effects of the proposed action are estimated using economic impact modeling. Model inputs were selected to represent average conditions over the life of the mine.

The spatial boundaries for analyzing direct and indirect effects are Gila County (including the Town of Miami, City of Globe, and Claypool census-designated place) and surrounding populated townships (Town of Superior and Top of the World census-designated place), which could potentially experience a change in employment, demand for housing or temporary accommodations, demand for public services (such as law enforcement) and utilities, or demand for community infrastructure as a result of construction-related activities. Gila County was selected as the analysis area because the mine is located in Gila County; approximately half of the workforce comes from Gila County; and the majority of project-related purchases of goods and services, taxation, and other economic activity would occur in Gila County. Including the full extent of other surrounding counties in the analysis area would have diluted the analysis of potential effects in Gila County, which is the county most likely to experience social and economic effects under the alternatives. Any social or economic effects extending outside of the analysis area are likely to be similar to those occurring within the analysis area and would depend on the types and locations of mine-related expenditures and mine employees residing outside of the analysis area. The temporal boundary for analyzing cumulative socioeconomic impacts includes ongoing operations at Pinto Valley Mine through post-closure of the facility.

3.17.1 Relevant Laws, Regulations, and Policy

3.17.1.1 **Federal Authorities**

The National Environmental Policy Act (42 U.S. Code 4321) provides guidance specific to social and economic resources. Under the National Environmental Policy Act, an EIS must discuss social and economic effects if they are related to the natural or physical effects and the definition of “effects” includes economic and social factors. Consequently, the EIS must include an analysis of the proposed project’s economic, social, and demographic effects related to effects on the natural or physical environment in the affected area, but economic, social, and demographic effects may not be analyzed in isolation from the physical environment.

3.17.1.2 **Forest Service Regulations, Policies, and Guidance**

3.17.1.2.1 Forest Service Manual 1970 and Forest Service Handbook 1909.17

Forest Service Manual 1970 directs how economic and social analyses should be conducted to aid Forest Service decision making. Forest Service guidelines for socioeconomic analyses are outlined in Forest Service Handbook 1909.17, “Economic and Social Analysis Handbook.” The handbook provides guidelines to be used to evaluate socioeconomic impacts that may result from policy, program, plan, or project decisions on National Forest System lands.

3.17.1.2.2 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan does not provide management direction or prescriptions specific to socioeconomic conditions (Forest Service 1985).

3.17.2 Resource Indicators

Table 3-81 below provides the resource indicators and measures for assessing potential effects on social and economic conditions.

Table 3-81. Resource indicators and measures for assessing effects on social and economic conditions

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Social conditions	Population and demographics	Multiyear trends in population size; demographics by race/ethnicity, Hispanic or Latino; age; gender	Yes	U.S. Census Bureau 2010, 2016; Arizona Office of Economic Opportunity 2019a
Social conditions	Housing	Occupancy status; tenure status; vacancy status	Number of units and percentage of total	U.S. Census Bureau 2016
Social conditions	Community infrastructure	Characteristics of community services; net assessed valuations tax levies and tax rates; property and sales tax; school districts	Yes	Gila County 2017, 2019a, 2019b, 2019c; U.S. Census Bureau 2019b
Economic conditions	Labor market conditions	Population employed	Yes	Bureau of Labor Statistics 2019
Economic conditions	Income and poverty	Median Household Income (2017 Dollars); Personal Per-Capita Income (2017 Dollars); Poverty Rate (percent)	Yes	U.S. Census Bureau 2019c, 2019a. Impact Analysis for Planning Input-Output Model
Economic conditions	Industry-level employment and personal earnings	Employment by industry and multiyear trends	Yes	Impact Analysis for Planning Input-Output Model
Fiscal conditions	Taxes and revenue	Local taxes; property and sales taxes; transportation taxes; federal revenue	Yes	Gila County 2017, Kimley-Horn 2014, Office of Natural Resources Revenue 2019

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Nonmarket values	Benefits and values assigned to recreational activities and access to forest resources	Stated value per person per day by activity; recreation spending	Yes	Rosenberger and Loomis 2001, U.S. Fish and Wildlife Service 2016b

3.17.3 Affected Environment

Table 3-82 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-82. Resource indicators and measures for the existing socioeconomic condition

Resource Element	Resource Indicator	Measure	Existing Condition in Gila County
Social conditions - Population and demographics	Multiyear trends in population size; demographics	Number of people by category and percentage of population	Population: 53,557 Gila County has a predominantly white population.
Social conditions - Housing	Occupancy status; tenure status; vacancy status	Number of units and percentage of total	Occupied housing units: 21,408 (64.6%) Vacant housing units: 11,730 (35.4%) Owner-occupied housing is 71.9% of total occupied units.
Social conditions - Community infrastructure	Characteristics of community services; school districts	Demand for and funding of infrastructure, law enforcement and emergency response, and education services	Local communities provide a variety of services and infrastructure including schools, law enforcement, and fire protection.
Economic conditions - Labor market conditions	Employment, unemployment, and multiyear trends	Population employed	Employed persons: 15,500 Unemployed persons: 1,357
Economic conditions - Income and poverty	Household income within region	Median household income; population in poverty	Median Household Income: $38,897 Population in Poverty: 24.1%
Economic conditions - Industry-level employment and average personal earnings	Employment by industry and multiyear trends; average earnings in each industry	Number of people employed by industry and average earnings by industry	Largest employment sectors: government; retail trade; accommodation and food services Highest-paying sectors: manufacturing; mining, quarrying, and oil and gas extraction; utilities
Fiscal conditions	Net assessed valuations tax levies and tax rates; property and sales tax	Financial contributions of Pinto Valley Mine and associated economic activity to Federal, State, and local taxes	State and local taxes are collected for a variety of purposes
Nonmarket value	Benefits and values assigned to recreational activities and access to forest	Stated value	A variety of nonmarket (nonmonetized) values may be ascribed to lands around Pinto Valley Mine.

3.17.3.1 Social Conditions

3.17.3.1.1 Population and Demographics

Pinto Valley Mining Corp. maintains a work force of up to 690[89] employees at the Pinto Valley Mine. The work force at the Pinto Valley Mine is predominantly male (approximately 86 percent of work force) and predominantly white (approximately 55 percent of work force) and Hispanic (approximately 35 percent of workforce).

Population estimates for Gila County, Arizona, and the U.S. from 2001 to 2016 are provided in table 3-83. Gila County is home to over 53,000 residents. The components of population change data show a net in-migration of population in Gila County between 2010 and 2016. However, these statistics do not capture the temporary population that has accompanied surges in mining and other related industries.

While the population of the State of Arizona is projected to increase over the foreseeable future, the population of Gila County is projected to remain flat or slightly decrease. By 2055, the State is projected to have 10,504,530 residents (53 percent increase) while Gila County is projected to have 53,309 residents (less than 1 percent decrease) (Arizona Office of Economic Opportunity 2019).

Table 3-83. Selected population characteristics

Area	2010 Population	2016 Population	Change	Percentage Change
Gila County	51,271	53,179	1,908	4%
Arizona	5,273,458	6,728,577	1,455,119	28%
Nation	284,968,937	318,558,162	33,589,225	12%

Source: U.S. Census Bureau 2010, 2016a

The U.S. Census Bureau estimates the racial characteristics of population in Gila County (summarized in table 3-84). The population of Gila County is predominantly White, which has changed little since 2001. People that identify as White and Hispanic make up the second-largest demographic. American Indian and Alaskan Natives make up the third most-populous group, in large part due to the three Native American reservations in Gila County. The Apache and San Carlos Reservations cover large geographic areas within Gila County and are near the Pinto Valley Mine project boundary.

Based on the estimates from the 2016 American Community Survey (U.S. Census Bureau 2016a), residents of Gila County tend to be older than those in the rest of the State and the United States as a whole. In Gila County, approximately 26.4 percent of the population is 65 years or older. The median age of local residents is 48.9 years, which is higher than the analogous estimate in 2010 (46.9 years) (U.S. Census Bureau 2010). Furthermore, the number of residents in that age group has increased since 2000, while the number of residents under 18 has declined. Increases in the number of working-age persons in the county can be attributed in part to recent increases in jobs, particularly in the mining sector, which attracts a high portion of working adults, including younger male workers who are unmarried or married but not accompanied by spouses or school-age children (U.S. Census Bureau 2010, 2016a).

Racial and ethnic minorities are populations of concern when it comes to environmental justice issues. How these populations are potentially affected is further discussed in section 3.7, "Environmental Justice."

[89] The number of reported employees reflects estimated full-time-equivalent jobs including Pinto Valley Mine salaried employees, hourly workers, and contractor staff. Staffing levels can vary over time based on time of year, project phase, and other factors.

Table 3-84. Gila County demographics (2001 and 2016)

Demographic	2001 Population	2016 Population	Percentage Change
White, Non-Hispanic	35,143	33,621	(4%)
Black, Non-Hispanic	208	294	41%
American Indian or Alaskan Native, Non-Hispanic	6,567	8,132	24%
Asian, Non-Hispanic	229	404	76%
Native Hawaiian or Pacific Islander, Non-Hispanic	23	0	(100%)
Two or More Races, Non-Hispanic	433	864	100%
White, Hispanic	8,225	8,191	0%
Black, Hispanic	50	38	(24%)
American Indian or Alaskan Native, Hispanic	304	117	(62%)
Asian, Hispanic	16	14	(13%)
Native Hawaiian or Pacific Islander, Hispanic	9	0	(100%)
Two or More Races, Hispanic	63	985	1,463%

Source: U.S. Census Bureau 2016b

All communities in the analysis area grew in population between 2010 and 2016, with the exception of the City of Globe, which experienced a small decrease in residents. Communities near Pinto Valley Mine remain relatively stable in terms of population growth. The largest increase in population was in the Town of Miami, which gained over 300 residents between 2010 and 2016 (table 3-85).

Table 3-85. Population in affected area, 2010–2016

City/Town/Census-designated Place	2010 Population	2016 Population
Town of Miami	1,837	2,153
Claypool Census-designated Place	1,538	1,605
City of Globe	7,532	7,369
Top of the World Census-designated Place	231	236
Town of Superior	2,837	2,895

Source: U.S. Census Bureau 2010, 2016a

3.17.3.1.2 Housing

Information on housing and occupancy status in Gila County is presented in table 3-86. The tenure status of homes is listed in table 3-87, and the vacancy status is provided in table 3-88.

Based on 5-year estimates from the 2016 American Community Survey, most of the housing units in Gila County are occupied by their owners, while 28.1 percent are occupied by renters. Almost 35.4 percent of all housing units are vacant. Of these 11,730 vacant units, approximately 2.6 percent are rental units, while approximately 73.7 percent are for seasonal or recreational use. Housing units that are classified as vacant for seasonal, recreational, or occasional use are used or intended for use only in certain seasons or for weekends or other occasional use throughout the year. This category of housing units is commonly used to estimate the number of “vacation” homes in an area but may also include temporary residences for workers.

There were 238 vacant housing units in the Town of Miami, the closest settled area to Pinto Valley Mine (U.S. Census Bureau 2016c). Median monthly housing costs in the Miami area are $668 for renter-occupied units and $402 for owner-occupied units (U.S. Census Bureau 2016d).

The median household income for a homeowner in Gila County is $40,593, while the average renter's income was lower, at $26,650 (U.S. Census Bureau 2016d). The median value for owner-occupied housing units in Gila County is $139,800 (U.S. Census Bureau 2016c).

Table 3-86. Occupancy status in Gila County

Occupancy Status	Estimate	Percentage
Occupied housing units	21,408	64.6%
Vacant housing units	11,730	35.4%
Total housing units	**33,138**	**100%**

Source: U.S. Census Bureau 2016c

Table 3-87. Tenure status in Gila County

Tenure	Estimate	Percentage
Owner occupied	15,383	71.9%
Owned with a mortgage or loan	6,524	42.4%
Owned free and clear	8,583	55.8%
Unknown	276	1.8%
Renter occupied	6,025	28.1%
Total occupied housing units	**21,408**	**100%**

Source: U.S. Census Bureau 2016c, 2016e

Table 3-88. Vacancy status of homes in Gila County

Vacancy Status	Estimate	Percentage
For rent	216	1.8%
Rented, not occupied	97	0.8%
For sale only	730	6.2%
Sold, not occupied	56	0.5%
For seasonal, recreational, or occasional use	8,641	73.7%
For migratory workers	0	0%
Other vacant	1,990	17.0%
Total vacant housing units	**11,730**	**100%**

Source: U.S. Census Bureau 2016f

3.17.3.1.3 Community Infrastructure

Infrastructure

Gila County contains two sanitary districts, seven street lighting districts, and three water districts. Gila County runs a Public Works Division that serves these districts as well as providing road maintenance. The Public Works Division provides floodplain management to help residents build in a manner that reduces property damage and loss of life.

Gila County's Recycling and Landfill Management Department is responsible for the operation and compliance of two landfills, as well as two waste tire collection sites and four inactive landfills (Gila County 2019a).

The Wastewater Department in Gila County receives its authority by delegation from the Arizona Department of Environmental Quality (Arizona Revised Statute 49-107). The department provides clearance letters, contractors' lists, gray water information, information on the maintenance and care of septic systems, public record administration, site investigations, and transfers of ownership (Gila County 2019b).

Law Enforcement and Emergency Response Services

The Gila County Sheriff's Office provides law enforcement services throughout Gila County, including certain services in the incorporated municipalities. In and near the Pinto Valley Mine project boundary, the sheriff's office provides patrol services, civil service, and traffic enforcement; responds to accidents and emergencies; conducts criminal investigation; coordinates local search and rescue; and responds to calls for other law enforcement–related services. The sheriff's office is also responsible for administration of the county jail and the inmates in the Gila County Jail. The sheriff's office provides dispatch services for most of the county, including the application area (Gila County 2019c).

Fire districts include Central Heights, East Verde Park, Pine/Strawberry, Whispering Pines, Houston Mesa, Christopher Kohls, Tonto Basin, Gisela Valley, Round Valley, Pleasant Valley, Beaver Valley, Hellsgate, and Water Wheel Fire and Medical. These districts are funded by local taxes.

Education

Gila County contains nine school districts, which impose tax levies through the State Legislature, which sets the rates for school equalization (Gila County 2017). Miami and City of Globe have high schools and primary schools, which share the revenue pool in their respective school districts.

Statewide, 86.5 percent of persons 25 years or older were high school graduates and 28.4 percent had obtained a bachelor's or higher degree for the 2013–2017 5-year estimate. Gila County had a similar level of high school completion (85.0 percent) for persons over 25 years of age, but a substantially lower level of bachelor's degree attainment (19.0 percent) than the State as a whole (U.S. Census Bureau 2019b).

3.17.3.2 **Economic Conditions**

3.17.3.2.1 Labor Market Conditions

Employment, Unemployment, and Multiyear Trends

The industrial composition of the local economy, in terms of employment and employment growth since 2001, is summarized on figure 3-17. Gila County employment has been rising steadily since 2001 but experienced a decline in 2008 due to the recession. Job growth has been positive but slow since that time (figure 3-17), rising to around 15,050 employed persons in December 2019. After increasing significantly in the years following the 2008 recession, unemployment in Gila County has declined to a non-seasonally adjusted 1,093 persons in December 2019, which represents an unemployment rate of 5.1 percent (compared to a statewide unemployment rate of 4.2 percent) (Arizona Office of Economic Opportunity 2021a).

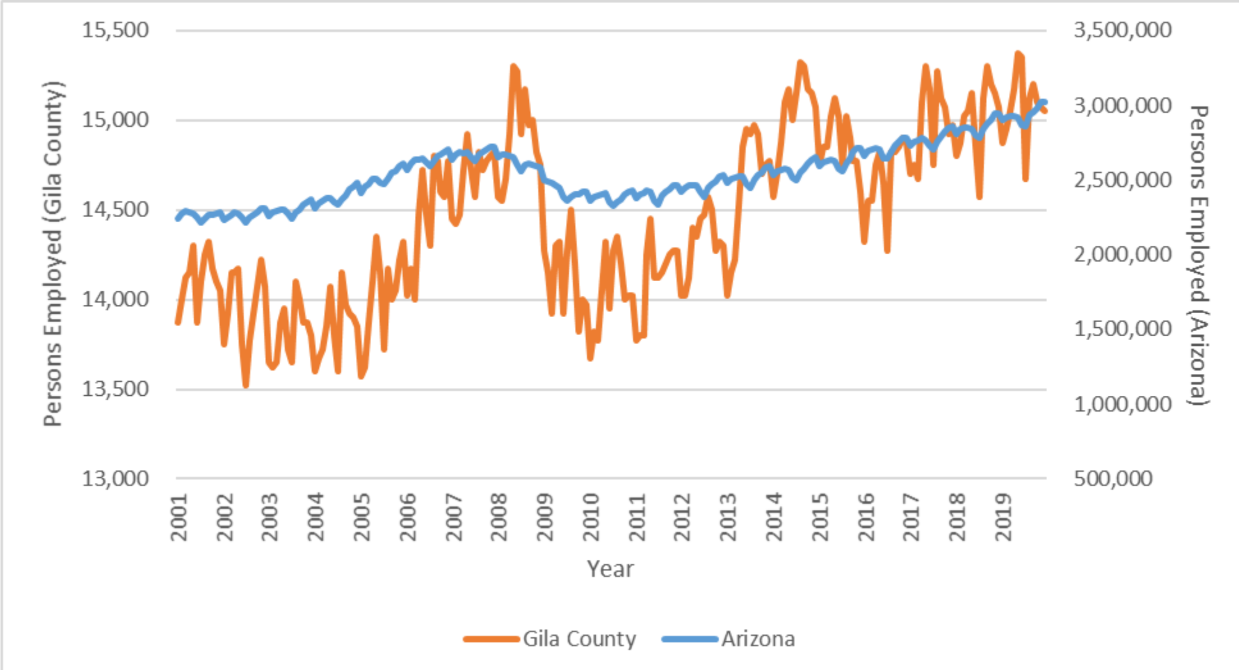

Figure 3-17. Total non-farm employment in Gila County, Arizona and the State of Arizona, January 2001–December 2019

Source: Arizona Office of Economic Opportunity 2021b
Note: Employment figures are not seasonally adjusted.

3.17.3.2.2 Income and Poverty

Income and poverty data are presented in table 3-89. The median, inflation-adjusted, household income for Gila County increased by 3.9 percent between 2010 and 2017. In comparison, the increase in median household income for Gila County was lower than for the State as a whole (20.7 percent) or the nation (20.6 percent) during the same period (U.S. Census Bureau 2019c). Both household median and per-capita incomes in Gila County are below incomes for the State and the nation (see table 3-89).

While poverty rates state- and nationwide declined overall between 2010 and 2017, the poverty rate in Gila County increased from 19.8 percent to 24.1 percent during that period (see table 3-89). Gila County had a poverty rate higher than for the State as a whole or nation (U.S. Census Bureau 2019c).

Table 3-89. Income and Poverty

Location	Median Household Income (2017 Dollars)		Personal Per-Capita Income (2017 Dollars)	Poverty Rate (percent)	
	2010	*2017*	*2013–2017 5-year estimate*	*2010*	*2017*
United States	$50,046	$60,336	$57,652	15.3	13.7
Arizona	$46,787	$56,508	$53,510	17.6	14.9
Gila County	$37,430	$38,897	$41,179	19.8	24.1

Sources: U.S. Census Bureau 2019c, 2019a.

3.17.3.2.3 Industry-level Employment and Average Personal Earnings

Table 3-90 summarizes employment and average personal earnings by job sector in Gila County. Mining plays a critical role in the development of the local economy and remains an important cultural and economic influence in the county. Since the start of the century, Gila County has seen growth in the mining sector and manufacturing sector, while simultaneously experiencing decline in the healthcare and construction sectors (U.S. Bureau of Labor Statistics 2019, ICF analysis). Mining in Gila County increased by 37 percent from 2001 to 2017, adding almost 300 jobs to the local economy. Related industries, such as real estate (including rental and leasing), have grown as well—by 46 percent since 2001 until 2017. Manufacturing jobs, which grew by 24 percent since 2001, also provide a steady income for employees. There were approximately 1,238 manufacturing employees in 2017 in Gila County. Other large employers include government (over 5,000 employees in 2017, with a 25 percent increase over 17 years), retail trade (which fell slightly since 2001), and accommodation and food services, which increased by 49 percent since 2001 (U.S. Bureau of Labor Statistics 2019, ICF analysis).

Earnings by industry vary widely. While the average income is lower in Gila County than in the U.S. overall, some industries provide higher wages on average. For example, average earnings in the mining, quarrying, and oil and gas extraction industry in Gila County, at $80,000 a year, are above the average American median income.

Gila County has experienced economic decline in 8 of 20 main industrial sectors. The healthcare and social assistance industries as well as the construction industry experienced the largest declines between 2001 and 2017 (-21 percent and -16 percent, respectively). The information sector followed, declining by 16 percent (U.S. Bureau of Labor Statistics 2019, ICF analysis).

Table 3-90. Full- and part-time employment in Gila County, 2001–2016

Description	2001 Jobs	2017 Jobs	2001–2017 Change	2001–2016 Percent Change	Average Earnings
Management of Companies and Enterprises	149	<10	Insufficient data	Insufficient data	Insufficient data
Government	4,469	5,585	1,116	25%	$55,350
Retail Trade	2,461	2,371	-90	-4%	$28,164
Accommodation and Food Services	1,439	2,145	706	49%	$18,515
Health Care and Social Assistance	2,111	1,674	-437	-21%	$48,545
Manufacturing	997	1,238	241	24%	$88,353
Construction	1,617	1,359	-258	-16.0%	$46,977
Mining, Quarrying, and Oil and Gas Extraction	818	1,117	299	37%	$80,348
Real Estate and Rental and Leasing	863	1,261	398	46%	$18,052
Other Services (except Public Administration)	1,035	930	-105	-10%	$15,515
Administrative and Support and Waste Management and Remediation Services	660	950	290	44%	$25,204
Professional, Scientific, and Technical Services	610	857	247	41%	$35,915
Finance and Insurance	400	583	183	46%	$23,291
Arts, Entertainment, and Recreation	378	385	7	2%	$19,986
Transportation and Warehousing	279	338	59	21%	$44,934
Agriculture, Forestry, Fishing and Hunting	345	387	42	12%	$18,429
Wholesale Trade	295	263	-32	-11%	$45,985
Information	204	172	-32	-15.9%	$47,694
Educational Services	236	203	-33	-14%	$22,109

Description	2001 Jobs	2017 Jobs	2001–2017 Change	2001–2016 Percent Change	Average Earnings
Utilities	81	70	-11	-13%	$68,422
Unclassified Industry	17	69	52	306%	$29,270
Total	**19,462**	**21,958**	**2,496**	**13%**	**$39,053**

Source: U.S. Bureau of Labor Statistics 2019

3.17.3.3 Fiscal Conditions

3.17.3.3.1 Local Taxes

Table 3-91 summarizes the net assessed valuation that tax levies generate for funds in Gila County. Tax rates are set by a mix of State and local bodies. For example, State statute sets the rates for school equalization. The Board of Supervisors sets the tax rates for Gila County, the Gila County Library District, the Gila County Flood Control District, and Fire District Assistance Tax. The County School Superintendent sets the rate for the Unorganized Schools' Property and Reserve Fund. Each city or town, school district, special district, irrigation district, and drainage districts sets its own tax rates (Gila County 2017).

Table 3-91. Gila County net assessed valuations tax levies and tax rates, fiscal year 2017–2018

Tax Authority	Net Assessed Valuation	Levy Amount	Tax Rate
State of Arizona			
School Equalization	$481,991,319	$2,349,708	0.4875
Gila County			
Gila County General Purpose	$481,991,319	$20,195,437	4.1900
Gila County	$481,991,319	Not assessed	Not assessed
County-Wide Districts			
Gila Community College	$481,991,319	$4,511,921	0.9361
Fire District Assistance Tax	$481,991,319	$481,992	0.1000
Gila County Library District	$481,991,319	$1,168,829	0.2425
Fire Districts			
Tri-City/Central Heights	$25,000,992	$700,028	2.8000
East Verde Park	$1,847,140	$60,000	3.2483
Pine/Strawberry	$59,924,809	$2,097,368	3.5000
Whispering Pines	Not assessed	Not assessed	Not assessed
Houston Mesa	$4,006,648	$130,216	3.2500
Christopher Kohl's	$18,915,075	$571,235	3.0200
Tonto Basin	$16,485,044	$535,764	3.2500
Gisela Valley	$1,400,775	$40,000	2.8556
Round Valley/Oxbow Estates	$5,283,357	$124,159	2.3500
Pleasant Valley	$6,809,291	$106,320	1.5614
Beaver Valley	Not assessed	Not assessed	Not assessed
Hellsgate	$23,248,907	$755,589	3.2500
Water Wheel Fire and Medical	$12,186,811	$383,885	3.1500
Sanitary Districts			
Northern Gila County	$168,850,266	$1,013,102	0.6000
Tri-City Regional	$15,071,754	$105,918	0.7028

Tax Authority	Net Assessed Valuation	Levy Amount	Tax Rate
Street Lighting Districts			
Pine Street Light Improvement District	$1,302,185	$2,270	0.1743
Miami Gardens Street Light Improvement District	$277,851	$2,903	1.0448
Apache Hills Street Light Improvement District	$120,305	$5,105	4.2434
East Verde Park Street Light Improvement District	$1,847,140	$4,531	0.2453
Upper Glendale Street Light Improvement District	$88,557	$1,081	1.2207
Claypool Lower Miami Street Light Improvement District	$3,886,289	$17,317	0.4456
Central Heights Country Club Midland City Street Light Improvement District	$3,314,818	$19,534	0.5893
Water Districts			
Pine Strawberry Domestic Water Improvement District	$52,042,141	$727,601	1.3981
Pine Creek Canyon Domestic Water Improvement District	$3,156,273	$180,000	5.7029
Whispering Pines Domestic Water Improvement District	$3,025,577	$8,575	0.2834
Cities and Towns			
City of Globe	$39,070,722	$513,272	1.3137
Town of Hayden	$7,052,170	$423,130	6.0000
Town of Miami	$4,006,892	$175,854	4.3888
Town of Winkelman	$674,625	$46,280	6.8600
Town of Payson	$175,925,301	$669,748	0.3807
Town of Star Valley	$15,916,284	Not assessed	Not assessed

Source: Gila County 2017.

3.17.3.3.2 Property Taxes and Sales Taxes

Table 3-92 summarizes total budgeted expenditures generated by property taxes, which generates the majority of tax revenue in the county. Total assessed property tax for fiscal year 2017 is $20,195,437 for the primary property tax levy, and an additional $1,168,829 for the secondary property tax revenue (table 3-92). Total budgeted expenses for Gila County is $98.9 million. The actual 2017 sales tax revenue for Gila County from the State-shared sales tax was $5,414,633, while the county excise tax generated $2,967,764. The State sales tax rate in Arizona is 5.6 percent, while the county imposes an additional 1 percent sales tax. The county also collects a vehicle license tax, which contributed a total of $1,754,964 in 2017 (Gila County 2017).

Table 3-92. Gila County estimated and actual property taxes, fiscal year 2017–2018

Category	Amount
Adopted/Adjusted Budgeted Expenditures/Expenses	$94,014,975
Actual Expenditures/Expenses	$62,286,315
Fund Balance/Net Position at July 1	$37,670,254
Primary Property Tax Levy	$20,195,437
Secondary Property Tax Levy	$1,168,829
Estimated Revenues Other than Property Taxes	$39,824,839
Interfund Transfers (In)	$9,446,067
Interfund Transfers (Out)	$9,446,067
Total Financial Resources Available	$98,859,359
Budgeted Expenditures/Expenses	$98,859,359

Source: Gila County 2017

3.17.3.3.3 Transportation Taxes

In 1994, Gila County voters passed a 0.5 cent excise tax to fund improvements to highway, street, and transportation projects. However, the Gila County Transportation Excise Tax program had an expiration date of December 31, 2014. Data are unavailable prior to 1999 on the tax. From January 1999 to July 2002, the excise tax revenues totaled $31,570,836. On average, the revenues generated approximately $3 million per year (Kimley-Horn 2014).

The State of Arizona collects taxes on fuels, as well as registration and operational fees of motor vehicles, such as gasoline taxes and license taxes. These revenues are distributed to the Arizona Department of Transportation State Highway Fund and are used for projects at the town, city, and county level. In 2012, the Highway User Revenue Fund distribution to Gila County was $3.25 million (Kimley-Horn 2014).

3.17.3.3.4 Federal Revenue

In fiscal year 2017, revenue from leasable mineral extraction on Federal lands in Arizona accounted for $13,352.00 in total, $10,046 of which was redistributed to the State of Arizona (Office of Natural Resources Revenue 2019). Note that companies pay fees but not royalties for extracting locatable hardrock minerals on Federal lands under the Mining Law of 1872. Revenue from mining on Federal land was a minor component of the approximately $4.2 billion[90] (Bureau of Economic Analysis 2019) contribution of the mining, quarrying, and oil and gas extraction industries to the State's gross domestic product.

3.17.3.4 **Nonmarket Value**

Nonmarket environmental values (or simply "nonmarket values") reflect the benefits individuals attribute to experiences of the environment, uses of natural resources, or the existence of particular ecological conditions that do not involve market transactions and, therefore, lack prices. Nonmarket values generally result from three types of uses and benefits of the environment, including:

- Direct use of the environment through recreation, education, or other activities on the landscape that provide nonmarket values. These uses can also result in market values if there are market transactions.
- Indirect use of the environment, such as protecting watersheds to preserve surface water quality for downstream communities or protecting scenic landscapes along historic trails to preserve cultural and historic settings.
- Passive-use (sometimes call nonuse) benefits, which can stem from a desire to preserve a resource as a social or public good (existence value), for future use or enjoyment by future generations. These passive-use benefits often reflect nonmarket values.
- Table 3-93 summarizes the nonmarket values associated with intermountain recreation lands, such as the Tonto National Forest, which may be lost or diminished due to expansion onto National Forest System lands. Values are presented as person per activity day and represent individuals' willingness to pay for certain recreational resources, such as biking, camping, and hiking. Recreational use of National Forest System lands surrounding Pinto Valley Mine is generally not tracked or monitored but occasional use for hiking, hunting, and dispersed camping has been observed. See section 3.16, "Recreation and Wilderness," for more details on recreation opportunities and uses in the vicinity of Pinto Valley Mine.

[90] 2017 gross domestic product, in 2018 dollars.

Table 3-93. Nonmarket use value of recreation on public lands in the intermountain area[91]

Recreational Activity	Value per Person per Activity Day (2017 dollars)[92]
Biking	$92
Camping	$38
Fishing	$34
General Recreation[93]	$22
Hiking	$46
Hunting (Big game)	$57
Picnicking	$38
Sightseeing	$19
Wildlife Viewing	$50

Source: Rosenberger and Loomis 2001.

Individuals, groups, and society may value lands and landscapes for their nonuse or "passive" characteristics that do not involve active onsite use. Examples of passive values include the pleasure associated with viewing a scenic open vista or a ranching landscape with cattle grazing in an irrigated pasture; individual actions to support establishment of wilderness and the opportunities for solitude thereby provided, whether or not one ever intends to recreate in a wilderness; or satisfaction from the knowledge that efforts are being taken to protect critical habitat for an endangered species. Use values and passive-use values associated with public lands are a matter of individual preference, lifestyle, and social and economic circumstances. These values were not quantified for this EIS.

It should be noted that recreation activities also have monetary effects at the State and local levels when users of public lands purchase goods and services associated with recreational activity. Outdoor recreationists, both residential and nonresidential, account for a significant contribution to Arizona's economy. In 2011, State residents and nonresidents spent $2.4 billion on wildlife recreation in Arizona. Of that total, trip-related expenditures were $897 million and equipment expenditures totaled $1.1 billion (U.S. Fish and Wildlife Service 2016b).

3.17.4 Environmental Consequences

3.17.4.1 Analysis Methodology and Assumptions

Socioeconomic impacts are organized into social, economic, fiscal, and nonmarket categories. Wherever possible, the analysis provides quantitative data and comparisons. In cases where quantitative data are unavailable, the analysis uses qualitative data and comparisons.

The impact analysis for socioeconomics includes the following general assumptions:

- Mine-related activity would continue at current production levels throughout the duration of the active mine life, approximately 2 months for the no-action alternative, 7 years for alternative 1, and 19 years for the proposed action.

[91] Intermountain area is Forest Service regions 1 through 4.
[92] Average (median) value as presented in table 3, Recreation activity day values per person by various geographic locations. Original data in 1996 dollars. Adjusted to 2017 dollars using Gross Domestic Product Inflation Index annual value. Rounded to the nearest dollar.
[93] General recreation is a composite of recreation opportunities at a site with a measure for the site, not a specific activity.

- Potential labor force will first be supplied by local skilled laborers, and by those from neighboring towns thereafter.
- Potential temporary and permanent workers are assumed to seek housing in areas close to the application site.
- Gila County was selected as the analysis area for modeling because approximately half of the workforce comes from Gila County; the mine is located in Gila County; and the majority of project-related purchases of goods and services, taxation, and other economic activity would occur in Gila County. Any social or economic effects extending outside of the analysis area are likely to be similar to those occurring within and would depend on the types and locations of mine-related expenditures and mine employees residing outside of the analysis area.
- The temporal boundaries for analyzing the majority of direct and indirect effects occur during the mine life because temporary jobs and economic effects are assumed to cease afterward.
- All dollar figures in this analysis are stated in terms of 2016 dollars unless otherwise noted.
- Nonmarket environmental values can also be characterized emotional connectivity to a specific location that emerges from human interactions and experience with the environment, commonly referred to as “sense of place” (Masterson et al. 2019). Because Pinto Valley Mine is an existing mine and the predominant feature of the surrounding landscape, “sense of place” that individuals may associate with this landscape is not expected to change notably relative to existing conditions.

3.17.4.1.1 Economic Modeling through IMPLAN

The regional economic effects of the project were analyzed for the Gila County analysis area using the Impact Analysis for Planning (IMPLAN) input-output model. IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through an analysis area’s economy. The IMPLAN model provides estimates of how a specific economic activity translates into jobs and income. The model includes the ripple effect (also called the “multiplier effect”) of changes in economic sectors that may not be directly affected by management actions, but are linked to industries that are directly affected. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

The IMPLAN model is constructed with data from the U.S. National Income and Product Accounts and the Bureau of Economic Analysis, among a variety of other data sources. The model includes 536 industry sectors based on the North American Industry Classification System. The model uses region-specific multipliers to trace and calculate the flow of dollars from the industries that originate the impact on supplier industries. Three types of impacts are calculated in IMPLAN:

- **Direct Economic Impacts** are impacts in the primary industries associated with the activity.
- **Indirect Economic Impacts** are impacts in the industries that supply or interact with the primary industries.
- **Induced Economic Impacts** represent impacts from spending by workers who earn money due to increased economic activity, such as when mine employees use their wages to purchase goods from local shops.

Whenever new industry activity or income is injected into an economy, it starts a ripple effect that creates a total economic impact that is larger than the initial input. This is because the recipients of the new income spend some percentage of it and the recipients of that share, in turn, spend some of it, and so on. The total impact of the new activity is the sum of these progressively smaller rounds of spending within the economy. This total economic impact creates a certain level of value added (gross state product), jobs, and industry activity. The total impact is the sum of the multiple rounds of secondary indirect and induced impacts that remain in the analysis area (as opposed to “leaking out” to other regions).

The results of this analysis are reported using commonly used metrics, consistent with best practices. A summary of each metric is provided below:

- **Employment[94]:** Represents the jobs created by industry, based on the output per worker and output impacts for each industry.
- **Labor Income:** Includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income.
- **Industry Activity:** Represents the total economic output generated by the direct spending.
- **Total Value Added**: The difference between an industry’s total output and the cost of its intermediate inputs; is the State-level counterpart to gross domestic product.
- **State and Local Tax:** Represents the estimated tax revenue from the activity.

3.17.4.2 <u>No-action Alternative – Direct and Indirect Impacts</u>

3.17.4.2.1 Social Conditions

Staffing levels would remain at current levels of up to 690 staff during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure after issuance of the record of decision. Approximately 400 nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities are expected to be laid off within 3 months after issuance of the record of decision. After mine closure, approximately 100 staff will be required to support closure operations for approximately 12 to 36 months. The analysis area could see out-migration, increased vacancy rates, and decreased housing values as staffing levels are substantially reduced during the transition to mine closure.

3.17.4.2.2 Economic Conditions

The Gila County analysis area economy generally produces around 15,000 jobs (Arizona Office of Economic Opportunity 2021a) and approximately $82.4[95] million in labor income annually (2021a). Employment and labor income in the analysis area reflect the ongoing operation of the mine and both employment and labor income would be substantially reduced by closing the mine within 6 months, compared to existing conditions. The modeled annual economic impacts on the Gila County analysis area are anticipated to be approximately 83 percent less than existing conditions in the first year after the record of decision because active mining operations, and associated expenditures and employment, would only continue for 2 months under the no-action alternative (10 months/12 months = 0.83 or 83%). Following the 2 months of active mining operations and laying off approximately 400 employees within 3 months, the economic effects associated with operation of the Pinto Valley Mine would be substantially reduced in perpetuity compared to existing conditions, potentially resulting in depressed

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[94] Due to the static nature of the IMPLAN model, the employment impacts are presented in terms of annual job-years, as the model calculates the annual impact of annual activity. It is likely that once the job is created, it will be sustained; however, to ensure that the impact is not overstated, it is conservatively assumed that the job impact is annual.

[95] For year 2017, in 2018 dollars.

economic conditions in the analysis area (such as loss of jobs, revenues, and overall economic output). While reclamation and closure staffing and activities would continue for approximately 12 years, staffing levels and expenditures associated with these phases are substantially less than active mining operations.

3.17.4.2.3 Fiscal Conditions

State and local government revenues generated through taxes and fees on Pinto Valley Mine expenditures for ongoing operations would generally cease approximately 2 months after issuance of the record of decision, commensurate with the end of active mining operations under the no-action alternative. As a result, the modeled State and local tax benefits are expected to be approximately 83 percent less than the amounts shown for the proposed action in table 3-94 in the first year following the record of decision. Following the 2 months of active mining operations, under the no-action alternative State and local revenues generated from mine-related expenditures would be substantially reduced in perpetuity compared to existing conditions.

3.17.4.2.4 Nonmarket Value

This section discusses impacts other than those reflected in market transactions, also known as nonmarket values. Nonmarket value impacts depend on the proposed level of development and are closely related to social and quality of life impacts. The no-action alternative would result in 367 acres of additional disturbances on private lands but would have minimal impacts on nonmarket values, as the area is and would likely remain unavailable for recreation or other uses by the public. The relatively minimal level of disturbance, the existing landscape already highly altered from mine development, the relatively distant viewing locations, and the likelihood that only portions of Pinto Valley Mine could be seen from each viewing location would also minimize the potential for scenic quality impacts perceived by recreationists. Following the 2-month period of active mining operations after issuance of the record of decision, impacts from noise, human presence, and visual disturbance would decrease. As disturbed areas are reclaimed, nonmarket values would increase commensurate with the success of vegetation and reclamation efforts. This could limit disturbance of wildlife and recreationists on National Forest System lands surrounding the mine and could increase direct and indirect nonmarket values associated with improved recreational experiences in the area and enhanced habitat for wildlife. Refer to section 3.17.3.4, “Nonmarket Value,” for more information on the types of nonmarket values.

3.17.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.17.4.3.1 Social Conditions

Under alternative 1, the workforce at the Pinto Valley Mine would include up to 690 staff supporting active mining operations, which would continue for approximately 7 more years than the no-action alternative. An estimated 100 employees would support reclamation and closure operations for 12 to 36 months. Because mine operations and expansion of mining facilities onto an additional 909 acres of private lands under alternative 1 are not projected to affect staffing at the mine, no increase in population, effects on housing, or other social impacts (stresses on schools, public services, or utilities, or changes in quality of life) would occur. This extension of the life of the mine would delay social effects associated with mine closure by approximately 7 years compared to the no-action alternative. In addition, with a longer period to plan for mine closure, additional measures could be taken to phase down employment and expenditures to reduce potential impacts on social conditions, compared to the no-action alternative

3.17.4.3.2 Economic Conditions

Because employment and expenditures under alternative 1 would generally not change from existing conditions, the economic impacts associated with operation of the Pinto Valley Mine would be similar to those under existing conditions. Alternative 1 would provide for continued economic effects in the analysis area during active mining operations for approximately 7 more years than under the no-action alternative. In general, annual staffing levels and expenditures associated with alternative 1 would be the same as under the proposed action; therefore, the annual modeled annual economic impacts on the Gila County analysis area are the same as those shown in table 3-94 and table 3-95, below. However, because mine operations would occur for 12 fewer years under alternative 1, economic impacts modeled for operations under the proposed action would end sooner under this alternative but would continue for approximately 7 more years than under the no-action alternative. As with the no-action alternative and proposed action, during reclamation, the reduction in staff at the mine would likely reduce jobs and labor income in the analysis area.

3.17.4.3.3 Fiscal Conditions

State and local taxes and fees would continue to be collected and would contribute to government revenue for approximately 7 more years compared to the no-action alternative. The modeled State and local annual tax benefits would be the same as those shown in table 3-94 for the proposed action, except that because mine operations would occur for 12 fewer years under alternative 1, taxes would be collected for fewer years than under the proposed action. Annual State and local government revenues generated through taxes and fees on Pinto Valley Mine are estimated to be greater and accrue for approximately 7 more years than under the no-action alternative.

3.17.4.3.4 Nonmarket Value

- Alternative 1 would result in 909 acres of additional surface disturbance on private land (542 more acres than the no-action alternative). However, this additional disturbance would have minimal effects on nonmarket values, as the area is and would remain unavailable for recreation or other uses by the public during reclamation and closure. Although the size of certain mining facilities, such as the tailings storage facilities, would increase progressively over the life of the mine, continued use of the site as a mine would not represent a new visual impact on local communities and would not change local land uses. Similar to the no-action alternative, the incremental nature of mine facility expansion, existing landscape already highly altered from mine development, relatively distant viewing locations, and likelihood that only portions of Pinto Valley Mine could be seen from each viewing location would also minimize the potential for scenic quality impacts perceived by recreationists (see section 3.16, “Recreation and Wilderness,” and section 3.20, “Visual Resources,” for more on potential viewing locations and scenic qualities of the landscape).

Decreased impacts from noise, human presence, and visual disturbance after the end of active mining operations and from successful reclamation could increase direct and indirect nonmarket values in the same manner as described for the no-action alternative but would occur approximately 7 years later.

3.17.4.4 **Proposed Action – Direct and Indirect Impacts**

3.17.4.4.1 Social Conditions

Under the proposed action, the workforce during active mining operations would generally be the same as described under alternative 1 and is not expected to increase population, affect housing, or result in other social impacts (stresses on schools, public services, or utilities, or changes in quality of life). However, extension of the life of the mine would delay social effects associated with mine closure by approximately 19 years compared to the no-action alternative and 12 years compared to alternative 1. In addition, with a longer period to plan for mine closure, additional measures could be taken to phase down employment and expenditures to reduce potential impacts on social conditions, compared to the no-action alternative and alternative 1.

3.17.4.4.2 Economic Conditions

Economic effects were estimated using an IMPLAN model for the Gila County analysis area, the results of which are presented in table 3-94 and table 3-95 below. The tables identify the direct, indirect, induced, and total effects on employment, labor income, total value added, industry activity, and State and local tax revenue in the Gila County analysis area. Refer to section 3.17.4.1, "Analysis Methodology and Assumptions," above for definitions of the types of effects and terminology referred to in this section. IMPLAN modeling input used to develop the results below consisted of Pinto Valley Mine expenditures in support of the project, direct employment and contractors, and road construction expenditures. The results in table 3-94 and table 3-95 represent annual values.

Table 3-94 shows that the proposed action would support approximately 1,030 total annual jobs in the Gila County region. Employment is supported by annual expenditures provided by the proponent and spending on road construction (910 jobs and 120 jobs, respectively). The proposed action would generate approximately $66.3 million in labor income and contribute approximately $326.4 million in industry activity across the region. The proposed activity would generate approximately $14.8 million in State and local tax revenue. Operation of Pinto Valley Mine for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 would extend the economic impacts in the analysis area compared to the other alternatives. After the end of active mining operations, a reduced level of employment and economic impact would occur until reclamation is complete; economic impacts from reclamation activities would be the same as under the no-action alternative and alternative 1, but would be delayed by approximately 19 years or 12 years, respectively.

Table 3-95 provides a breakdown of the total annual economic impact by direct, indirect, and induced effects of the proposed action. The indirect and induced effects of the two input categories can be summarized through a multiplier. As shown in table 3-95, for every direct job added in the region due to direct spending, the multiplier generated through IMPLAN modeling indicates that approximately 1.5 jobs are created in the regional economy. For every dollar of direct labor income, approximately $1.17 of labor income is generated. Similarly, every dollar of direct industry activity creates an additional $1.15 in industry activity throughout Gila County.

Table 3-94. Summary of annual economic impact of operation of the Pinto Valley Mine for the proposed action (in 2016 dollars)

Total Effect (Direct + Indirect + Induced)	Employment[96]	Labor Income[97]	Total Value Added[98]	Industry Activity[99]	State & Local Tax[100]
Pinto Valley Mine Expenditures	910	$61.8	$171.9	$309.4	$14.3
Road Construction	120	$4.5	$6.6	$17	$.47
Total	1,030	$66.3	$178.5	$326.4	$14.8

Source: IMPLAN 2017
Analysis based on IMPLAN results. Numbers may not sum due to rounding.

Table 3-95. Summary of the regional annual economic effects and multipliers from operation of the Pinto Valley Mine for the proposed action (in 2016 dollars)

Impact Type	Employment[101]	Employee Compensation[102]	Industry Activity[103]
Direct Effect	690	$56.6	$284.5
Indirect Effect	120	$4.1	$17.7
Induced Effect	225	$5.7	$24.1
Total Effect	1,030	$66.3	$326.4
Multiplier	1.50	1.17	1.15

Source: IMPLAN 2017
Analysis based on IMPLAN results. Numbers may not sum due to rounding.

3.17.4.4.3 Fiscal Conditions

Extending the life of Pinto Valley Mine by approximately 19 years compared to the no-action alternative and 12 years compared to alternative 1 would provide a long-term revenue source that would enable the county to continue to provide public services for its residents. As noted in table 3-94, operation of Pinto Valley Mine is estimated to contribute approximately $14.8 million annually in State and local taxes. While property taxes would continue to be collected for Pinto Valley Mine following its closure, sales and fuels taxes and income taxes from employees would not. The proposed action would delay the reduction in these State and local taxes by approximately 19 years compared to the no-action alternative and 12 years compared to alternative 1, providing a long-term benefit in the analysis area compared to the other alternatives.

3.17.4.4.4 Nonmarket Value

- Effects on nonmarket values under the proposed action would be greater than under the no-action alternative and alternative 1 due to the increased amount of surface disturbance on private land, the addition of 229 acres of surface disturbance on National Forest System lands, and the longer operational life of the mine. However, similar to the other alternatives, adverse impacts on nonmarket values would continue to be limited due to the existing landscape already highly altered from mine development, relatively distant viewing locations, and likelihood that only portions of Pinto Valley Mine could be seen from each viewing location (see

[96] Rounded to the nearest 10 jobs.
[97] In millions of dollars per year.
[98] Ibid.
[99] Ibid.
[100] Ibid.
[101] Rounded to nearest 10 jobs.
[102] In millions of dollars per year.
[103] Ibid.

section 3.16, “Recreation and Wilderness,” and section 3.20, “Visual Resources,” for more on potential viewing locations and scenic qualities of the landscape).

Because the proposed action would continue for approximately 19 more years than the no-action alternative and 12 more years than alternative 1, noise and traffic from operation and reclamation of Pinto Valley Mine would diminish the rural characteristics in and around the mine for a longer period of time compared to the other alternatives.

The expansion of mining facilities onto National Forest System lands and resulting impacts on wildlife, visual resources, recreation, and other uses could decrease passive use benefits (existence value) that reflect nonmarket values. Conversion of the 229 acres of National Forest System lands to a more industrial landscape could diminish the range of available opportunities for enjoyment and use of public lands in the area. Because there is no evidence of substantial existing recreation use on or directly adjacent to the mine site, the potential for substantial new adverse impacts on recreation and related uses from expansion onto immediately adjacent National Forest System lands is limited; as a result, the Forest Service has determined it is not necessary to monetize or model the potential loss of recreation-related expenditures. Refer to section 3.16, “Recreation and Wilderness,” for additional information on recreational use in the analysis area.

As noted under the no-action alternative, after the mine is closed and active reclamation is complete, adverse effects on many nonmarket values would diminish commensurate with the level of reclamation success.

Refer to section 3.17.3.4, “Nonmarket Value,” for more information on the types of nonmarket values.

3.17.4.5 **Cumulative Impacts**

The cumulative impact analysis area for socioeconomic conditions consists of Gila County (including the Town of Miami, City of Globe, and Claypool census-designated place) and surrounding populated townships (Town of Superior and Top of the World census-designated place)—the same area used to analyze direct and indirect effects in section 3.17.4, “Environmental Consequences.” These communities could potentially experience a change in employment, demand for housing or temporary accommodations, demand for public services (such as law enforcement) and utilities, or demand for community infrastructure as a result of construction-related activities. The discussion in section 3.17.4, “Environmental Consequences,” encompasses cumulative impacts of past and present actions due to the aggregated composition of the social and economic data used to support the analysis. The temporal boundary for analyzing cumulative socioeconomic impacts includes ongoing operations at Pinto Valley Mine through post-closure of the facility.

Section 3.17.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on socioeconomic conditions. The primary types of past actions that have resulted in present effects that contribute to cumulative impacts on socioeconomics include growth in the mining and manufacturing sectors and declines in the healthcare and construction sectors.

Within the cumulative impacts analysis area, existing mining operations of the Carlota Mine, Freeport-McMoRan Miami Copper Mine, and Pinto Valley Mine have played a critical role in the development of the local economy and remain an important cultural and economic influence in the county. Since the start of the century, Gila County has seen growth in the mining sector and manufacturing sector, while simultaneously experiencing decline in the healthcare and construction sectors (U.S. Bureau of Labor Statistics 2019; ICF analysis). Mining in Gila County increased by 37 percent from 2001 to 2017, adding almost 300 jobs to the local economy. Related industries, such as real estate (including rental and leasing), have grown as well—by 46 percent since 2001 until 2017. Manufacturing jobs, which grew by 24 percent since 2001, also provide a steady income for employees. There were approximately 1,238 manufacturing employees in 2017 in Gila County. Other large employers include government (over 5,000 employees in 2017, with a 25 percent increase over 17 years), retail trade (which fell slightly since 2001), and accommodation and food services, which increased by 49 percent since 2001 (U.S. Bureau of Labor Statistics 2019; ICF analysis).

The regional economic effects of the project were analyzed for the Gila County analysis area using the IMPLAN input-output model. The proposed action is estimated to generate approximately $66.3 million in labor income and contribute approximately $326.4 million in industry activity across the region, support approximately 1,030 jobs, and generate $14.8 million in State and local tax revenue on an annual basis. Continuation of limited mining operations for several more years and subsequent closure activities at Carlota Mine and limited leaching operations and care and maintenance of inactive facilities at the Freeport-McMoRan Miami Copper Mine would support continued employment in the mining industry. Development of the proposed Resolution Copper Project and Land Exchange would have significant social and economic effects on the region. The draft EIS for Resolution Copper Project and Land Exchange estimates that the project would directly employ 1,523 workers, pay about $134 million per year in total employee compensation, and purchase about $546 million per year in goods and services (Forest Service 2019e). The project would increase the number of mining jobs within the analysis area, potentially spurring additional residential and commercial growth, as well as contribute to natural resource impacts that could affect tourism and amenity-based industries.

This cumulative analysis considers the present effects of past actions described in section 3.17.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect social conditions, economic conditions, fiscal conditions and nonmarket value in the future as identified in table 3-3 and further described in table 3-2.

3.17.4.5.1 Social Conditions

Present effects of the relevant past and present actions are as described for existing conditions in section 3.17.3, “Affected Environment.” The cumulative impacts on social conditions would generally be the same as those described in sections 3.17.4.2 through 3.17.4.4. The proposed action is not expected to increase population, affect housing, or result in other social impacts (stresses on schools, public services, or utilities, or changes in quality of life).

Present and reasonably foreseeable actions that could contribute to cumulative social conditions impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on social conditions are the Carlota Mine, Resolution Copper Project and Land Exchange, Freeport-McMoRan Miami Copper Mine, Ray Land Exchange, and Gibson Copper Mine. Continuation of limited mining operations for several more years and subsequent closure activities at Carlota Mine and limited leaching operations and care and maintenance of inactive facilities at the Freeport-McMoRan Miami Copper Mine would support continued employment in the mining industry. However, employment would decline with the cessation of mining and leaching operations at these mines. If unemployed staff are unable to find jobs at other nearby mines or in other industries, communities within the analysis area could experience out-migration, increased vacancy rates, and decreased housing values. Development of the proposed Resolution Copper Project and Land Exchange would have significant social and economic effects on the region. The draft EIS for Resolution Copper Project and Land Exchange estimates that the project would directly employ 1,523 workers, pay about $134 million per year in total employee compensation, and purchase about $546 million per year in goods and services (Forest Service 2019e). The project would increase the number of mining jobs within the analysis area, potentially spurring additional residential and commercial growth, as well as contribute to natural resource impacts that could affect tourism and amenity-based industries. In general, ongoing and reasonably foreseeable actions, combined with Pinto Valley Mining Corp.'s proposed action, would contribute incrementally to cumulative impacts on social conditions. Mining projects would contribute to local, regional, and national economies through capital costs, labor, and fiscal impacts on a temporary to long-term basis, depending on the planned operational life of the mine.

The differences in cumulative impacts on social conditions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.17.4.2 through 3.17.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Extension of the life of the mine under the proposed action would delay social effects associated with mine closure by approximately 19 years compared to the no-action alternative and 12 years compared to alternative 1. In addition, with a longer period to plan for mine closure, additional measures could be taken to phase down employment and expenditures to reduce potential impacts on social conditions under the proposed action compared to the no-action alternative and alternative 1.

Based on the longer duration of the mine life under the proposed action compared to alternative 1 and the no-action alternative and in consideration of other past, present, and reasonably foreseeable actions, the proposed action is anticipated to result in the lowest degree and most gradual change from existing social conditions among the alternatives.

3.17.4.5.2 Economic Conditions

Present effects of the relevant past and present actions are as described for existing conditions in section 3.17.3, "Affected Environment." The cumulative impacts on economic conditions would generally be the same as those described in sections 3.17.4.2 through 3.17.4.4. The proposed action would support approximately 1,030 total annual jobs in the Gila County region, would generate approximately $66.3 million in labor income, and would contribute approximately $326.4 million in industry activity across the region.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on economic conditions in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative economic conditions are the same as described above for social conditions and include the Carlota Mine, Resolution Copper Project and Land Exchange, Freeport-McMoRan Miami Copper Mine, Superior West Exploration Drilling Project, Ray Land Exchange, and Gibson Copper Mine. In general, ongoing and reasonably foreseeable actions, combined with Pinto Valley Mining Corp.'s proposed action, would contribute incrementally to cumulative impacts on economic conditions. Mining projects would contribute to local, regional, and national economies through capital costs, labor, and fiscal impacts on a temporary to long-term basis, depending on the planned operational life of the mine.

The differences in cumulative impacts on economic conditions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.17.4.2 through 3.17.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Operation of Pinto Valley Mine under the proposed action for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 would extend the economic impacts in the analysis area compared to the other alternatives. After the end of active mining operations, a reduced level of employment and economic impact would occur until reclamation is complete; economic impacts from reclamation activities under the proposed action would be the same as under the no-action alternative and alternative 1 but would be delayed by approximately 19 years or 12 years, respectively.

Based on these factors, the cumulative economic effects of mining operations under the proposed action in combination with other past, present, and reasonably foreseeable actions would be sustained for a longer period of time than under alternative 1 or the no-action alternative.

3.17.4.5.3 Fiscal Conditions

Present effects of the relevant past and present actions are as described for existing conditions in section 3.17.3, "Affected Environment." The cumulative impacts on fiscal conditions would generally be the same as those described in sections 3.17.4.2 through 3.17.4.4. Operation of Pinto Valley Mine under the proposed action would contribute approximately $14.8 million annually in State and local taxes. While property taxes would continue to be collected for Pinto Valley Mine following its closure, sales and fuels taxes and income taxes from employees would not.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on fiscal conditions in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative economic conditions are the same as described above and include the Carlota Mine, Resolution Copper Project and Land Exchange, Freeport-McMoRan Miami Copper Mine, Ray Land Exchange, and Gibson Copper Mine. In general, ongoing and reasonably foreseeable actions, combined with Pinto Valley Mining Corp.'s proposed action, would contribute incrementally to cumulative impacts on fiscal conditions. Mining projects would contribute to local, regional, and national economies through capital costs, labor, and fiscal impacts on a temporary to long-term basis, depending on the planned operational life of the mine.

The differences in cumulative impacts on fiscal conditions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.17.4.2 through 3.17.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Extending the life of Pinto Valley Mine by approximately 19 years under the proposed action compared to the no-action alternative and 12 years compared to alternative 1 would provide a long-term revenue source that would increase Gila County's capacity to provide public services for its residents.

Based on these factors, the cumulative revenue generated by mining operations under the proposed action in combination with other past, present, and reasonably foreseeable actions would be greater than under alternative 1 or the no-action alternative.

3.17.4.5.4 Nonmarket Value

Present effects of the relevant past and present actions are as described for existing conditions in section 3.17.3, "Affected Environment." The cumulative impacts on nonmarket value would generally be the same as those described in sections 3.17.4.2 through 3.17.4.4. Adverse impacts on nonmarket values would be limited under the proposed action because the existing landscape is already highly altered from mine development, and the likelihood that only portions of Pinto Valley Mine could be seen from relatively distant viewing locations.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on fiscal conditions in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative nonmarket value impacts are the same as described above and include the Carlota Mine, Resolution Copper Project and Land Exchange, Freeport-McMoRan Miami Copper Mine, Superior West Exploration Drilling Project, Ray Land Exchange, and Gibson Copper Mine. In general, present and reasonably foreseeable actions, combined with Pinto Valley Mining Corp.'s proposed action, would contribute incrementally to cumulative impacts on nonmarket value. Mining projects would contribute to disturbances on private and National Forest System Lands that could make land unavailable for recreation or other uses by the public, or result in scenic quality impacts depending on the future level of development.

The differences in cumulative impacts on nonmarket value among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.17.4.2 through 3.17.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The proposed action would continue for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. As a result, noise and traffic from operation and reclamation of Pinto Valley Mine would diminish the rural characteristics in and around the mine for a longer period of time compared to the other alternatives.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to contribute to a greater cumulative decrease in non-market values such as recreation opportunities and scenic quality than under alternative 1 or the no0action alternative.

3.18 Soils

This section describes the affected environment and environmental consequences for soils affected by the operation, expansion, and reclamation of Pinto Valley Mine. Soil disturbance, soil condition and reclamation, and soil contamination are the primary factors considered in this analysis.

The analysis area for analyzing direct and indirect effects on soils is the Pinto Valley Mine project boundary (map 1-1 in appendix A), which includes all areas where surface land is or would be directly affected by soil-disturbing activities. The temporal boundary for analyzing direct and indirect impacts on soils from the implementation of the proposed action and alternatives includes the ongoing operations at Pinto Valley Mine and extends through closure and final reclamation, with some effects on soil productivity continuing into the post-closure period until successful reclamation is achieved.

3.18.1 Relevant Laws, Regulations, and Policy

3.18.1.1 **Federal Authorities**

3.18.1.1.1 Organic Administration Act of 1897

The Organic Administration Act (16 U.S. Code 473–475) authorizes the Secretary of Agriculture to establish regulations to govern the occupancy and use of national forests and "to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States."

3.18.1.1.2 Bankhead-Jones Farm Tenant Act of 1937

The Bankhead-Jones Farm Tenant Act (Public Law 75-210) authorizes and directs the Secretary of Agriculture to develop a program of land conservation and land utilization to correct maladjustments in land use, and thus assist in controlling soil erosion (reforestation), preserving natural resources, (protecting fish and wildlife, developing and protecting recreational facilities), mitigating floods, (preventing impairment of dams and reservoirs, developing energy resources), conserving surface and subsurface moisture, protecting the watersheds of navigable streams, and protecting the public lands, health, safety, and welfare.

3.18.1.1.3 Multiple-Use Sustained-Yield Act of 1960

The Multiple-Use Sustained-Yield Act (16 U.S. Code 528–531) states that national forests are to be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. This act directs the Secretary of Agriculture to manage these resources in the combination that will best meet the needs of the American people, providing for periodic adjustments in use to conform to changing needs and conditions and harmonious and coordinated management of the resources without impairment of the productivity of the land. Sustained yield means achieving and maintaining into perpetuity a high-level annual or regular periodic output of renewable resources without impairment of the productivity of the land.

3.18.1.1.4 Forest and Rangeland Renewable Resources Planning Act of 1974

The Forest and Rangeland Renewable Resources Planning Act (16 U.S. Code 1600–1614) requires the maintenance of productivity of the land and the protection and, where appropriate, improvement of the quality of the soil and water resources. The act specifies that substantial and permanent impairment of productivity must be avoided and has far-reaching implications for watershed management in the National Forest System. This act, as amended by the National Forest Management Policy Act of 1976 (16 U.S. Code 472a), also directs the Secretary of Agriculture to conduct surveys to assess forest and rangeland productivity, maintain an inventory of all National Forest System lands and renewable resources, and identify lands not suitable for timber production.

3.18.1.1.5 Comprehensive Environmental Response, Compensation, and Liability Act of 1980

The Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S. Code 9601 et seq.) establishes prohibitions and requirements concerning closed and abandoned hazardous waste sites and provides for liability of persons responsible for releases of hazardous waste at these sites, such as release of hazardous waste resulting in contamination of soils within abandoned mine lands.

3.18.1.1.6 Locatable Mineral Regulations

Locatable mineral regulations at 36 CFR 228, subpart A set forth rules and procedures to minimize adverse environmental impacts from mineral entry on National Forest System lands. The regulations enumerate requirements for reclamation of the surface in a manner that controls soil erosion, landslides, and runoff.

3.18.1.2 **Forest Service Regulations, Policies, and Guidance**

Forest Service Manual 2550

Forest Service Manual 2550 describes the Forest Service policies, practices, and procedures for managing soils under the Forest Service Directive System and Soil Survey Division.

3.18.1.2.1 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan states that "land uses have created some areas on the Forest that have unacceptable soil erosion and watershed conditions. Soil productivity is being threatened in these areas" (Forest Service 1985). The Tonto National Forest Plan provides the following management directions and prescriptions for soils:

- "Construction should take place only when soil conditions are not too wet."
- "Minimize impacts on soil and water resources from all ground disturbing activities."
- "Mitigate the adverse effects of planned activities on the soil and water resources through the use of Best Management Practices."
- "Implement and maintain soil resource improvement projects as needed."

Forest Service staff have identified the following desired conditions for soil:

- Have productive, functional, and inherent physical, chemical, and biological processes that remain intact or are enhanced.
- Readily absorb, store, and transmit water vertically and horizontally, resist erosion, and accept, hold, and release nutrients.
- Have vegetative cover and litter that are distributed across the soil surface in adequate amounts to limit erosion and contribute to soil development, productivity, and carbon cycling.
- Have cover and herbaceous vegetation that protect soil, facilitates infiltration, and contribute to plant and animal diversity and ecosystem function.
- Productivity is not to be inhibited by nonnative invasive plant species.
- Free from contaminants that could alter ecosystem integrity or affect public health.
- Do not exhibit accelerated or unnatural signs of water or wind erosion (such as pedestaling, rills, and gullies).

3.18.1.2.2 Other Forest Service Guidance

- R3 Technical Guidance for Assessing and Monitoring Soil Quality in the Southwestern Region (Forest Service 2013b)
- Forest Service General Technical Report W0-68 – Terrestrial Ecological Unit Inventory Technical Guide: Landscape and Lane Unit Scales (Winthers et al. 2005)

3.18.1.3 **State and Local Laws, Regulations, and Policies**

3.18.1.3.1 Arizona Soil Remediation Levels

Arizona Administrative Code R18-7-201 establishes thresholds for remediation in the event of contamination or spills that occur during active mine life or any known soil contamination during mine closure. Soil remediation levels are also applicable in the event of contamination or spills that occur during active mine life, along with and Arizona Administrative Code R18-9-A209, “Aquifer Protection Permit Closure Requirements.” Investigation and characterization of potential soil contamination is a component of closure and contingency plans required under the Arizona Aquifer Protection Permit process.

3.18.1.3.2 Arizona Mined Land Reclamation

The Arizona Mined Land Reclamation Act requires reclamation of mined lands to a safe, stable condition. Title 27 Arizona Revised Statute Chapter 5, Article 4, requires submission of a reclamation plan for new mines to the Arizona State Mine Inspector. The State Mine Inspector is responsible for reclamation on private property. Two criteria contained in the statute specifically involve soils and soil productivity:

- Section 27-971(B)(9) requires that the plan include information on proposed reclamation measures that would be taken to address erosion control and stability.
- Section 27-974 specifies that, prior to disturbance, soil shall be conserved unless otherwise it is unable to be conserved or it is unnecessary to do so.

3.18.1.3.3 Arizona Aquifer Protection Permit

Investigation and characterization of potential soil contamination is contained under Arizona Aquifer Protection Permit regulations (Arizona Administrative Code R18-9-A209). The current Aquifer Protection Permit for Pinto Valley Mine was last amended on July 27, 2020 (Arizona Department of Environmental Quality 2019a). These regulations require permittees to submit a closure plan that includes:

- A site investigation summarizing relevant site studies already conducted and a proposed scope of work for any additional site investigation necessary to identify the following:
  - The lateral and vertical extent of contamination in soils and groundwater, using applicable standards;
  - The approximate quantity and chemical, biological, and physical characteristics of each waste, contaminated water, or contaminated soil proposed for removal from the facility;
  - The approximate quantity and chemical, biological, and physical characteristics of each waste, contaminated water, or contaminated soil that would remain at the facility; and
  - Information regarding site conditions related to pollutant fate and transport that may influence the scope of sampling necessary to characterize the site for closure.
- A closure design identifying: the method used, if any, to treat any material remaining at the facility; the method used to control the discharge of pollutants from the facility; any limitation on future land or water uses created as a result of the facility’s operations or closure activities; and the methods used to secure the facility.

3.18.2 Resource Indicators

Table 3-96 below provides the resource indicators and measures for assessing potential effects on soils.

Table 3-96. Resource indicators and measures for assessing effects on soils

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Soil disturbance	Soil types and coverage	Acres of proposed new surface disturbance affecting each soil type	Yes	Natural Resources Conservation Service soil survey data, Forest Service Terrestrial Ecological Unit Inventory data
Soil condition and reclamation	Potential effects on soil stability, productivity, and capacity to support vegetative growth	Soil stability, hydrologic function, and capacity to support native vegetation communities after reclamation	Yes	Natural Resources Conservation Service soil survey data, WestLand Resources, Inc. site characterizations for Pinto Valley Mine (2015, 2017), Pinto Valley Mining Corp.'s Mined Land Reclamation Plan (SRK Consulting, Inc. 2016a), Aquifer Protection Permit Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a)
Soil contamination	Potential for soil contamination	Prevention measures and proposed remediation for areas with potential soil contamination	Yes	Federal and State laws and guidance; plan of operations

3.18.3 Affected Environment

Table 3-97 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-97. Resource indicators and measures for the existing condition for soils

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Soil disturbance	Soil types and coverage	Acres of proposed new surface disturbance affecting each soil type	Soils are often thin or nonexistent due to bedrock exposures or removal by mining activities.
Soil condition and reclamation	Potential effects on soil stability, productivity, and capacity to support vegetative growth	Soil stability, hydrologic function, and capacity to support native vegetation communities after reclamation	Variable reclamation success observed on existing facilities or no monitoring data available. Semiarid climate and vegetation communities require long periods of time to reclaim.
Soil contamination	Presence of contaminated soils	Prevention measures and proposed remediation for areas with potential soil contamination	Areas of petroleum-, concentrate-, and reagent-contaminated soils present from past mining activities.

3.18.3.1 Soil Disturbance

Most natural soil cover within operational areas of Pinto Valley Mine has been removed or buried from decades of mining activity. Land cover within the mine site consists primarily of bare rock, paved surfaces, or structural fill containing soil and earthen materials that serve as a base surface for roads, equipment, and buildings. Bedrock in undisturbed, upland areas surrounding Pinto Valley Mine is often exposed or covered by a thin, irregular veneer of soil, terrace gravels, and talus (WestLand Resources, Inc. 2016a). Alluvium deposits present along drainage bottoms are typically thin.

Table 3-98 lists the acreage and percentage of soil map units in the Pinto Valley Mine project boundary. Preliminary soil survey data compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service identifies the presence of at least seven soil map units within the Pinto Valley Mine project boundary (map 3-15 in appendix A). A substantial portion of the area (36 percent) is classified as “mined land,” indicating that natural soil cover is mostly absent. Areas mapped as mined lands include the Open Pit, Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, and the Cottonwood Tailings Impoundment. In areas where the Forest Service’s geospatial ecosystem mapping project known as Terrestrial Ecological Unit Inventory data (Forest Service 2019b) are unavailable, soil information has been supplemented with Natural Resources Conservation Service data.

Table 3-98. Soil map units in the Pinto Valley Mine project boundary

Soil Map Unit Name	Acres of National Forest System Lands	Acres of Private Lands	Total Acres	Percentage of Total
Natural Resources Conservation Service soil map units				
Mined land	347	3,506	3,853	36
Rock outcrop-Woodcutter complex, tuff, 15 to 50 percent slopes	15	1,491	1,506	14
Silverstrike-Popcorn-Quillian complex, 15 to 50 percent slopes	7	906	913	9
Caralampi-Eloma complex, 10 to 60 percent slopes	19	358	376	4
Rock outcrop-Turquoise complex, 25 to 65 percent slopes, bouldery	less than 1	68	69	1
Comoro sandy loam, 0 to 5 percent slopes	8	46	54	1
Bodecker soils and Riverwash, 0 to 5 percent slopes	1	13	14	<1
Bodecker and Horner soils, 1 to 8 percent slopes	0	1	1	<1
Terrestrial Ecological Unit Inventory map units				
444: Lithic Argiustolls-Rock Outcrop-Typic Argiustolls complex, 40 to 120 percent slopes	1,027	3	1,030	10
446: Calcic Haplustalfs-Typic Haplustalfs-Lithic Argiustolls-Typic Haplustepts association, 40 to 80 percent slopes	930	2	931	9
326: Ustic Calciargids-Calcidic Haplustalfs-Torrertic Haplustalfs-Ustertic Haplargids-Lithic Ustic Haplargids complex, 15 to 60 percent slopes	511	0	511	5
472: Typic Haplustepts-Lithic Haplustepts complex, 15 to 60 percent slopes	252	0	252	2
445: Lithic Haplustolls-Rock Outcrop-Typic Haplustalfs complex, 15 to 60 percent slopes	243	<1	243	2
474: Lithic Haplustolls-Typic Haplustalfs complex, 0 to 40 percent slopes	202	0	202	2
365: Aridic Haplustalfs-Typic Haplustalfs complex, 15 to 60 percent slopes	119	3	121	1
30: Oxyaquic Ustifluvents-Riverwash complex, 0 to 5 percent slopes	95	0	95	1
430: Typic Haplustalfs-Typic Argiustolls-Lithic Argiustolls-Rock Outcrop complex, 40 to 80 percent slopes	41	0	41	<1

Soil Map Unit Name	Acres of National Forest System Lands	Acres of Private Lands	Total Acres	Percentage of Total
405: Lithic Haplustalfs-Typic Argiustolls-Aridic Ustorthents-Typic Ustorthents complex, 40 to 80 percent slopes	31	0	31	<1
436: Typic Haplustalfs-Typic Argiustolls-Rock Outcrop-Lithic Argiustolls complex, 40 to 120 percent slopes	30	0	30	<1
40: Oxyaquic Ustifluvents-Riverwash complex, 0 to 5 percent slopes, stony	11	0	11	<1
320: Aridic Haplustalfs-Aridic Paleustalfs complex, 0 to 15 percent slopes	1	0	1	<1
No data available	354	61	415	4
Total	**4,244**	**6,459**	**10,701**	**100**

Sources: Natural Resources Conservation Service 2013; Forest Service 2019b.

Outside of mined land, the rock outcrop-Woodcutter complex and Silverstrike-Popcorn-Quillian complex are the most abundant Natural Resources Conservation Service soil map units within the analysis area. The rock outcrop-Woodcutter complex, which occupies much of the area north of Tailings Storage Facility No. 3 and southwest of Tailings Storage Facility No. 4, consists of exposed bedrock in rugged terrain with intermittent coverage by a thin layer of shallow, cobbly, sandy loam derived from weathering of underlying tuff; soils within this complex have high erosion potential when disturbed and are difficult to revegetate due to steep topography and depth to bedrock (Natural Resources Conservation Service 2013). The Silverstrike-Popcorn-Quillian complex, which is present along the eastern edge of the analysis area consists of shallow to moderately deep, cobbly loams with high gravel content derived from weathering of sandstone and limestone; soils in this complex have moderate water erosion potential, low wind erosion potential, and moderate to high revegetation potential. The Caralampi-Eloma complex, which is present in upland areas within the northern portion of Pinto Valley Mine, consists of gravelly loam formed from alluvium; soils in this complex have low wind and water erosion potential and moderate revegetation potential. The Comoro sandy loam and Bodecker Series soils are the dominant alluvial soils within the Pinto Creek depositional channel; these soils have low water erosion potential, moderate to high wind erosion potential, and high revegetation potential.

The rugged terrain east of the Open Pit and east and north of Tailings Storage Facility No. 4 has patchy coverage by shallow, well-drained soils complexes, including the Lithic Argiustolls-Rock Outcrop-Typic Argiustolls complex, Calcic Haplustalfs-Typic Haplustalfs-Lithic Argiustolls-Typic Haplustepts association, and Ustic Calciargids-Calcidic Haplustalfs-Torrertic Haplustalfs-Ustertic Haplargids-Lithic Ustic Haplargids complex. These soils have not been extensively surveyed and their characteristics are not well known. In general, these soils are expected to have moderate to high erosion potential and low revegetation potential due to steep terrain and abundance of rock outcrops, sparse existing vegetation cover, and shallow depth to bedrock.

3.18.3.2 Soil Condition and Reclamation

The condition of soils, including the broad range of characteristics that contribute to soil stability, productivity, and capacity to support vegetative growth, is a critical determinant of the success of mined land reclamation. Soils in semiarid climates are very susceptible to water erosion, which is accelerated by extreme precipitation events and the absence of vegetation cover, mostly due to the scarce vegetation cover, low organic matter content, and minimal resistance to erosive forces. Extraction of ore from the Open Pit; creation of waste rock dumps, tailings storage facilities, and impoundments; and grading and leveling areas for installation of mining facilities has resulted in permanent or long-term loss of natural soil cover.

Table 3-99 summarizes past and ongoing reclamation activities at Pinto Valley Mine, including inactive waste rock dumps and tailings storage facilities, or areas no longer needed for ongoing operations. In a memo prepared for Pinto Valley Mining Corp., SRK Consulting, Inc. (2016a) noted the success of concurrent reclamation at Pinto Valley Mine along a large portion of the Tailings Storage Facility No. 4 embankment, where a local seed mix was applied to cover material composed of Gila Group, as well as Tailings Storage Facility No. 1 and a portion of Tailings Storage Facility No. 2, which were reclaimed with mixed inert material from the 14 Dump. Some vegetation has reestablished naturally on the 19 Dump, which is dominantly composed of Pinal Schist. Based on limited observations available, reclaimed areas with flatter topography have been observed to revegetate faster than side slopes. For example, WestLand Resources, Inc. estimated that 50 percent to 70 percent of the top of the 19 Dump was covered with mature vegetation, while vegetative cover on the side slopes ranged from and 0 percent to 50 percent (WestLand Resources, Inc. 2015b). Vegetative cover was higher in the berm and swale topography at the eastern portion of the dump than in the flatter areas in the western portion of the dump.

Although there is no existing formal monitoring program for soils and other cover materials used for reclamation at Pinto Valley Mine, mine personnel inspect reclaimed areas for evidence of erosion on a daily basis in the course of normal operations and after major storm events. Requirements under Pinto Valley Mine’s Aquifer Protection Permit issued by the Arizona Department of Environmental Quality also require quarterly site inspections of tailings storage facility embankments for signs of erosion, slumps, cracks, visible slips at the slope toes, and top failures. Results of these periodic or as-needed inspections are included in periodic reports pursuant to the Arizona Department of Environmental Quality’s permit requirements. Repairs to degraded areas are made when appropriate, and typically consist of replacing soil on exposed tailings or filling cracks in embankments (WestLand Resources, Inc. 2017d).

Table 3-99. Summary of reclamation activities at Pinto Valley Mine

Facility	Description	Reclaimed Area (Acres)
Southside Dump 13	No soil cover over waste rock; volunteer vegetation established in some areas.	6
Southside Dump 14	This waste rock dump was consumed during the reclamation of the underlying Tailings Storage Facility No. 1.	See Tailings Storage Facility Nos. 1 and 2
19 Dump	No soil cover over waste rock; naturally revegetated.	84
Cottonwood Tailings Impoundment	Surface capped in 1988 with 6-inch layer of inert material, and subsequently seeded with grasses.	279
Tailings Storage Facility Nos. 1 and 2	Tailings Storage Facility No. 1 reclaimed in 2011–13 with 2-foot layer of soil and revegetated top surface, rock armoring on side slopes. A portion of Tailings Storage Facility No. 2 was similarly reclaimed, and volunteer vegetation established in some areas.	120
Tailings Storage Facility No. 4	A portion of the embankment face was reclaimed in 2008–2010 with 2-foot-thick soil cover and rock armoring.	174

Source: WestLand Resources, Inc. 2017d

3.18.3.3 Soil Contamination

Pinto Valley Mining Corp. does not routinely analyze soil quality, but has indicated the presence of potential areas of petroleum- and concentrate-contaminated soils, primarily in the vicinity of the concentrator plant site (including the light-vehicle fueling station, fuel storage, and haul truck ready line area), truck and equipment wash facilities, and substations (SRK Consulting, Inc. 2019c). Areas of known soil contamination are all located on private lands owned by Pinto Valley Mining Corp.

3.18.4 Environmental Consequences

3.18.4.1 **Analysis Methodology and Assumptions**

Direct impacts on soils were estimated by overlaying proposed new disturbance areas with geospatial data characterizing soils. Potential impacts are refined based on soil characteristics that are typically key determinants of reclamation potential (such as depth and salinity).

The soils analysis incorporates the following assumptions:

- Soil data used for the analysis appropriately represent the types and characteristics of soils in the analysis area. Size and extent of mapped soil units used for baseline analysis represent the best available geospatial information.
- Potential direct and indirect impacts on soil resources are based on extent and duration of surface-disturbing activities, the length of time required for reclamation, and the potential for contamination during or after the mine life.
- Periods of drought and extreme rainfall events could increase rates of soil erosion and extend reclamation timeframes.
- Revegetation and reclamation in disturbed areas will generally be a slow process due to relatively arid climate and dominance of soil constraints (shallow or saline soils) in the Pinto Valley Mine project boundary. Vegetation communities may take three decades or more to fully revegetate after disturbance.
- Developed mine facilities, roads, and locations of supporting infrastructure would remain unvegetated or disturbed for the life of the project.

3.18.4.2 **No-action Alternative – Direct and Indirect Impacts**

3.18.4.2.1 Soil Disturbance

There is an estimated 3,915 acres of existing disturbance at the Pinto Valley Mine, including 3,349 acres on private land and 566 acres on National Forest System lands (table 2-1). Under the no-action alternative, there would be an estimated 367 acres of additional surface disturbance on private land, including 10 acres of disturbance associated with continued deposition of tailings in Tailings Storage Facility No. 4 and 357 acres of disturbance associated with excavation of borrow and riprap sources. New disturbance on private land associated with the production of borrow and riprap materials will be regraded to shed storm water and revegetated with a local seed mix free of invasive plants and noxious weeds according to the Mined Land Reclamation Plan. There would be no new planned disturbance on National Forest System lands.

Soil disturbance would generally result in clearing or inundation of vegetation and removal of the natural soil cover. Removal of vegetation and the subsequent exposure of the soil could lead to increased susceptibility to erosion and loss of soil productivity. Soils are more susceptible to erosion if they are not protected by vegetation cover or are left exposed to wind or water flow. Susceptibility to erosion could be exacerbated during intensive storm events, floods, or drought conditions. Loss of topsoil from project-related activities and erosion would also result in the loss or reduction of soil organisms, viable seed bank, and soil nutrients. Additionally, bare soils could be more susceptible to the establishment and spread of invasive plants and noxious weeds.

3.18.4.2.2 Soil Condition and Reclamation

Reestablishment of natural soil cover and vegetation after disturbance in arid and semiarid ecosystems occurs very slowly relative to more temperate regions due in part to limited moisture and the low fertility of desert soils, dry climate, high solar radiation, and high winds. Despite sparse vegetation cover, plants and their root systems play an important role in increasing soil moisture, organic content, cohesion, and stability. Vegetation is discussed more specifically in section 3.3.3.1, “Vegetation.” Biological soil crusts, which form on soil surfaces from a mosaic of cyanobacteria, algae, fungi, moss, and lichen species, also provide critical ecosystem functions by maintaining soil stability and surface hydrology (Chock et al. 2018).

Soil disturbance reduces soil fertility and stability, contributing over time to desertification (Belnap 1995). Studies tracking revegetation following a variety of disturbances in the Mojave and Sonoran Deserts of southwestern North America indicated that reestablishment of perennial plant cover requires approximately 76 years, while recovery of species composition typical of undisturbed areas requires approximately 215 years (Abella 2010). Another study estimates that reestablishing pre-disturbance plant cover and biomass after disturbance in southern California desert ecosystems may take 50 to 300 years, while complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge 1999). The use of active management treatments, such as seeding, planting, or soil manipulation, generally improves revegetation rates and species composition. However, the use of some active management techniques may not be economically feasible over large areas due to the cost of importing reclamation materials.

Past and ongoing mining activities at Pinto Valley Mine have resulted in the loss of natural soil cover. Pinto Valley Mining Corp.’s active Mined Land Reclamation Plan and reclamation plan for National Forest System lands identify conceptual reclamation measures necessary to achieve the proposed post-mining land uses at Pinto Valley Mine, including wildlife habitat, livestock grazing, recreational land, commercial or industrial use, and mineral exploration and mining (SRK Consulting, Inc. 2016a). Additional closure and post-closure requirements are described in the Aquifer Protection Permit Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a).

Under the no-action alternative, closure of facilities and reclamation of disturbed areas, including existing encroachments, would generally begin following the 6-month transition period unless facilities and infrastructure are necessary for post-closure operations. Reclamation activities are anticipated to last for approximately 12 years with additional post-closure monitoring activities continuing for up to 30 years.

Given the limited soil resources present and long-term nature of most disturbances at the mine, Pinto Valley Mining Corp. does not currently salvage or stockpile soil. Pinto Valley Mining Corp.’s active Mined Land Reclamation Plan specifies that soils may be used locally for reclamation of access roads and the Mine Reservoir, but reclamation of most large facilities would consist of coverage with inert waste rock or rock armor (SRK Consulting, Inc. 2016a). SRK Consulting, Inc. (2019a) reports that “vegetation growth on hydro-seeded Gila Group, Whitetail Conglomerate, Pinal Schist, limestone, and other inert mixed rock types has been successfully achieved in mine closure and reclamation projects throughout southern Arizona.” The same memo asserts that successful concurrent reclamation of portions of Tailings Storage Facility No. 4 and Tailings Storage Facility Nos. 1 and 2 demonstrates the efficacy of the proposed reclamation techniques at Pinto Valley Mine. The Open Pit would not be backfilled or reclaimed and would be partially filled with a pit lake over time.

Limited revegetation has established on the top and side slopes of the 19 Dump, which consists of Pinal Schist inert waste rock (WestLand Resources, Inc. 2015c). Successful reclamation of the top, side slopes, and other slopes in excess of approximately 30 degrees may require use of reclamation techniques specific to steep slopes or recontouring to a lower slope.

In general, reclamation activities are anticipated to improve soil conditions over time commensurate with the level of reclamation success that is achieved. However, given the slow recovery of natural vegetative communities on disturbed land in arid climates in the desert southwest, soil conditions in disturbed areas may require a substantial amount of time to return to natural conditions.

3.18.4.2.3 Soil Contamination

Areas of potential soil contamination at the Pinto Valley Mine include the concentrator plant site (including the light-vehicle fueling station, fuel storage, and haul truck ready line area), truck and equipment wash facilities, substations, Solvent Extraction and Electrowinning Plant, Raffinate Pond, and storage tanks, all of which lie on private property. During final reclamation, Pinto Valley Mining Corp. would remove any soils potentially contaminated with petroleum hydrocarbons, concentrates, or reagents and haul them to an off-site repository for disposal (Capstone Mining Corp. 2016a). Depending on the level of contamination, petroleum-contaminated soils may be removed or covered in place in accordance with Arizona solid waste rules and soil remediation levels. Concentrate-contaminated soils and sludge may be transported to a nearby concentrator or smelter for processing for their residual value. Reagent-contaminated soil would be categorized and disposed of off site, if hazardous. In addition, Pinto Valley Mining Corp. would continue to apply its spill prevention, control, and countermeasures plan to address storage and containment of spills of petroleum and non-petroleum products from aboveground storage tanks and fill stations. Based on these practices and compliance with applicable laws, regulations, and policies, there would be limited potential for long-term impacts on soils from contamination at the Pinto Valley Mine.

3.18.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.18.4.3.1 Soil Disturbance

Expansion of mining facilities on private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in approximately 909 acres of new surface disturbance on private land with 0 acres of new surface disturbance on National Forest System lands. Potential impacts on soils from surface disturbance would be similar to those described for the no-action alternative, but to a greater extent due to the additional 542 acres of surface disturbance on private land compared to the no-action alternative.

The primary direct impact on soils would result from excavation of borrow and riprap sources on private land for use as cover material during reclamation; construction of the West Dump and Castle Dome Marginal Dump; and peripheral expansion of Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, the Inert Limestone Stockpile, and the Main Dump. Additional activities that could result in impacts on soils include ongoing grading and recontouring of facilities that are in closure or post-closure to ensure proper drainage and reclamation and necessary maintenance activities on access roads and National Forest System roads (such as shoulder drop-off maintenance, and resurfacing). However, these activities would generally occur in areas of previously disturbed soils, which would limit any new impacts on soils.

Similar to the no-action alternative, soil material for reclamation (borrow and riprap) would be sourced from private land and could include excavation of up to 357 acres of new disturbance. There would be no new surface disturbance on National Forest System lands. Table 3-100 reports the acreages of each soil map unit that would be affected by alternative 1. More than 70 percent of newly disturbed soils consist of the Silverstrike-Popcorn-Quillian complex and Rock outcrop-Woodcutter complex. Soils within the Silverstrike-Popcorn-Quillian complex are generally characterized by moderate water erosion potential, low wind erosion potential, and moderate to high revegetation potential, while soils within the Rock outcrop-Woodcutter complex generally have high erosion potential and low revegetation potential when disturbed. Based on Natural Resources Conservation Service mapping of existing mined lands, approximately 139 acres or 14 percent of soils in expansion areas have been previously disturbed, especially in the area of the proposed West Dump.

Table 3-100. Acres of new surface disturbance by soil map unit under alternative 1

Soil Map Unit Name	Acres of Private Land	Percentage
Natural Resources Conservation Service soil map units		
Silverstrike-Popcorn-Quillian complex, 15 to 50 percent slopes	328	36
Rock outcrop-Woodcutter complex, tuff, 15 to 50 percent slopes	322	35
Mined land	137	15
Caralampi-Eloma complex, 10 to 60 percent slopes	123	13
Rock outcrop-Turquoise complex, 25 to 65 percent slopes, bouldery	10	1
Terrestrial Ecological Unit Inventory map units		
444: Lithic Argiustolls-Rock Outcrop-Typic Argiustolls complex, 40 to 120 percent slopes	less than 1	less than 1
Total	920[104]	100

Source: Natural Resources Conservation Service 2013; Forest Service 2019b.

3.18.4.3.2 Soil Condition and Reclamation

Alternative 1 would result in 542 acres of additional surface disturbance on private land compared to the no-action alternative, primarily associated with private land expansion of the Open Pit, dumps, and Tailings Storage Facilities No. 3 and 4 (see table 2-7). The increased surface disturbance under alternative 1 would result in the same types of impacts on soil conditions as described under the no-action alternative, but to a greater extent due to the increased area of disturbance.

Reclamation activities and reclamation success would generally be the same as described under the no-action alternative except that reclamation of facilities and disturbance not required for post-closure operations would start approximately 7 years later than under the no-action alternative.

3.18.4.3.3 Soil Contamination

Under alternative 1, operations at the Pinto Valley Mine would last approximately 7 years longer than under the no-action alternative. The longer operational life of the mine may result in a larger volume of soil on private land becoming contaminated by petroleum-based products, concentrate, and reagents due to continued releases associated with additional vehicle fueling, material transport, and ore-processing activities. As a result, the potential for soil contamination from operational activities would increase commensurate with the extended operational period, compared to the no-action alternative. Practices to address soil contamination would generally be the same as described under the no-action alternative, except that final reclamation activities that would address areas of contamination would begin approximately 7 years later than under the no-action alternative.

[104] The total surface disturbance varies slightly from the total disturbance reported in chapter 2 due to geospatial data–based topology and edge matching issues in the Natural Resources Conservation Service soils data.

3.18.4.4 Proposed Action – Direct and Indirect Impacts

3.18.4.4.1 Soil Disturbance

Surface disturbance under the proposed action would result from similar mechanisms and contribute to similar types of effects on soils as described for the no-action alternative and alternative 1. However, the proposed action would result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands). This represents an increase of 720 acres of surface disturbance on private land compared to the no-action alternative and an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. The increased surface disturbance under the proposed action would generally increase potential impacts on soils commensurate with the increased area of disturbance compared to the no-action alternative and alternative 1.

The additional surface disturbance under the proposed action would primarily consist of expansion of the following facilities onto National Forest System lands: the Open Pit, Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, borrow and riprap source areas, and realignment of existing access roads and water pipelines (see table 2-11). Similar to the other alternatives, ongoing grading and recontouring of facilities in closure and post-closure would continue, as would necessary maintenance of roads.

Table 3-101 provides the estimated acreage of surface disturbance under the proposed action, by soil map unit. The largest percentage of new surface disturbance would affect the Silverstrike-Popcorn-Quillian complex (37 percent), followed by the rock outcrop-Woodcutter complex (28 percent). Based on Natural Resources Conservation Service mapping of existing mined lands, approximately 142.7 acres or 10 percent of soils in expansion areas have been previously disturbed, especially in the area of the proposed West Dump.

Table 3-101. Acres of new surface disturbance by soil map units under the proposed action

Soil Map Unit Name	Acres of National Forest System Lands	Acres of Private Land	Total Acres	Percentage of Total
Natural Resources Conservation Service soil map units				
Silverstrike-Popcorn-Quillian complex, 15 to 50 percent slopes	2	459	461	35
Rock outcrop-Woodcutter complex, tuff, 15 to 50 percent slopes	11	366	377	29
Mined land	8	132	140	11
Caralampi-Eloma complex, 10 to 60 percent slopes	less than 1	123	123	9
Rock outcrop-Turquoise complex, 25 to 65 percent slopes, boulder	0	10	10	1
Terrestrial Ecological Unit Inventory map units				
446: Calcic Haplustalfs-Typic Haplustalfs-Lithic Argiustolls-Typic Haplustepts association, 40 to 80 percent slopes	106	1	108	8
444: Lithic Argiustolls-Rock Outcrop-Typic Argiustolls complex, 40 to 120 percent slopes	41	less than 1	41	3
472: Typic Haplustepts-Lithic Haplustepts complex, 15 to 60 percent slopes	33	0	33	2
No data available	29	less than 1	29	2
Total	230	1,092	1,322	100

Source: Natural Resources Conservation Service 2013; Forest Service 2019b.
The total surface disturbance varies slightly from the total disturbance reported in chapter 2 due to geospatial data–based topology and edge matching issues in the Natural Resources Conservation Service soils data.

3.18.4.4.2 Soil Condition and Reclamation

The proposed action would result in 1,317 total acres of new surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands). The increased surface disturbance would result in the same types of impacts on soil conditions as described under the no-action alternative and alternative 1, but to a greater extent due to the increased area of surface disturbance under the proposed action.

The longer operating life of the mine under the proposed action would delay the start of reclamation for most facilities by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1. This would result in the distribution of borrow, riprap, inert waste rock, or other growth media approximately 19 years after the no-action alternative and 12 years after alternative 1, but is not anticipated to affect the outcome of reclamation. As described under the no-action alternative, inert waste rock may require amendment with topsoil or other constituents and specialized techniques on steep slopes to support vegetation growth that meets reclamation standards.

Reclamation activities and reclamation success would generally be the same as described under the no-action alternative and alternative 1, except that reclamation of facilities and disturbance not required for post-closure operations would commence approximately 19 years later than under the no-action alternative and approximately 12 years later than under alternative 1. Similar to the other alternatives, the efficacy of the proposed reclamation strategy to meet applicable reclamation standards may vary based on the site-specific conditions at each facility, and thus may require refinement during implementation of the reclamation strategy to ensure standards are achieved.

3.18.4.4.3 Soil Contamination

The potential for soil contamination from operational activities on private land would increase commensurate with the extended operational period of the proposed action, compared to the other alternatives. Practices to address soil contamination would generally be the same as described under the no-action alternative and alternative 1, except that final reclamation activities that would address areas of contamination would begin approximately 19 years later than under the no-action alternative and approximately 12 years later than under alternative 1.

3.18.4.5 **Cumulative Impacts**

The cumulative impact analysis area for soils is the Pinto Valley Mine project boundary—the same area used to analyze direct and indirect effects in section 3.18.4, “Environmental Consequences.” This analysis area encompasses approximately 10,574 acres and is the extent of the area that could experience direct and indirect effects from the proposed action that could combine with effects from other past, ongoing, and reasonably foreseeable actions, resulting in cumulative effects. The temporal boundary for analyzing cumulative impacts on soils is the ongoing operations at Pinto Valley Mine and extends through closure and final reclamation, with some effects on soil productivity continuing into the post-closure period until successful reclamation is achieved.

Section 3.18.3, “Affected Environment,” describes the present effects of past and present actions that warrant consideration and that could contribute to cumulative effects on soils. Within the cumulative impacts analysis area, previous disturbances associated with the Pinto Valley Mine constitute the primary past and present activities that have contributed to cumulative impacts and the existing condition of soils described in section 3.18.3, “Affected Environment.”

Existing surface disturbance within the soils cumulative impacts analysis area has resulted in the loss of natural soil cover on an estimated 4,283 acres, which represents approximately 41 percent of the 10,574 acres in the cumulative impacts analysis area. Proposed new disturbances at Pinto Valley Mine would contribute to an additional loss of natural soil cover on 1,317 total acres (1,087 acres on private land and 229 acres on National Forest System lands). There are no identified reasonably foreseeable actions that would occur within the cumulative impacts analysis area that would contribute to cumulative surface disturbance. As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 5,600 acres, which is approximately 53 percent of the cumulative impacts analysis area. Pinto Valley Mining Corp.'s active Mined Land Reclamation Plan and reclamation plan for National Forest System lands identify conceptual reclamation measures necessary to achieve the proposed post-mining land uses at Pinto Valley Mine, including wildlife habitat, livestock grazing, recreational land, commercial or industrial use, and mineral exploration and mining (SRK Consulting, Inc. 2016a).

Several recent wildfires within the Tonto National Forest burned vegetation and contributed to rapid erosion of bare soils during subsequent rainstorms. The most notable of these wildfires include the Woodbury Fire, which burned 124,000 acres in June and July of 2019 mostly within the Superstition Wilderness Area west of the analysis area and also a portion of Little Campaign Creek northwest of the analysis area, and the Salt Fire, which burned over 21,000 acres north and east of the analysis area in August and September of 2020. These fires would not contribute to cumulative effects on soils because they occurred outside of the analysis area but demonstrate the potential for incremental effects on soils if future wildfires reach Pinto Valley Mine.

This cumulative analysis considers the present effects of past actions described in section 3.18.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect soils in the future as identified in table 3-3 and further described in table 3-2.

3.18.4.5.1 Soil Disturbance

Present effects of the relevant past and present actions have resulted in the loss of natural soil cover conditions presented in section 3.18.3, "Affected Environment." Present and reasonably foreseeable actions that could contribute to cumulative soil disturbance in the future are identified in table 3-3 and further described in table 3-2. Most natural soil cover within operational areas of Pinto Valley Mine has been removed or buried from decades of mining activity. Land cover within the mine site consists primarily of bare rock, paved surfaces, or structural fill containing soil and earthen materials that serve as a base surface for roads, equipment, and buildings. The proposed action would result in 1,317 total acres of surface disturbance (1,087 acres on private land and 229 acres on National Forest System lands), which would contribute to the increased susceptibility to erosion and loss of soil productivity as well as the potential for the establishment and spread of noxious weeds. The reasonably foreseeable future actions within the cumulative impact analysis area for soils includes the potential for future wildland fires and pending decisions in the Tonto National Forest Management Plan Revision that could affect soils. No other past, ongoing, or reasonably foreseeable actions are expected to have a cumulative effect on soils due to their location outside of the Pinto Valley Mine project boundary.

The differences in cumulative impacts from soil disturbance among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.18.4.2 through 3.18.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts from soil disturbance compared to the other alternatives.

3.18.4.5.2 Soil Condition and Reclamation

Present effects of the relevant past and present actions have resulted in the soil conditions presented in section 3.18.3, "Affected Environment." Past and ongoing mining activities at Pinto Valley Mine have resulted in the loss of natural soil cover. Given the limited soil resources present and long-term nature of most disturbances at the mine, Pinto Valley Mining Corp. does not currently salvage or stockpile soil. Pinto Valley Mining Corp.'s active Mined Land Reclamation Plan and reclamation plan for National Forest System lands identify conceptual reclamation measures necessary to achieve the proposed post-mining land uses at Pinto Valley Mine, including wildlife habitat, livestock grazing, recreational land, commercial or industrial use, and mineral exploration and mining (SRK Consulting, Inc. 2016a). Additional closure and post-closure requirements are described in the Aquifer Protection Permit Closure and Post-Closure Strategy (SRK Consulting, Inc. 2019a). The efficacy of the proposed reclamation strategy to meet applicable reclamation standards may vary based on the site-specific conditions at each facility, and therefore may require refinement during implementation of the reclamation strategy to ensure standards are achieved. The reasonably foreseeable future actions within the cumulative impact analysis area for soils includes the potential for future wildland fires and pending decisions in the Tonto National Forest Management Plan Revision that could affect soils. No other past, ongoing, or reasonably foreseeable actions are expected to have a cumulative effect on soil conditions due to their location outside of the Pinto Valley Mine project boundary.

The differences in cumulative impacts on soil condition among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.18.4.2 through 3.18.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.
- The longer operating life of the mine under the proposed action would delay the start of reclamation for most facilities by approximately 19 years compared to the no-action alternative and by 12 years compared to alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on soil conditions compared to the other alternatives.

3.18.4.5.3 Soil Contamination

Present effects of the relevant past and present actions have resulted in the soil contamination conditions presented in section 3.18.3, "Affected Environment." Areas of potential soil contamination at the Pinto Valley Mine include the concentrator plant site (including the light-vehicle fueling station, fuel storage, and haul truck ready line area), truck and equipment wash facilities, substations, Solvent Extraction and Electrowinning Plant, Raffinate Pond, and storage tanks. The proposed action would contribute to potential soil contamination impacts; however, Pinto Valley Mining Corp. would remove any soils potentially contaminated with petroleum hydrocarbons, concentrates, or reagents and haul them to an off-site repository for disposal (Capstone Mining Corp. 2016a). In addition, Pinto Valley

Mining Corp. would continue to apply its spill prevention, control, and countermeasures plan to address storage and containment of spills of petroleum and non-petroleum products. Based on these practices and compliance with applicable laws, regulations, and policies, the proposed action would have limited potential for long-term impacts on soils from contamination at the Pinto Valley Mine.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on soils, as indicated in table 3-3 in section 3.1.5.3, “Past, Present, and Reasonably Foreseeable Actions,” including the potential for future wildland fires and pending decisions in the Tonto National Forest Management Plan Revision that could affect soils. No other past, ongoing, or reasonably foreseeable actions are expected to have a cumulative effect on soil conditions due to their location outside of the Pinto Valley Mine project boundary.

The differences in cumulative impacts from soil contamination among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.18.4.2 through 3.18.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Final reclamation activities under the proposed action that would address areas of contamination would begin approximately 19 years later than under the no-action alternative and approximately 12 years later than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in a greater potential for cumulative impacts from soil contamination compared to the other alternatives; however, current practices and compliance with applicable laws, regulations, and policies, would result in a limited potential for long-term impacts on soils from contamination at the Pinto Valley Mine.

3.18.5 Mitigation Measures

The Forest Service identified one mitigation measure to address potential adverse impacts on soils as a result of surface disturbance on National Forest System lands. This section provides a summary of the mitigation measure for soil resources and the long-term productivity of soils and vegetation. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.10, “Soils,” for additional information on the mitigation measure and the impacts being mitigated, the timing of the measure, the regulatory authority for the measure, and the potential effectiveness of the measure.

- **Mitigation Measure SR-1: Soil Characterization and Salvage**. This measure addresses existing and proposed surface disturbance on National Forest System lands and associated impacts on soils and the long-term productivity of soils and vegetation. The measure will develop best management practices for storing salvaged soil material and use suitable measures in compliance with local direction to prevent and control invasive species. Additionally, Pinto Valley Mining Corp. will maintain their Noxious Weed Control Plan and apply other suitable measures, in compliance with local direction, to prevent and control invasive species and noxious weeds within the soils. The details of soil characterization and salvage will be included in the reclamation plan for National Forest System lands.

Under Mitigation Measure SR-1, there would be surface disturbance associated with certain reclamation activities such as grading, stockpiling and salvaging soils, and extracting soils for sources of borrow and riprap during reclamation. Surface disturbance associated with reclamation activities is accounted for in the surface disturbance estimates in chapter 2, “Proposed Action and Alternatives,” and within the impacts disclosure in chapter 3, “Environmental Consequences.”

3.19 Traffic and Transportation

This section describes the existing conditions associated with transportation routes, access, and traffic associated with Pinto Valley Mine activity and describes potential impacts on these conditions based on the alternatives. A network of National Forest System roads and other access roads[105] provide access to public lands and private property in and around the Pinto Valley Mine. National Forest System Road 287 serves as the primary access route to Pinto Valley Mine from U.S. Highway 60 and provides access to other mining facilities, ranches, and recreation areas (map 3-16 in appendix A). U.S. Highway 60 is the primary highway providing access to Pinto Valley Mine from locations around the region.

The analysis area for direct and indirect effects on traffic and transportation is the network of National Forest System roads and access roads used to access project facilities within the Pinto Valley Mine project boundary and vicinity (map 3-16 in appendix A). Primary highways used by mine employees and contractors to access the Pinto Valley Mine from destinations around the region are also included in the analysis area. This analysis area comprises 19 National Forest System roads and 41 access roads and U.S. Highway 60 between milepost 226.89 (State route 177 south) and milepost 252.14 (U.S. Highway 70). For the no-action alternative, the temporal boundary for analyzing direct and indirect impacts on traffic and transportation begins with the signing of the record of decision and extends through mine closure and final reclamation. Under alternative 1 and the proposed action, the temporal boundary for analyzing direct and indirect impacts on traffic and transportation begins with proposed expansion of mine facilities and extends through mine closure and reclamation. These spatial and temporal boundaries encompass the extent of potential changes to traffic and transportation from the proposed action.

3.19.1 Relevant Laws, Regulations, and Policy

3.19.1.1 **Federal Authorities**

3.19.1.1.1 National Forest Roads and Trails Act of 1964

The National Forest Roads and Trails Act of 1964 (16 U.S. Code 532–538) authorizes granting of easements across National Forest System lands and requirements on road users for maintaining and reconstructing roads.

3.19.1.1.2 National Forest Management Act of 1976

The National Forest Management Act of 1976 (16 U.S. Code 1608) directs that roads be designed to standards appropriate for their intended uses and requires revegetation of temporary roads authorized under a contract, permit, lease, or other written authorization within 10 years of termination of the written authorization.

[105] The proposed mining plan of operations refers to segments of access roads located on National Forest System lands as “temporary access roads.” For simplicity, this EIS refers to all roads other than National Forest System roads that provide access to the mine or mine-related facilities, regardless of land jurisdiction, as “access roads.” Access roads located exclusively on private lands were not mapped for this EIS.

3.19.1.2 **Forest Service Regulations, Policies, and Guidance**

3.19.1.2.1 Title 36, Part 228, Subpart A of the Code of Federal Regulations – Forest Service Locatable Mineral Regulations

Locatable mineral regulations at 36 CFR 228 subpart A set forth rules and procedures for construction and maintenance of roads associated with locatable mineral operations on National Forest System lands.

3.19.1.2.2 Forest Service Travel Management Regulations (Title 36, Part 212 and Title 36, Part 251, subpart D, of the Code of Federal Regulations)

Forest Service travel management regulations at 36 CFR 212 and 36 CFR 251, subpart D, contain provisions for granting reasonable and appropriate access across National Forest System lands to private inholdings.

3.19.1.2.3 Forest Service Manuals 7700 and 7730

Forest Service policy for the management of roads, trails, bridges, airfields, and heliports is described in Forest Service Manual 7700, "Travel Management." Forest Service policies and objectives for the operation and maintenance of the National Forest Transportation System are described in Forest Service Manual 7730, "Transportation System Operation and Maintenance."

3.19.1.2.4 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following management directions and prescriptions for the use of National Forest System roads and access roads (Forest Service 1985):

- "Roads needed for private land access, special uses, or mineral activities will be built and maintained by the permittee to minimum standards for the intended use on permanent locations, and closed, drained, and revegetated after use."
- "Maintain roads to provide for public safety commodity haul, and resource protection in accordance with [Forest Service Manual] 7700 and 7730."

The desired condition for transportation in the Tonto National Forest is "a serviceable road and trail transportation system to meet public access, land management, and resource protection needs" (Forest Service 1985). Additionally, Forest Service Manual 7730 specifies that roads must be operated and maintained in a manner that meets road management objectives established for National Forest System roads.

3.19.1.3 **State and Local Laws, Regulations, and Policies**

The Arizona Department of Transportation has exclusive jurisdiction over interstate highways, U.S. routes, and State routes in Arizona. Key regulatory provisions applicable to operation of Pinto Valley Mine relate to oversize and overweight special permits (Arizona Administrative Code Title 17, chapter 6), traffic and vehicle regulations (Arizona Revised Statute Title 28, chapter 3), and highway fees (Arizona Revised Statute Title 28, chapter 15).

Other Guidance and Recommendations

- Arizona Department of Transportation "Roadway Design Guidelines" (Arizona Department of Transportation 2014)

- Arizona Department of Transportation "Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands" (Arizona Department of Transportation 2008)

3.19.2 Resource Indicators

Table 3-102 below provides the resource indicators and measures for assessing potential project-related traffic and transportation effects.

Table 3-102. Resource indicators and measures for assessing traffic and transportation effects

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Vehicle traffic	Change in traffic volume and type	Vehicle trips (by vehicle type), expressed as average annual daily traffic for U.S. and State routes and National Forest System Road 287[106]	Yes	Arizona Department of Transportation traffic data, AMEC Foster Wheeler Environment & Infrastructure, Inc. National Forest System Road 287 speed study (2018b), Pinto Valley Mining Corp. vehicle trip estimates
Vehicle crashes	Change in crash rate	Crash rate (estimated based on accidents per million vehicle miles)[107]	Yes	Arizona Crash Information System, Pinto Valley Mining Corp. vehicle trip estimates
Public access	Changes in road access or alignment	Miles of existing roads closed to public access; miles of roads realigned	Yes	Forest Service evaluation of the effects of the proposed action on public access
Road condition	Change in road condition	Qualitative assessment of road conditions on National Forest System Road 287 relative to Road Management Objectives	Yes	Forest Service National Resource Management system reports, AMEC Foster Wheeler Environment & Infrastructure, Inc. National Forest System Road 287 scoping report (2018b)

3.19.3 Affected Environment

Table 3-103 below summarizes existing conditions with respect to each resource indicator and measure, which are described in more detail in the sections that follow.

Table 3-103. Resource indicators and measures for the existing condition for traffic and transportation

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Vehicle traffic	Traffic volume and type	Vehicle trips (by vehicle type), expressed as average annual daily traffic for U.S. and State routes and National Forest System Road 287[108]	See table 3-104 and table 3-105
Vehicle crashes	Crash rate	Crash rate (accidents per million vehicle miles)[109]	See "Vehicle Crashes" in section 3.19.3.2
Public access	Changes in road access or alignment	Miles of existing roads open to public access; miles of roads realigned	14.7 miles of existing National Forest System roads open to public access

[106] Measure assessed qualitatively for other National Forest System roads and access roads.
[107] Ibid.
[108] Measure assessed qualitatively for other National Forest System roads and access roads.
[109] Ibid.

Resource Element	Resource Indicator (Quantify if possible)	Measure (Quantify if possible)	Existing Condition
Road condition	Road condition	Qualitative assessment of road conditions on National Forest System Road 287 relative to road management objectives	Deteriorated pavement condition but currently meets road maintenance level 3

3.19.3.1 Vehicle Traffic

Table 3-104 reports available traffic data for National Forest System Road 287 and U.S. Highway 60 from 2013 to 2017. Table 3-105 shows the percentage of traffic generated by trucks or commercial vehicles. Mileposts are shown on map 3-16 in appendix A for U.S. Highway 60 and National Forest System Road 287 for reference to the milepost segments shown in table 3-104 and table 3-105.

The data for National Forest System Road 287 do not capture seasonal or yearly variability in traffic volume because they were limited to a 3-day collection period (Wednesday, September 7 to Friday, September 9, 2016), but are the best available information on existing traffic volume for the analysis area. Average daily traffic associated with all mine-related activities (employee and contractor trips) ranged from 1,239 to 1,248 vehicles, 13.2 percent to 18.6 percent of which were trucks or commercial vehicles (AMEC 2018b). Average vehicle speeds ranged from 52 to 55 miles per hour. No traffic data were available for other National Forest System roads and access roads in the analysis area; however, National Forest System Road 287 has a relatively high traffic volume and truck percentage compared to typical National Forest System roads (AMEC 2018b).

The portion of U.S. Highway 60 in the analysis area had the highest average annual daily traffic on a 0.6-mile segment through the city of Globe—from milepost 249.46 (Evans Street) to milepost 250.06 (Broad Street/Silver Street)—each year from 2013 to 2017. The maximum average annual daily traffic on this segment was 29,677 vehicles in 2016, a substantial portion of which is likely attributed to local traffic (Arizona Department of Transportation 2017). Traffic volume decreases east and west of this segment, with the lowest average annual daily traffic value of 7,059 recorded in 2015 on a 15.81-mile segment between State route 177 south (milepost 226.89) and Mackey Camp Road (milepost 242.7) (Arizona Department of Transportation 2017). Traffic volume peaked in 2016 for most U.S. Highway 60 segments, then decreased in 2017. The percentage of traffic volume attributed to trucks and commercial vehicles was generally larger on the western segments of U.S. Highway 60, which have less local traffic.

Table 3-104. Traffic on analysis area roads, 2013–2017

Beginning Milepost	Ending Milepost	2013	2014	2015	2016	2017
National Forest System Road 287 – Average Daily Traffic[110]						
0.08	0.08	–	–	–	1,239	–
1.80	1.80	–	–	–	1,248	–
U.S. Highway 60 – Average Annual Daily Traffic[111]						
226.89	242.70	7,335	7,612	7,059	7,080	7,925
242.70	244.34	8,996	9,069	10,230	10,578	8,940
244.34	245.60	12,327	11,695	12,344	12,764	11,856

[110] Data collected Wednesday, September 7 to Friday, September 9, 2016 (AMEC 2018b). No traffic data were available for other National Forest System roads and access roads in the analysis area. Represents bidirectional traffic volume.
[111] Arizona Department of Transportation average annual daily traffic data (Arizona Department of Environmental Transportation 2017). Represents bidirectional traffic volume.

Beginning Milepost	Ending Milepost	2013	2014	2015	2016	2017
245.60	247.05	14,510	13,517	14,460	14,952	14,599
247.05	248.12	20,457	19,048	20,310	21,001	19,408
248.12	249.46	22,467	21,709	23,416	24,212	23,084
249.46	250.06	27,452	28,037	28,701	29,677	23,790
250.06	250.46	19,720	15,525	15,928	16,470	18,722
250.46	251.03	17,990	18,372	17,246	17,832	15,692
251.03	252.14	15,755	15,591	15,543	15,289	15,950

Table 3-105. Percentage of truck and commercial vehicle traffic on analysis area roads, 2013–2017

Beginning Milepost	Ending Milepost	2013	2014	2015	2016	2017
National Forest System Road 287 – Average Daily Traffic[112]						
0.08	0.08	–	–	–	13.2	–
1.8	1.8	–	–	–	18.6	–
U.S. Highway 60 – Average Annual Daily Traffic[113]						
226.89	242.70	11.1	13.9	11.3	10.6	9.8
242.70	244.34	12.6	14.1	9.9	7.3	8.1
244.34	245.60	12.8	14.3	9.4	7.3	8.1
245.60	247.05	12.1	13.3	8.9	7.3	8.1
247.05	248.12	10.7	12.8	8.3	7.3	8.1
248.12	249.46	9.3	12.1	8.0	7.3	8.1
249.46	250.06	8.8	12.1	7.8	7.3	8.1
250.06	250.46	8.6	12.0	8.6	7.3	8.1
250.46	251.03	8.6	11.8	8.5	7.3	8.1
251.03	252.14	8.5	11.6	8.7	8.8	8.7

Average annual daily traffic associated with Pinto Valley Mine full-time employees is estimated to be 144,820 roundtrips based on a 5-day work week for 557 full-time employees. Existing contractor and part-time employee vehicle trips for current operations at the Pinto Valley Mine are estimated by Pinto Valley Mining Corp. to be 46,720 roundtrips per year. Combined, Pinto Valley Mine employees and contractors currently account for approximately 191,540 roundtrips per year, or 525 average annual daily roundtrips to support mine operations (see chapter 2, "Proposed Action and Alternatives," table 2-4). All Pinto Valley Mine employees and contractors travel along U.S. Highway 60 (from either the east or west) to National Forest System Road 287 to access the mine. Based on these estimates and the traffic data presented in table 3-104, mine-related traffic is estimated to account for 2 percent to 8 percent of the annual daily traffic on U.S. Highway 60 between mileposts 226 and 252, and

[112] Data collected Wednesday, September 7 to Friday, September 9, 2016 (AMEC 2018b). Traffic data not available for other National Forest System roads and access roads in the analysis area. Represents bidirectional traffic volume.

[113] Arizona Department of Transportation average annual daily traffic data (Arizona Department of Transportation 2017). Represents bidirectional traffic volume. Trucks and commercial vehicles are defined as Federal Highway Administration vehicle classes 4–13.

approximately 42 percent of the annual daily traffic on National Forest System Road 287 between mileposts 0.08 and 1.8.

3.19.3.2 **Vehicle Crashes**

Vehicle crash data for U.S. Highway 60 between State route 177 south (milepost 226) and U.S. Highway 70 (milepost 252) show a total of 1,041 accidents between 2013 and 2017 (Arizona Department of Transportation 2019). Of the total accidents on U.S. Highway 60 between 2013 and 2017, approximately 81 percent were associated with passenger cars. Accidents involving semitrucks, dump trucks, and other trucks showed a relatively low value, at approximately 9 percent. Of the accidents that occurred on U.S. Highway 60 between 2013 and 2017, 64 percent resulted in no injury and 33 percent resulted in suspected injuries. There were 29 fatal accidents during this time period between mileposts 226 and 252, accounting for approximately 3 percent of the total accidents. None of the accidents occurred at the intersection of U.S. Highway 60 and National Forest System Road 287 (Arizona Department of Transportation 2019).

During the same timeframe (2013–2017), three accidents were reported on the segment of National Forest System Road 287 that provides access to the Pinto Valley Mine from U.S. Highway 60. One of the accidents involved a semitruck, while the other two involved passenger cars. All three accidents were single-vehicle incidents; one resulted in a possible injury while the other two accidents were reported as non-injury incidents (Arizona Department of Transportation 2019).

3.19.3.3 **Public Access**

National Forest System roads are roads that fall under the jurisdiction of the Forest Service, are usually maintained by the Forest Service, and often provide public access to National Forest System lands. Other roads that are under the jurisdiction of another public road agency, such as a county or the Arizona Department of Transportation, and those that are privately owned can also provide access to National Forest System lands or National Forest System roads. U.S. Highway 60, for example, is maintained under the Arizona Department of Transportation's jurisdiction and serves as the primary access for National Forest System Road 287 in the analysis area.

As shown on map 3-16 in appendix A, numerous National Forest System roads provide access to National Forest System lands in the analysis area. National Forest System Road 287 traverses the Pinto Valley Mine site and is used by the public to access a variety of recreation areas in the vicinity, including the Haunted Canyon and Pinto Creek trailheads of the Superstition Wilderness Area. National Forest System Road 287 is accessible from U.S. Highway 60 south of Pinto Valley Mine and provides access to National Forest System roads 287B, 305, 312, 2493, 2495, and 1020 located north and west of Pinto Valley Mine (map 3-16 in appendix A). National Forest System Road 287B provides access to National Forest System Road 608 (including 608A), which is occasionally used by mine-related traffic to access various facilities. National Forest System Roads 287 and 305 are currently open to public use, including approximately 14.7 miles of these roads used by Pinto Valley Mining Corp. for ongoing operations. An additional 15.0 miles of National Forest System roads currently used by Pinto Valley Mining Corp. are designated by the Forest Service as open and the road status may change based on the pending Tonto National Forest Travel Management Plan.

Some of the National Forest System roads pass through Pinto Valley Mining Corp.'s patented claims for Peak Wells. Public access to these National Forest System roads through the private property has not been restricted. However, public access has been restricted on three National Forest System roads that terminate on Pinto Valley Mine property in the area of the Open Pit.

As part of the mining plan of operations, Pinto Valley Mining Corp. included a road use and maintenance plan that describes use of National Forest System roads, public use of National Forest System roads, maintenance standards for National Forest System roads, access roads, and planned use of roads during the post-closure period (Capstone Mining Corp. 2020b).

3.19.3.4 **Road Condition**

At the request of Pinto Valley Mining Corp., AMEC Foster Wheeler Environment & Infrastructure, Inc. (2018b) prepared a scoping report evaluating roadway conditions and improvement options for a 2.9-mile segment of National Forest System Road 287 between U.S. Highway 60 and Pinto Valley Mine. The report indicated that the “pavement condition of [National Forest System Road] 287 is deteriorated” with “high severity block cracking” along the entire roadway, and several locations exhibited “potholes, depressions. Additionally, a temporary concrete barrier and several guardrail sections were found to not meet Arizona Department of Transportation or American Association of State Highway and Transportation Officials design standards. The remaining National Forest System roads are unpaved primitive-type facilities intended for high-clearance vehicles.

The Forest Service currently manages National Forest System Road 287 as road maintenance level 3. Existing road conditions along National Forest System Road 287 are consistent with Forest Service road management objectives for road maintenance level 3. As defined in Forest Service Handbook 7709.58, maintenance level 3 roads are maintained for travel by “a prudent driver in a standard passenger car,” “usually do not consider user comfort and convenience priorities,” and “typically must be driven at low speeds” (Forest Service 2012).

Road conditions on U.S. Highway 60 are typical of highways in the region, which are designed and maintained for conveying high traffic volumes at high speeds. As shown in table 3-105, truck traffic accounts for approximately 13 to 19 percent of all traffic on National Forest System Road 287 and for 7 to 14 percent of all traffic on U.S. Highway 60. Data from the American Association of State Highway and Transportation Officials suggest that a five-axle tractor trailer loaded to the current 80,000-pound Federal weight limit weighs about the same as 20 automobiles (U.S. Government Accountability Office 1979). This increased truck weight can cause an increased rate of pavement damage, equal to 9,600 automobiles by some estimates (U.S. Government Accountability Office 1979). The Arizona Department of Transportation calculates that a 24,000-pound truck axle consumes over 2,000 times as much pavement life as a 2,000-pound automobile axle (Arizona Department of Transportation 2006). This suggests that pavement damage from a five-axle tractor trailer loaded to the Federal weight limit would be the equivalent to 10,000 automobiles.

3.19.4 Environmental Consequences

3.19.4.1 **Analysis Methodology and Assumptions**

The analysis of traffic and transportation impacts applies the following methods:

- Impacts associated with vehicle traffic are quantitatively assessed by estimating the magnitude of change in traffic volume from existing conditions under the proposed action and alternatives.
- Impacts associated with vehicle crashes are qualitatively assessed by estimating the potential increase in crash rate from existing conditions under the proposed action and alternatives.

- Impacts on public recreation access are qualitatively assessed by identifying road segments where mine-related activities may limit public access along National Forest System Road 287 and other National Forest System roads.
- Impacts on road condition are qualitatively assessed by analyzing mine-related traffic and road maintenance agreements relative to road management objectives under the proposed action and alternatives.

The analysis of traffic and transportation impacts includes the following assumptions:

- Baseline estimates of mine-related vehicle trips and average employee commute distances provided by Pinto Valley Mining Corp. represent the best available data and are reasonably accurate for assessing the approximate proportion of vehicle trips on primary access roads to Pinto Valley Mine attributed to mining operations. Vehicle trip estimates are presented as annual daily averages; actual traffic volumes could vary considerably from day to day based on mine operations.
- The analysis assumes that baseline traffic volumes would change during the study period according to growth rates estimated by the Arizona Department of Transportation.
- The origins and routes of vehicle trips terminating at Pinto Valley Mine would vary throughout the life of the mine depending on a variety of factors such as employees' places of residence, mine production rate, and locations of material suppliers and copper smelters. Therefore, the distribution of mine-related vehicle trips among the primary highway segments used to access Pinto Valley Mine is estimated based on baseline conditions. It is assumed that 50 percent of total vehicle trips would access National Forest System Road 287 via U.S. Highway 60 from the east and 50 percent would access National Forest System Road 287 via U.S. Highway 60 from the west. All employees and contractors would use National Forest System Road 287 to access the mine from U.S. Highway 60.

3.19.4.2 **<u>No-action Alternative - Direct and Indirect Impacts</u>**

3.19.4.2.1 Vehicle Traffic

The volume of vehicle traffic entering and exiting Pinto Valley Mine, as estimated in section 3.19.3.1, "Vehicle Traffic," would continue at approximately current levels during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure. Employee and contractor vehicle traffic along U.S. Highway 60 and National Forest System Road 287 is currently estimated at 525 average annual daily roundtrips. Approximately 400 nonessential personnel and personnel not employed in roles supporting ramp-down of active mining operations or ramp-up of closure and reclamation activities are expected to be laid off within 3 months after issuance of the record of decision, resulting in decreasing average annual daily vehicle trips by the end of the 6-month transition period. As the mine fully transitions from active mining operations to reclamation and closure, vehicle trips would be further reduced in proportion to the overall workforce and operational reductions during these phases. After the 6-month transition period, annual contractor vehicle trips would substantially decrease to a maximum of approximately 1,806 vehicle roundtrips per year (approximately five average annual daily roundtrips) for 12 years. During the 30-year post-closure period, approximately 161 annual contractor vehicle trips are anticipated under the no-action alternative. Refer to table 2-5 for the estimated number of annual mine-related vehicle roundtrips by project phase under the no-action alternative.

General population growth in Arizona is projected to contribute to increased traffic on all roads in the analysis area. According to Arizona Department of Transportation 20-year traffic projections, traffic levels on U.S. Highway 60 between milepost 226 (at State route 177 south) and milepost 255 (Fairgrounds Access Road east of Globe) are anticipated to increase by approximately 26 percent from current levels by the year 2030 (Arizona Department of Transportation 2017). It is anticipated that the mine-related traffic on roads in the analysis area would result in conditions that remain within an acceptable level of service, or Arizona Department of Transportation would improve highway infrastructure to provide an acceptable level of service. National Forest System Road 287 currently serves as an access road for commercial purposes (serving two mines and an electrical substation), and average daily traffic volumes are not anticipated to decrease in the near future (AMEC 2018b).

3.19.4.2.2 Vehicle Crashes

Vehicle traffic to and from Pinto Valley Mine under the no-action alternative would begin to decline leading up to closure of the mine at the end of the 6-month transition period. Total vehicle trips would be further reduced during the mine closure and post-closure phases. The decrease in mine-related traffic along U.S. Highway 60 and National Forest System Road 287 would result in a corresponding decrease in the probability of traffic accidents related to vehicle traffic to and from Pinto Valley Mine. Traffic accidents and fatalities are the result of numerous variables that cannot be predicted with any certainty; therefore, this analysis should not be taken as a prediction.

3.19.4.2.3 Public Access

Use of approximately 29.8 miles of existing National Forest System roads and 15.2 miles of access roads to support ongoing operation of Pinto Valley Mine would not restrict public access to National Forest System roads or National Forest System lands. All existing National Forest System roads designated for public use would remain open to the public under the no-action alternative. However, the potential for temporary public road user conflicts with mining operation traffic would exist along the segment of National Forest System Road 287 from U.S. Highway 60 through Pinto Valley Mining Corp. property. In addition, necessary maintenance activities for National Forest System Road 287 and other roads (such as line striping, cattle guard repair, and shoulder drop-off maintenance) could result in minor delays for public access. Although public users may encounter minor delays, public access to Pinto Creek and Haunted Canyon would be maintained along National Forest System Road 287. As a result, potential impacts on public access would be short term and minor.

3.19.4.2.4 Road Conditions

Pavement and road conditions would continue to be maintained to maintenance level 3 along the segment of National Forest System Road 287 used to access the mine under the no-action alternative. Road conditions on U.S. Highway 60 would remain typical of highways in the region and Arizona Department of Transportation would continue to perform routine maintenance and would improve highway infrastructure as needed.

3.19.4.3 **Alternative 1 – Direct and Indirect Impacts**

3.19.4.3.1 Vehicle Traffic

Under alternative 1, the volume of employee and contractor vehicles entering and exiting Pinto Valley Mine would continue at approximately the current levels estimated in section 3.19.3.1, “Vehicle Traffic,” for the operational period of the mine, which would be approximately 7 years longer than under the no-action alternative. It is anticipated that the mine-related traffic on State roads in the analysis area would result in conditions that remain within an acceptable level of service, or the Arizona Department of Transportation would improve highway infrastructure to provide an acceptable level of service.

3.19.4.3.2 Vehicle Crashes

Continuation of mining operations for approximately 7 more years under alternative 1 would extend the timeframe during which mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287, compared to the no-action alternative.

3.19.4.3.3 Public Access

Although public users may encounter minor delays or reroutes due to mine-related traffic and necessary maintenance along portions National Forest System Road 287 used to access the mine, all existing National Forest System roads designated for public use would remain open to the public, and the approximately 29.8 miles of existing National Forest System roads within the analysis area would remain open to the public. The segment of National Forest System Road 287 within Pinto Valley Mining Corp. property would be used for mining operations for approximately 7 more years than under the no-action alternative, resulting in an increased timeframe where public road users could encounter temporary delays due to mine-related traffic and maintenance during active mining operations.

3.19.4.3.4 Road Conditions

Operation of the Pinto Valley Mine for approximately 7 more years than under the no-action alternative would extend the duration of road use along U.S. Highway 60 and National Forest System Road 287 by Pinto Valley Mining Corp. employees and contractors to access the mine. Similar to the no-action alternative, pavement conditions would be maintained to Forest Service road management objectives for road maintenance level 3. It is anticipated that pavement will continue to deteriorate due to heavy truck traffic related to mine operations. National Forest System Road 287 may possibly be improved to maintenance level 4 if Pinto Valley Mining Corp. desires a higher level of service. Road improvements would be accommodated through establishment of an agreement for maintenance and use. Maintenance level 4 is “assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds for prudent drivers in a standard passenger car” (Forest Service 2012). Road conditions on U.S. Highway 60 would remain typical of highways in the region and the Arizona Department of Transportation would continue to perform routine maintenance and would improve highway infrastructure as needed.

3.19.4.4 **Proposed Action – Direct and Indirect Impacts**

3.19.4.4.1 Vehicle Traffic

Expansion of mining activities onto National Forest System lands and reclamation of mining facilities under the proposed action would have the same types of impacts on vehicle traffic as those under alternative 1, except vehicle trips associated with mine operation would continue for approximately 12 more years than under alternative 1. Under the proposed action, extension of the mine life would extend the timeframe where daily vehicle trips would occur on roads in the analysis area for Pinto Valley Mining Corp. employees and contractors. However, because National Forest System Road 287 and U.S. Highway 60 currently convey commercial traffic, the increased traffic volume associated with mine operation would not change the current use of the roads. Similarly, it is anticipated that the mine-related traffic on roads in the analysis area would result in conditions that remain within an acceptable level of service, or Arizona Department of Transportation would improve highway infrastructure to provide an acceptable level of service.

3.19.4.4.2 Vehicle Crashes

Expansion of mining activities onto National Forest System lands and reclamation of mining facilities under the proposed action would have the same types of impacts on accident rates as alternative 1, which is not anticipated to increase, except that vehicle trips associated with mine operation would be extended for approximately 12 years more than under alternative 1. As a result, extension of the mine life under the proposed action, would extend the timeframe where mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287.

3.19.4.4.3 Public Access

Similar to alternative 1, continued use of approximately 29.8 miles of existing National Forest System roads would generally not affect public access to National Forest System roads or National Forest System lands. Also similar to alternative 1, all existing National Forest System roads designated for public use would remain open to the public. However, the segment of National Forest System Road 287 within Pinto Valley Mining Corp. property would be used for active mining operations for an additional 12 years compared to alternative 1. As a result, the timeframe where public road users could encounter temporary delays due to mine-related traffic and maintenance during active mining operations would be increased compared to the no-action alternative and alternative 1.

3.19.4.4.4 Road Conditions

Operation of the Pinto Valley Mine for approximately 19 more years than under the no-action alternative and 12 years more than under alternative 1 would extend the duration of road use along U.S. Highway 60 and National Forest System Road 287 by Pinto Valley Mining Corp. employees and contractors to access the mine. Similar to alternative 1, road conditions would be maintained to Forest Service road management objectives for road maintenance level 3. It is anticipated that pavement will deteriorate to a greater degree than under alternative 1 due to 12 additional years of heavy truck traffic related to mine operations. Per transportation mitigation measures, Pinto Valley Mining Corp. would enter a road use permit to maintain or make improvements to National Forest System Road 287 as needed and dependent on level of road deterioration. Road conditions on U.S. Highway 60 would remain typical of highways in the region and the Arizona Department of Transportation would continue to perform routine maintenance and would improve highway infrastructure as needed.

3.19.4.5 **Cumulative Impacts**

The analysis area for cumulative impacts on traffic and transportation is the same area analyzed for direct and indirect effects (section 3.19.4, “Environmental Consequences”): the network of National Forest System roads and access roads used to access project facilities within the Pinto Valley Mine project boundary and the primary highways used by mine employees and contractors to access the Pinto Valley Mine (map 3-16 in appendix A). This analysis area encompasses approximately 6,453 acres and is the extent of the area that could experience direct and indirect effects from the proposed action that could combine with effects from other past, ongoing, and reasonably foreseeable actions, resulting in cumulative effects. The temporal boundary for analyzing cumulative impacts on traffic and transportation begins with proposed expansion of mine facilities and extends through mine closure and reclamation.

Section 3.19.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on traffic and transportation. Combined, Pinto Valley Mine employees and contractors currently account for approximately 191,540 roundtrips per year, or 525 average annual daily roundtrips to support mine operations. Roadway conditions along the 2.9-mile segment of National Forest System Road 287 between U.S. Highway 60 and Pinto Valley Mine are described as "deteriorated" with "high severity block cracking" along the entire roadway, and several locations exhibited "potholes," and "depressions"(AMEC 2018b). Additionally, a temporary concrete barrier and several guardrail sections were found to not meet Arizona Department of Transportation or American Association of State Highway and Transportation Officials design standards. Road conditions on U.S. Highway 60 are typical of highways in the region, which are designed and maintained for conveying high traffic volumes at high speeds.

This cumulative analysis considers the present effects of past actions described in section 3.19.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect traffic and transportations in the future as identified in table 3-3 and further described in table 3-2.

3.19.4.5.1 Vehicle Traffic

Present effects of the relevant past and present actions have resulted in the existing vehicle traffic conditions presented in section 3.19.3, "Affected Environment." The volume of vehicle traffic entering and exiting Pinto Valley Mine, as estimated in section 3.19.3.1, would continue under the proposed action. Extension of the mine life would extend the timeframe where daily vehicle trips would occur on roads in the analysis area for Pinto Valley Mining Corp. employees and contractors. However, because National Forest System Road 287 and U.S. Highway 60 currently convey commercial traffic, the increased traffic volume associated with mine operation would not change the current use of the roads. It is anticipated that the mine-related traffic on roads in the analysis area would result in conditions that remain within an acceptable level of service.

Present and reasonably foreseeable actions that could contribute to cumulative recreation traffic impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on vehicle traffic are the continued development in the Eder South area of the Carlota Mine for the next several years and the future development of the proposed Resolution Copper Project and Land Exchange. Continued operation of the Carlota Mine would contribute to vehicle traffic on U.S. Highway 60 and a portion of National Forest System Road 287, but no increase in vehicle trips or change in current traffic volume is anticipated. Operations at Carlota Mine and associated vehicle traffic are expected to cease in several more years. Development of the proposed Resolution Copper Project and Land Exchange would contribute additional vehicle traffic on U.S. Highway 60, predominantly between the Phoenix/Mesa metropolitan area and the Oak Flat Campground east of Superior, Arizona, that is currently used and would continue to serve as the primary access route to Pinto Valley Mine. Combined with vehicle traffic from ongoing operation of Pinto Valley Mine, the proposed Resolution Copper Project and Land Exchange could increase traffic congestion and result in minor delays along this segment of U.S. Highway 60 and intersecting roads relative to existing conditions.

The differences in cumulative impacts on vehicle traffic among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.19.4.2 through 3.19.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Under the proposed action, vehicle trips associated with mine operation would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on the factors listed above, the proposed action is anticipated to result in greater cumulative impacts on vehicle traffic compared to the other alternatives.

3.19.4.5.2 Vehicle Crashes

Present effects of the relevant past and present actions have resulted in the vehicle accident conditions presented in section 3.19.3, "Affected Environment." The proposed action would extend the timeframe during which mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287. Traffic accidents and fatalities are the result of numerous variables that cannot be predicted with any certainty; therefore, this analysis should not be taken as a prediction.

Present and reasonably foreseeable actions that could contribute to cumulative traffic accidents in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on vehicle traffic are the continued development in the Eder South area of the Carlota Mine and the future development of the proposed Resolution Copper Project and Land Exchange. Increased vehicle traffic from the proposed Resolution Copper Project and Land Exchange, when combined with existing traffic volumes that include ongoing operation of Pinto Valley Mine and Carlota Mine, could increase crash rates on U.S. Highway 60, predominantly between the Phoenix/Mesa metropolitan area and the Oak Flat Campground.

The differences in cumulative impacts on traffic accidents among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.19.4.2 through 3.19.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Extension of the mine life under the proposed action would extend the timeframe where mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287 for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on the factors listed above, the proposed action is anticipated to result in greater cumulative impacts on accident rates compared to the other alternatives.

3.19.4.5.3 Public Access

Present effects of the relevant past and present actions have resulted in the public access conditions presented in section 3.19.3, "Affected Environment." National Forest System Road 287 traverses the Pinto Valley Mine site and is used by the public to access a variety of recreation areas in the vicinity, including the Haunted Canyon and Pinto Creek trailheads of the Superstition Wilderness area. National Forest System Road 287 is accessible from U.S. Highway 60 south of Pinto Valley Mine and provides access to National Forest System Roads 287B, 305, 312, 2493, 2495, and 1020 north and west of Pinto Valley Mine (map 3-16 in appendix A). National Forest System Road 287B provides access to National Forest System Road 608 (including 608A), which is occasionally used by mine-related traffic to access various facilities. National Forest System Roads 287 and 305 are currently open to public use, including approximately 14.7 miles of these roads used by Pinto Valley Mining Corp. for ongoing operations. An additional 15.0 miles of National Forest System roads currently used by Pinto Valley Mining Corp. are designated by the Forest Service as open and the road status may change based on the pending Tonto National Forest Travel Management Plan. Continued use of approximately 29.8 miles of existing National Forest System roads under the proposed action would generally not affect public access to National Forest System roads or National Forest System lands. All existing National Forest System roads designated for public use would remain open to the public.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on public access in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on public access are the Pinto Creek Bridge Replacement Project on U.S. Highway 60 and pending decisions in the Tonto National Forest Management Plan Revision and Tonto National Forest Motorized Travel Management Plan that could result in changes to travel management. Replacement of the Pinto Creek Bridge on U.S. Highway 60 could contribute to cumulative traffic and transportation impacts when combined with traffic associated with the proposed action and ongoing and reasonably foreseeable actions. Although the Pinto Creek Bridge will remain in service until the new bridge is completed, occasional restrictions and closures of U.S. Highway 60 will be required, which could result in traffic delays along U.S. Highway 60 when combined with increased vehicle traffic from mine developments in the analysis area (Arizona Department of Transportation 2019). Construction of the Pinto Creek Bridge replacement project commenced in 2019 and is expected to be completed within 2 years.

Potential changes in management of cross-country travel and other motor vehicle uses associated with the Tonto National Forest Motorized Travel Management Plan could result in changes to the established system of roads and trails on National Forest System lands in the cumulative impact analysis area. It is anticipated that those changes could include closure of some unauthorized roads and some existing National Forest System roads, prohibitions on some motor vehicle use, and addition of some unauthorized roads to the current road system. Road closures and vehicle prohibitions would contribute to a decrease in motorized access to National Forest System lands in the analysis area in the long term. The designation or addition of currently unauthorized roads that are used for hunter access, hiking, and dispersed camping as part of the National Forest System roads inventory may increase access to some National Forest System lands by legalizing use of those roads by the public and ensuring maintenance and management of those roads.

The differences in cumulative impacts on public access among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.19.4.2 through 3.19.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The segment of National Forest System Road 287 within Pinto Valley Mining Corp. property would be used for active mining operations under the proposed action for an additional 19 years compared to the no-action alternative and approximately 12 years longer than under alternative 1.

Based on the factors listed above, the proposed action is anticipated to result in a greater potential for cumulative impacts on public access through temporary delays from mine-related traffic and maintenance compared to the other alternatives.

3.19.4.5.4 Road Conditions

Present effects of the relevant past and present actions have resulted in the road conditions presented in section 3.19.3, “Affected Environment.” Roadway conditions along the 2.9-mile segment of National Forest System Road 287 between U.S. Highway 60 and Pinto Valley Mine are described as “deteriorated” with “high severity block cracking” along the entire roadway, several locations exhibited “potholes, depressions” (AMEC 2018b). Road conditions on U.S. Highway 60 are typical of highways in the region, which are designed and maintained for conveying high traffic volumes at high speeds.

Present and reasonably foreseeable actions that could contribute to cumulative impacts on road conditions in the future are identified in table 3-3 and further described in table 3-2. The potential cumulative increase in vehicle traffic on U.S. Highway 60 from continued development in the Eder South area of the Carlota Mine and the future development of the proposed Resolution Copper Project and Land Exchange could result in more rapid wear and deterioration of the road surface. Operation of the Pinto Valley Mine under the proposed action would extend the duration of road use along U.S. Highway 60 and National Forest System Road 287 by Pinto Valley Mining Corp. employees and contractors to access the mine. The Arizona Department of Transportation would continue to perform routine maintenance and make road improvements on U.S. Highway 60 as needed. The approximately 2.6-mile segment of National Forest System Road 287 from U.S. Highway 60 to Carlota Copper Mine Access Road would continue to serve as an access road for both Pinto Valley Mine and Carlota Copper Mine. Pavement conditions would be maintained to Forest Service road management objectives for road maintenance level 3 unless modified through establishment of a subsequent road use and maintenance agreement. Mine-related traffic and associated road wear on this segment of National Forest System Road 287 would continue at approximately current levels while both mines are operating, then decrease after closure of the Carlota Mine.

The differences in cumulative impacts on road conditions among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.19.4.2 through 3.19.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Operation of the Pinto Valley Mine for approximately 19 more years than under the no-action alternative and 12 years more than under alternative 1 would extend the duration of road use for mine-related traffic under the proposed action.

Based on the factors listed above, the proposed action is anticipated to result in a greater potential for cumulative impacts on road conditions compared to the other alternatives.

3.19.5 Mitigation Measures

The Forest Service identified a variety of mitigation measures to address potential adverse impacts on roads and access during operations, closure, and post-closure. This section provides a summary of monitoring and mitigation measures for traffic and transportation. Refer to appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” section 4.4.11, “Traffic and Transportation,” for additional information on the mitigation measures and the impacts being mitigated, the timing of the measures, the regulatory authority for the measures, and the potential effectiveness of the measures.

- **Mitigation Measure TR-1: Road Use Permit for National Forest System Road 287**. This permit will address the continued use of and potential impacts on National Forest System Road 287 resulting from authorized access to Pinto Valley Mine site through the mining plan of operations. The proposed use would require commercial hauling and ongoing maintenance necessary to meet assigned maintenance levels for public and administrative access. The Forest Service will issue Pinto Valley Mining Corp. a road use permit (FS-7700-41) containing the relevant terms and conditions for Pinto Valley Mining Corp.’s commercial use and maintenance of the paved portion of National Forest System Road 287. On an annual basis, Pinto Valley Mining Corp. and the Forest Service will meet to discuss and, if needed, update the road use permit for all permitted maintenance and commercial uses of the paved portion of National Forest System Road 287.
- **Mitigation Measure TR-2: Rerouting or Realignment of National Forest System Road 287.** Potential rerouting or realignment of segments of National Forest System Road 287 located on Pinto Valley Mining Corp.’s private land during proposed project operations will be coordinated

with the Forest Service to ensure appropriate signage, gates and fencing, and other mechanisms to ensure clear and appropriate access for fire response, recreation, and other public uses. Additionally, Pinto Valley Mining Corp. will maintain public access to National Forest System Road 287 across Pinto Valley Mining Corp.'s private lands in accordance with the Forest Service's easement. The Forest Service requests that Pinto Valley Mining Corp. coordinate with the Forest Service on any realignments of National Forest System Road 287. The Forest Service also recommends that the Forest Service and Pinto Valley Mining Corp. pursue reciprocal easements for National Forest System Road 287 and other National Forest System roads crossing private property.

- **Mitigation Measure TR-3: Post-Closure Road Status and Reclamation.** This measure mitigates potential impacts on the long-term use, condition, and closure status of all National Forest System roads used by Pinto Valley Mining Corp. As a part of the reclamation plan, Pinto Valley Mining Corp. will include a description of the final road status, timing for end of use, and any other details necessary for the reclamation all roads (National Forest System Roads and access roads) that are proposed and authorized for use on National Forest System lands. During closure and post-closure planning, Pinto Valley Mining Corp. will propose a final reclamation action and condition of the paved portion of National Forest System Road 287 from the private parcel to the intersection with U.S. Highway 60, subject to final approval by the Forest Service. For all access roads on National Forest System lands, Pinto Valley Mining Corp. will be required to fully reclaim the roads when no longer necessary for mining and reclamation operations.
- **Mitigation Measure TR-4: Restricted Access on National Forest System Lands.** This measure addresses the ongoing maintenance of gates on National Forest System roads that are proposed for use during operation, closure, and if needed during the post-closure period. This measure would ensure that gates on National Forest System lands are maintained in a safe and functioning matter to restrict public access to Pinto Valley Mine facilities to reduce potential public health and safety issues at the mine.

Under Mitigation Measure TR-2, rerouting or realignment of National Forest System Road 287 could result in surface disturbance and associated effects on resources (such as vegetation removal, habitat degradation, increased potential for soil erosion, and increased potential for spread and establishment of noxious weeds). The amount of surface disturbance and associated effects would depend on the location and overall mileage and disturbance area associated with potential reroutes or realignments of the road. In general, the estimated disturbance area would include the linear distance of the road reroute or realignment and an assumed road disturbance width of 25 feet. At this time, there are no specific reroutes or realignments proposed. This mitigation measure would ensure that Pinto Valley Mining Corp. coordinates with the Forest Service to identify an alignment for road reroutes or realignments that minimize potential impacts on surface resources on adjacent National Forest System lands. In general, potential impacts on surface resources from any future rerouting or realignment of National Forest System Road 287 are expected to be minimal based on the localized nature of potential reroutes of National Forest System Road 287, the limited amounts of surface disturbance, and requirements in accordance with existing easements.

In addition, rerouting or realignment of National Forest System Road 287 could result in minor delays to public users or other road users. However, there would be no anticipated closure of existing roads that would limit access. Also, as described in this mitigation measure, Pinto Valley Mining Corp. and the Forest Service would coordinate to ensure that appropriate signage, gates and fencing, and other mechanisms are in place to allow for continued access for fire response, recreation, and other public uses during any rerouting or realignment of National Forest System Road 287. As such, impacts on access along National Forest System Road 287 during reroutes or realignments are expected to be minimal.

Under Mitigation Measure TR-3, reclamation activities associated with roads could result in surface disturbance due to recontouring, grading, extraction or movement of borrow and riprap, and removal of culverts and other features in or along the roadbed. In general, this disturbance would occur in areas that were previously disturbed, and the disturbance is accounted for within the 25-foot-wide disturbance area for roads presented in chapter 2, “Proposed Action and Alternatives.” In addition, potential sources of borrow and riprap for roads are accounted for in the surface disturbance estimates in chapter 2, “Proposed Action and Alternatives.” In general, surface disturbance associated with reclamation activities would support an overall improvement in surface resource conditions and would eventually support meeting reclamation objectives and post-mining land uses.

In addition to surface disturbance, reclamation would result in emissions, employment, noise, and other impacts while the reclamation activities are occurring. In general, project-related activity associated with reclamation activities is described in the disclosure of impacts in chapter 3, “Environmental Consequences,” and the Forest Service does not anticipate further impacts.

3.20 Visual Resources

This section describes the existing conditions associated with the visual landscape, scenic quality, and viewers in the vicinity of the Pinto Valley Mine and describes potential impacts on these conditions based on the alternatives. Visual landscape management encompasses the visible features of the landscape, including landforms, vegetation, water, and structures. Scenic quality is the measure of the visual appeal of a unit of land, user sensitivity is based on the level of concern by the public for the scenic resource, and visual quality objectives establish management prescriptions for visual resources (Forest Service 1973, 1974). The description of the affected environment and environmental consequences for visual resources focuses on potential effects of the project on scenic quality, on viewers of the landscape, and on consistency with Tonto National Forest Plan objectives (Forest Service 1985).

The analysis area for direct and indirect effects on visual resources is the Pinto Valley Mine project boundary plus a 15-mile distance buffer around Pinto Valley Mine project facilities (map 3-17 in appendix A). The 15-mile extent is based on the background distance zone and related perception of changes in the characteristic landscape. The foreground, middleground, and background surrounding the mine boundary are composed of both private and Federal lands managed by the Forest Service, Bureau of Indian Affairs, and Bureau of Land Management. The temporal boundary for analyzing the direct and indirect effects on visual resources begins with proposed expansion of mine facilities and extends through mine closure and final reclamation. These spatial and temporal boundaries encompass the extent of potential changes and effects on visual resources from the proposed action.

3.20.1 Relevant Laws, Regulations, and Policy

3.20.1.1 **Federal Authorities**

3.20.1.1.1 General Mining Law of 1872

The General Mining Law of 1872 confers a statutory right for claimants to enter public lands open to location, stake mining claims in pursuit of locatable minerals, and conduct mining activities in compliance with Federal and State statutes and regulations.

3.20.1.1.2 National Environmental Policy Act of 1969, as amended

The National Environmental Policy Act requires an analysis of potential impacts on affected resources from projects with a Federal nexus, including effects on visual resources.

3.20.1.1.3 Federal Land Policy and Management Act, as amended

The Federal Land Policy and Management Act established the Bureau of Land Management as the jurisdictional agency for expanses of land in the West to be managed as multiuse lands.

3.20.1.1.4 National Trails System Act

National Trails were established under the National Trail System Act of 1968 (16 U.S. Code 1241-51), designating and protecting national scenic trails, national historic trails, and national recreational trails. National trails are administered by the Bureau of Land Management, National Park Service, and Forest Service; these agencies provide coordination and oversight for the entire length of a trail. However, as these trails traverse both public and private lands as well as lands controlled by various agencies, onsite management activities are performed by the jurisdictional agency, the State, or the landowner.

3.20.1.1.5 National Historic Preservation Act

The act includes language protecting the visual integrity of sites listed or eligible for the National Register of Historic Places. Impacts on visual resources protected by the National Historic Preservation Act are further discussed in section 3.5 ("Cultural Resources").

3.20.1.2 **Forest Service Regulations, Policies, and Guidance**

3.20.1.2.1 Forest Service Land and Resource Management Regulations

Regulations at 36 CFR 219, subpart A, include requirements for consideration, treatment, and protection of intangible resources such as scenery and aesthetics in Forest Service land and resource management planning.

3.20.1.2.2 Forest Service Special Use Regulations

Regulations at 36 CFR 251, subpart B, include requirements for permittees or holders to minimize damage to scenic and aesthetic values.

3.20.1.2.3 Forest Service Manual 2380

Establishes the Forest Service's objective and policies for management of National Forest System lands to attain the highest possible quality of landscape aesthetics and scenery commensurate with other appropriate public uses, costs, and benefits.

3.20.1.2.4 Forest Service, Agriculture Handbook 701

Forest Service Agriculture Handbook 701 establishes a "Scenery Management System" for managing scenery and determining the relative value and importance of scenery in national forests.

3.20.1.2.5 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Plan provides the following visual management system directions and prescriptions for visual resources (Forest Service 1985).

- "Manage for Visual Quality Objectives (VQO's) ranging from Preservation to Maximum Modification as defined for each prescription and delineated in the Forest Visual Resource Inventory."
- "Refine variety classes, sensitivity levels, and visual quality objectives when needed for project-level planning."

Visual quality objectives in the Tonto National Forest Plan reflect use of the Forest Service's older "Visual Management System," which was updated in 1995 and is now referred to as the "Scenery Management System."

Visual management system visual quality objectives for the Pinto Valley Mine project footprint include:

- Maximum modification: Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.
- Partial retention: Human activities remain visually subordinate to the characteristic landscape.
- Retention: Human activities may not be visually evident (Forest Service 1974).

3.20.1.3 Bureau of Land Management Regulations, Policies, and Guidance

Bureau of Land Management-administered lands in the analysis area are subject to visual resource management decisions established by the Lower Sonoran Record of Decision and Approved Resource Management Plan (Bureau of Land Management 2012).

3.20.2 Resource Indicators

Resource indicators for determining and disclosing impacts on scenery, impacts on people, and consistency with Tonto National Forest Plan objectives are listed in table 3-106. The Forest Service visual variety classes and Bureau of Land Management scenic quality classes are the basis for determining impacts on scenery in the analysis area, which contains lands managed by and assessed for visual resource characteristics by these agencies. The Forest Service user sensitivity and distance zones and Bureau of Land Management sensitivity levels and distance zones are the basis for determining impacts on people in the analysis area. Refer to section 3.16, "Recreation and Wilderness," for analysis of visual effects specific to recreation and wilderness settings and Forest Service recreation opportunity spectrum classifications.

Table 3-106. Resource indicators and measures for assessing effects on visual resources

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Visual resources	Forest Service visual quality objectives and viewsheds	Disturbance acres and percentage, Viewshed acres and percentage	Yes	ICF project analysis
Visual resources	Forest Service variety classes: Bureau of Land Management scenic quality: impacts on scenery	Viewshed acres and percentage	Yes	Forest Service inventory; Bureau of Land Management inventory

Resource Element	Resource Indicator	Measure	Used to address purpose and need or key issue?	Source
Visual resources	Forest Service user sensitivity: impacts on people and viewers; Bureau of Land Management sensitivity levels	Viewshed acres and percentage	Yes	Forest Service inventory; Bureau of Land Management inventory
Visual resources	Forest Service distance zones: Bureau of Land Management distance zones: impacts on people and viewers	Viewshed Acres and Percentage	Yes	Forest Service inventory; Bureau of Land Management inventory
Visual resources	Bureau of Land Management visual resource inventory classes: impacts on landscape and value	Viewshed acres and percentage	Yes	Bureau of Land Management inventory
Visual resources	Dark sky conditions at Tonto National Monument	Mean sky brightness measurement	No	Public comment on Draft EIS

3.20.3 Affected Environment

Visual resources within the analysis area comprise the perceived topographic, vegetative, geologic, hydrologic, and land use characteristics. Key components of existing conditions include extensive landscape disturbance from historic and current mining operations and ancillary facilities such as roads, buildings, and utility structures. The surrounding characteristic landscape is typical of the Gerald Hills area, Mexican Highlands section, Basin and Range Physiographic Province (Fenneman 1931), generally with desert upland vegetation species and desert riparian species along Pinto Creek, which flows north into the Salt River (outside of the analysis area). Characteristic landforms range from flat basins to moderate to steep mountains and canyons including Grizzly Mountain, JK Mountain, Webster Mountain, and Ripper Canyon.

Indistinct forms and lines, varied colors, and moderate to coarse textures of native vegetation in the immediate mine area are characteristic of species of the Interior Chaparral (predominantly, scrub live oak, manzanita, mountain mahogany, and skunkbush) and Upland Sonoran desertscrub (typically, catclaw, cholla, mesquite, ocotillo, and palo verde) plant communities. Reclamation of disturbed lands in the mine area consists of species of grasses that portray homogenous colors, indistinct forms and lines, and smooth textures. Other plant communities in the analysis area include Great Basin conifer woodland, Madrean conifer woodland, Petran montane conifer forest, and semidesert grassland. Vegetation patterns affect visual contrast, which informs the impact analysis of alterations to visual resources in the analysis area. Land use in the analysis area includes mining, grazing, dispersed recreation, and private lands, and four categories of visually sensitive receptors. These occur at public recreation campsites, trailheads, trails (Arizona National Historic Trail), recreation areas, and designated roads, including the Copper Corridor East Scenic Route, Copper Corridor West Scenic Route, Desert to Tall Pines Scenic Route, and Gila-Pinal National Scenic Byway (map 3-17 in appendix A). Tonto National Forest recreational activities such as hiking, hunting, off-highway vehicle use, photography, picnicking, opportunities for solitude, and wildlife viewing depend on the settings and scenic views managed through the visual quality objectives in the Tonto National Forest Plan. The low-humidity atmospheric conditions in the region promote expansive views.

3.20.3.1 Forest Service Visual Quality Objectives

Visual quality objectives, determined through the Tonto National Forest Plan process, consist of measurable standards for the visual management of National Forest System lands. Table 3-107 provides the acreage of National Forest System lands within each visual quality objective class, as established by the Tonto National Forest Plan and managed within the standards and guidelines specific to management area 2F (covering the majority of the Globe Ranger District). Most National Forest System lands surrounding Pinto Valley Mine are managed as maximum modification, with areas of partial retention on the southern edge of the Open Pit and western edge of Tailings Storage Facility No. 3.

Table 3-107. Forest Service visual quality objectives on National Forest System lands in the Pinto Valley Mine visual resources analysis area

Visual Quality Objective	Total Acres in Analysis Area	Percentage of Total Acres in Analysis Area	Acres of Existing Disturbance from Pinto Valley Mine in Analysis Area
Preservation	0	0%	0
Retention	43,450	7.5%	8
Partial Retention	145,957	25.1%	418
Modification	83,729	14.4%	4
Maximum Modification	81,509	14.0%	126
Not rated	92,084	15.8%	4
Lands outside visual quality objective extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land	135,222	23.2%	0
Total	**581,951**	**100%**	**560**

Note: Acreages of individual features within a column may not sum to column total due to independent rounding. Additionally, total existing disturbance is slightly lower than reported in chapter 2 due to alignment of geospatial data layers.

Table 3-107 reports the acreages of existing surface disturbance from Pinto Valley Mine within each visual quality objective class on National Forest System lands within the visual resources analysis area. Note that some of these existing disturbances predate the establishment of visual quality objectives in the 1985 forest plan. Additionally, mapping of visual quality objectives for the 1985 forest plan (now represented with geospatial information system data) portrays broad, landscape-scale visual quality objectives and was not intended for detailed acre-by-acre accounting of these objectives at specific project sites such as the Pinto Valley Mine.

Existing facilities at Pinto Valley Mine have created a high degree of visual impact caused by color and texture contrasts that dominate the characteristic landscape. Existing Pinto Valley Mine facilities on National Forest System lands are generally visually consistent extensions of larger facilities located on private lands within the Pinto Valley Mine boundary that feature steep and rugged exposed rock surfaces with minimal plant cover that have been shaped by mining activities that began in the 1940s and intensified with development of the Pinto Valley Mine Open Pit in the early 1970s.

3.20.3.2 Forest Service Visual Variety Classes and Bureau of Land Management Scenic Quality

Forest Service variety classes rate National Forest System lands from the standpoint of scenic quality as ordered classes A, B, or C, where A represents the highest scenic quality due to presence of a natural landscape with distinctive features and C represents the lowest scenic quality due to minimal visual variety. Three variety classes identify the scenic quality of the natural landscape ranging from those with the most variety or diversity that lead to high scenic quality to those with little variety and diversity that are of a lesser value from the standpoint of scenic quality. Bureau of Land Management scenic quality ratings are based on variety and harmonious composition, as compared with public lands in the physiographic region. In the Bureau of Land Management visual resource inventory process, public lands are also given an A, B, or C rating, where A again represents the highest scenic quality, based on the apparent scenic quality, which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Scenery in the analysis area (table 3-108) consists of class A (Forest Service 20,779 acres and Bureau of Land Management 4,096 acres), class B (Forest Service 201,166 acres and Bureau of Land Management 0 acres), and class C (Forest Service 152,821 acres and Bureau of Land Management 5,651 acres) (map 3-19 in appendix A). Forest Service class B occurs outside of the western Pinto Valley Mine boundary in the vicinity of Grizzly Mountain and JK Mountain. All other lands in the immediate foreground of the project are rated as class C.

Table 3-108. Existing Forest Service variety classes and Bureau of Land Management scenery classes in the Pinto Valley Mine analysis area (15-mile analysis area)

Variety Classes and Scenic Quality	Acres	Percentage
Forest Service Variety Classes		
Class A	20,779	3.6
Class B	201,166	34.6
Class C	152,821	26.3
Not rated	97,136	16.7
Lands outside class extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	110,050	19
Bureau of Land Management Scenic Quality		
Class A	4,906	0.84
Class B	0	0
Class C	5,651	0.97
Not rated	0	0
Lands outside class extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	571,394	98

3.20.3.3 Forest Service User Sensitivity and Bureau of Land Management Sensitivity Levels

Forest Service user sensitivities are the measure of people’s concern for scenic quality. Bureau of Land Management sensitivity levels are the measure of public concern for scenic quality. User concern for scenery in the analysis area (table 3-109, table 3-110) consists of level 1–highest sensitivity (Forest Service 212,368 acres and Bureau of Land Management 4,906 acres), level 2–average sensitivity (Forest Service 20,301 acres and Bureau of Land Management 5,594 acres), and level 3–lowest sensitivity (Forest Service 142,096 and Bureau of Land Management 57 acres) (map 3-20 in appendix A). Forest Service level 1 and level 3 occur in the immediate foreground of the Pinto Valley Mine.

Table 3-109. Forest Service user sensitivity in the Pinto Valley Mine analysis area (15-mile analysis area)

Forest Service User Sensitivity	Acres	Percentage
Level 1	212,368	36.5
Level 2	20,301	3.5
Level 3	142,096	24.4
Not rated	97,136	16.7
Lands outside user sensitivity extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	110,050	18.9

Table 3-110. Bureau of Land Management user sensitivity in the Pinto Valley Mine analysis area (15-mile analysis area)

Bureau of Land Management Sensitivity Levels	Acres	Percentage
High	4,906	0.84
Moderate	5,595	0.96
Low	57	0.01
Not rated	0	0
Lands outside Bureau of Land Management extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	571,394	98.19

3.20.3.4 Forest Service Distance Zones and Bureau of Land Management Distance Zones

Forest Service distance zones are the measure of proximity to travel routes, use areas, and water bodies. Bureau of Land Management distance zones are based on relative visibility from travel routes and observation points. Distance zones, the distance from important viewer locations, in the analysis area (table 3-111, table 3-112) consist of foreground (0.0 mile to 0.5 mile): Forest Service 61,609 acres and Bureau of Land Management 8,368 acres; middleground (0.5 mile to 3–5 miles): Forest Service 133,789 acres; Bureau of Land Management foreground-middleground (8,368 acres); and background (3–5 miles out to infinity for National Forest System lands or 15 miles for Bureau of Land Management lands): Forest Service 37,271 acres and Bureau of Land Management 0 acres (map 3-21 in appendix A). Level 1, level 2, and level 3 occur in the immediate foreground of the project.

Table 3-111. Forest Service distance zones in the Pinto Valley Mine analysis area (15-mile analysis area)

Forest Service Distance Zones	Acres	Percentage
Foreground	61,609	10.6
Middleground	133,789	23
Background	37,271	6.4
Not rated	239,232	41.1
Lands outside distance zone extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	110,050	18.9

Table 3-112. Bureau of Land Management distance zones in the Pinto Valley Mine analysis area (15-mile analysis area)

Bureau of Land Management Distance Zones	Acres	Percentage
Foreground-Middleground	8,368	1.4
Background	0	0
Seldom Seen	2,189	0.4
Not rated	0	0
Lands outside Bureau of Land Management extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	571,394	98

3.20.3.5 Bureau of Land Management Visual Resource Inventory Classes

Bureau of Land Management visual resource inventory classes indicate the relative value of visual landscapes based on scenic quality, sensitivity levels, and distance zones, with classes I and II being the most valued, class III representing a moderate value, and class IV being of least value. Bureau of Land

Management visual resource inventory classes in the analysis area (table 3-113) consist of class II (4,906 acres) and class IV (5,651 acres) (map 3-20 in appendix A) (Bureau of Land Management 2012). Class IV occurs in the foreground-middleground (1 mile) of the project and class II occurs to the south of the project in the Red Hills area.

Table 3-113. Bureau of Land Management visual resource inventory classes in the Pinto Valley Mine analysis area (15-mile analysis area)

Bureau of Land Management Visual Resource Inventory Classes	Acres	Percentage
Class I	0	0
Class II	4,906	0.84
Class III	0	0
Class IV	5,651	0.97
Not rated	0	0
Lands outside Bureau of Land Management extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	571,394	98.19

Source: Bureau of Land Management 2012

3.20.3.6 Dark Sky Conditions at Tonto National Monument

In 2019, the International Dark-Sky Association designated the Tonto National Monument as an International Dark-Sky Park, recognizing the area's exceptional opportunities to observe the night sky and commitment to preserve the nocturnal environment and educate the public. The Tonto National Monument, which encompasses approximately 1,120 acres of federal land managed by the National Park Service, is approximately 14 miles northwest of the Pinto Valley Mine at its closest point.

The National Park Service Natural Sounds and Night Skies Division modeled sky brightness, as measured by the all-sky light pollution ratio, at Tonto National Monument. The all-sky light pollution ratio describes the amount of light, averaged over the entire sky, that is due to man-made sources compared to light from a natural dark sky. The modeling data show a median monument-wide all-sky light pollution ratio of 1.76, which corresponds to 176 percent brighter than average natural light from the night sky (National Park Service 2019). This value falls within the National Park Service's moderate concern condition rating for non-urban park units, indicating that light from man-made sources are affecting night sky brightness (Moore et al. 2013). Modeling suggests that night sky brightness at the monument is most affected by lights from the cities of Phoenix and Tucson, Arizona; sky brightness is threatened by future expansion of these urban areas as well as encroaching lights from nearby communities, such as Globe, Arizona (National Park Service 2019). No trend data are currently available; however, the National Park Service did measure a reduction in mean sky brightness after retrofitting light fixtures within the monument boundary to reduce skyward light emittance. The post-retrofitted mean sky brightness measurement of 21.20 magnitudes per square arc second obtained using a Unihedron Sky Quality Meter (SQM-L) places Tonto National Monument within the Silver sky quality tier for the International Dark-Sky Park (National Park Service 2018).

The types and amounts of artificial light sources at Pinto Valley Mine have generally remained consistent during the period which sky brightness modeling and monitoring was conducted to support the designation of Tonto National Monument as an International Dark-Sky Park. Existing operations at Pinto Valley Mine utilize stationary, outdoor lighting around buildings and other facilities, mobile light plants stationed at active areas of the Open Pit and waste rock dumps, and headlights and safety beacons on vehicles. Although Pinto Valley Mine is within the area where modeled light pollution was shown to affect sky brightness at Tonto National Monument, based on the existing data, it is not possible to determine the proportion of night sky effects attributable specifically to Pinto Valley Mine.

3.20.4 Environmental Consequences

3.20.4.1 Analysis Assumptions and Methodology

The following general methods and approach are used to conduct the impact analysis for visual resources:

- Impacts on people and viewers (the viewing public): The analysis measures the extent and the effects of the project's disturbance on people through geospatial analysis of Forest Service user sensitivity levels and distances, Bureau of Land Management's sensitivity levels and distance zones, and viewer sensitivity levels and sensitive receptors on private or other Federal lands.
- Impacts on the scenic landscape: The analysis measures the extent and the effects of the project's disturbance on the scenic landscape through geospatial analysis of Forest Service visual variety ratings, Bureau of Land Management's visual resource inventory scenic quality classifications, and scenic quality on private, State, and other Federal lands.
- Impacts on landscape scenery are determined by measuring the extent of effects of the project's landscape disturbance, structures, and access roads on the scenic landscape through geospatial analysis of visual variety and scenic quality classifications and scenic quality on private, State, and other Federal lands. The viewshed area (acreage) of influence and change for each inventory class are disclosed for each alternative under consideration.
- As part of this analysis, the Forest Service conducted a broad-scale viewshed assessment using the "viewshed" tool in ArcGIS Spatial Analyst software to identify areas where the Pinto Valley Mine could be visible within the 15-mile distance buffer under both alternative 1 and the proposed action. The viewshed tool uses a digital elevation model as surface elevation input to determine the area that can be seen from a set of vantage points within the 15-mile distance buffer. Thirty-seven vantage points were identified at various locations within the Pinto Valley Mine site to represent project features with the highest elevation and features under the proposed action that are either new or would increase in elevation compared to existing conditions and alternative 1. The vantage points are representative of transmission lines, Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, and points dispersed around the mine site where a haul truck might be seen. While the Forest Service recognizes some uncertainties associated with this broad-scale modeling, the assessment provides sufficient information to conduct the visual assessment and analysis in response to key issues #4 and #6 identified during scoping.
- Impacts on people and viewers are determined by measuring the effects of the project's landscape disturbance, structures, and access roads on people through geospatial analysis of user sensitivity levels and distance zones.
- Consistency with Tonto National Forest Plan management objectives involves assessment of form, line, color, and texture of the characteristic landscape's landform and water, vegetation, and structures and the form, line, color, and texture of the project's landform and water, vegetation, and structures. The analysis also compares the project with the characteristic landscape to determine effects of alterations by proposed conditions in comparison with existing conditions. Visual effects determination includes application of seven criteria: (1) the distance between observer and the project; (2) the length of time the project is in view (linear or stationary viewers); (3) the angle of observation (superior, eye-level, or inferior); (4) whether the disturbance is sun lit (brighter, lighter colors) or in shade (darker, less apparent colors); (5) relative size or scale; (6) scenic or historic views; and (7) reclamation recovery time.

Consistency with visual quality objectives involves the comparison of existing visual conditions and viewsheds with conditions and viewsheds that would occur with implementation of the project.

- The term "minor" is used throughout the analysis as a qualitative descriptor indicating a small degree of change from existing visual conditions.

3.20.4.2 **No-action Alternative – Direct and Indirect Impacts**

Under the no-action alternative, reclamation and closure of most facilities at Pinto Valley Mine are expected to begin following the 6-month transition period after release of the record of decision. There would be an estimated 367 acres of additional surface disturbance on private land, including 10 acres of disturbance associated with continued deposition of tailings in Tailings Storage Facility No. 4 during the 6-month transition period and 357 acres of disturbance associated with excavation of borrow and riprap sources for use in reclamation and closure. Construction of boundary dams associated with Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would cease and all new disturbances under the no-action alternative would be within previously disturbed areas or adjacent to areas of existing disturbance within the Pinto Valley Mine boundary, resulting in visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and an operating Open Pit mine. As such, visual impacts are expected to be minimal relative to existing conditions.

Due the minimal expansion of facilities under the no-action alternative, the viewshed of the mine would generally be the same as under existing conditions as depicted on map 3-17 in appendix A, "Maps." Impacts on viewers and scenery would be both short term (typically fewer than 5 years) and long term (typically more than 5 years). Minor, short-term impacts are associated with the plant buildings and structures such as utility lines and fences, which would be removed during reclamation and mine closure. Long-term minor impacts would result from the tailings facilities, waste rock facilities, and earthwork for roads, where landforms would change from natural, undulating topography to monolithic, relatively flat-topped benches or terraces or engineered slopes of the tailings dams. Long-term visual contrasts on landform and vegetation would be reduced with successful reclamation as vegetation becomes reestablished in areas of disturbance. The Open Pit would remain after stabilization of the pit walls and would develop into a pit lake.

3.20.4.2.1 Forest Service Visual Quality Objective

Consistency with Tonto National Forest Plan visual quality objectives (Forest Service 1985) is determined by comparing existing and future alterations to visual quality relative to applicable visual quality objectives (map 3-18 in appendix A). Under the no-action alternative, there would be no expansion of mining facilities onto additional areas of National Forest System lands. During the 6-month transition period from active operations to start of mine closure, the condition of lands relative to visual quality objectives would not change because all activities would occur on private lands, which are not subject to Forest Service visual resource management. Reclamation of existing Pinto Valley Mine facilities on National Forest System lands could result in the gradual transition of the existing disturbed areas to meet current visual objectives as mine facilities are removed and the disturbed area is revegetated in accordance with the reclamation plan for National Forest System lands.

3.20.4.2.2 Forest Service Visual Variety and Bureau of Land Management Scenic Quality

The Forest Service visual variety classes and Bureau of Land Management scenic quality classes are the basis for determining direct and indirect impacts on scenery in the analysis area. These impacts on scenery are determined by comparing the view characteristics of the expected landscape alterations with views of the characteristic landscape, where existing class A and class B scenery would be more susceptible to contrasts and impacts than would class C scenery.

Table 3-109 shows the acreages and percentages of existing Forest Service variety classes and Bureau of Land Management scenic quality classes in the 15-mile analysis area, which are depicted relative to the location of Pinto Valley Mine on map 3-19 in appendix A. Impacts on scenery are determined by comparing the visual characteristics of the no-action alternative with views of the characteristic landscape. Due to the dominant presence of existing mining-related facilities and disturbance in the viewshed and classification of the Pinto Valley Mine area as Forest Service visual variety Class C, which signifies lands with the lowest relative visual variety and scenic quality, additional disturbances under the no-action alternative would be similar to surrounding activities and consistent with existing visual variety and scenery designations. Visual contrasts created by the mine would gradually diminish as mining facilities are decommissioned or removed and disturbed areas are recontoured and revegetated in accordance with the approved mining plan of operations.

3.20.4.2.3 Forest Service User Sensitivity and Bureau of Land Management Sensitivity Levels

The Forest Service user sensitivity and distance zones and Bureau of Land Management sensitivity levels and distance zones are the basis for determining direct and indirect visual impacts on people in the analysis area. Higher user concern for scenery would be more susceptible to visual impacts than lower concern. Near distance zones would be more susceptible to visual impacts than far distance zones. Impacts on viewers are determined by comparison of the view characteristics of the expected landscape alterations with views of the characteristic landscape.

Table 3-110 shows the acreages and percentages of existing Forest Service user sensitivity and Bureau of Land Management sensitivity levels in the 15-mile analysis area, which are depicted on map 3-20 in appendix A. Portions of the 357 acres of disturbance associated with excavation of borrow and riprap sources on private lands for use in reclamation and closure under the no-action alternative would be within lands classified by the Forest Service as having the highest level of user sensitivity (level 1). However, 244 acres of this disturbance would occur in previously disturbed areas and new disturbances would be adjacent to existing mine facilities. Therefore, actual user sensitivity to these disturbances is expected to be minimal.

3.20.4.2.4 Bureau of Land Management Visual Resource Inventory Classes

The Bureau of Land Management visual resource inventory classes indicate the intrinsic scenic quality of the landscape on Bureau of Land Management lands. Views to the mine area under the no-action alternative from landscapes with higher scenic quality have greater potential for impacts than do views from landscapes with lower scenic quality. Table 3-108 shows the acreages and percentages of existing Bureau of Land Management visual resource inventory classes in the existing landscape, which are depicted on map 3-20 in appendix A. Disturbances under the no-action alternative that may be visible in the foreground-middleground zone when viewed from Bureau of Land Management lands east of Pinto Valley Mine would be consistent with assigned class IV visual resource inventory value. Modifications to Pinto Valley Mine under the no-action alternative would not be visible from and would have no effect on the scenic quality of Bureau of Land Management lands south of Pinto Valley Mine in the Red Hills area.

3.20.4.2.5 Dark Sky Conditions at Tonto National Monument

The same types and amounts of existing nighttime lighting at Pinto Valley Mine would continue to be used during the 2 months of active operations under the no-action alternative. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument during this time would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park.

Nighttime lighting at Pinto Valley Mine would decrease substantially as the mine transitions to reclamation and closure activities because lighting would no longer be needed to support active mining operations and there would be fewer vehicles traveling to and within Pinto Valley Mine. Pinto Valley Mining Corp. does not anticipate the need for lighting during the post-closure period unless required for essential security purposes. These decreases in nighttime lighting over time would decrease potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument but are unlikely to be directly measurable through monitoring.

3.20.4.3 Alternative 1 – Direct and Indirect Impacts

Alternative 1 consists of continuing the authorized activities and permitted disturbances at the Pinto Valley Mine for approximately 7 more years than the no-action alternative. The viewshed of alternative 1 is shown on map 3-22 in appendix A. Continuation of mining operations at the Pinto Valley Mine would result in visual resource impacts that are relatively similar to existing conditions including the visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and an operating open pit mine. Compared to the no-action alternative, visual effects from alternative 1 are expected to be slightly greater due to 542 more acres of new surface disturbance on private lands and the increased top elevation of Tailings Storage Facility No. 4 and the Main Dump. The final top elevation of Tailings Storage Facility No. 4 would increase by 132 feet compared to the no-action alternative. The final top elevation of the Main Dump would increase by 230 feet compared to the no-action alternative. However, these changes to the landscape would be minimal in relation to existing conditions due to the highly altered condition of the existing landscape at the Pinto Valley Mine.

Visual effects resulting from reclamation and mine closure would be essentially the same as described for the no-action alternative, with decreasing visual contrasts from the mine as disturbed areas are recontoured and revegetated.

3.20.4.3.1 Forest Service Visual Quality Objective

Similar to the no-action alternative, there would be no expansion of mining facilities onto additional areas of National Forest System lands under alternative 1. The condition of lands relative to visual quality objectives would not change because all activities would occur on private lands, which are not subject to Forest Service visual resource management. Reclamation of existing Pinto Valley Mine facilities on National Forest System lands could result in the gradual transition of the existing disturbed areas to meet current visual objectives as mine facilities are removed and the disturbed area is revegetated in accordance with the reclamation plan for National Forest System lands.

3.20.4.3.2 Forest Service Visual Variety and Bureau of Land Management Scenic Quality

Visual contrasts from mining facilities under alternative 1 would be slightly greater than under the no-action alternative due to 542 acres of surface disturbance on private lands, the increased top elevations of tailings dams and waste rock dumps, and extension of active mining operations by approximately 7 years. Due to the dominant presence of existing mining-related facilities, existing disturbance in the mine viewshed, and classification of the Pinto Valley Mine area as Forest Service visual variety class C, which signifies an area with minimal visual variety and scenic quality, additional disturbances under alternative 1 would be similar to surrounding activities and consistent with existing visual variety and scenery designations. Visual contrasts created by the mine would gradually diminish as mining facilities are decommissioned or removed and disturbed areas are recontoured and revegetated in accordance with the approved mining plan of operations.

3.20.4.3.3 Forest Service User Sensitivity and Bureau of Land Management Sensitivity Levels

Some areas of additional surface disturbance on private lands under alternative 1 would be within lands classified by the Forest Service as having the highest level of user sensitivity (level 1). However, as under the no-action alternative, actual user sensitivity to these disturbances is expected to be minimal given that all new disturbance would be adjacent to existing mine facilities and, in some areas, within previously disturbed areas.

3.20.4.3.4 Bureau of Land Management Visual Resource Inventory Classes

Potential effects on the scenic quality of Bureau of Land Management lands would be the same as described under the no-action alternative. Surface disturbance under alternative 1 that may be visible in the foreground-middleground zone when viewed from Bureau of Land Management lands east of Pinto Valley Mine would be consistent with assigned class IV visual resource inventory values. Modifications to Pinto Valley Mine under alternative 1 would not be visible from and would have no effect on the scenic quality of Bureau of Land Management lands south of Pinto Valley Mine in the Red Hills area.

3.20.4.3.5 Dark Sky Conditions at Tonto National Monument

Potential contributions of the Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for the no-action alternative except that nighttime lighting for mine operations would continue for approximately 7 more years under alternative 1. The effects of operational lighting unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Slight shifts in the locations of mobile light plants during mine operations under alternative 1 are not anticipated to change effects on dark skies.

Decreases in nighttime lighting and associated contributions to light pollution would be the same as described for the no-action alternative but would begin approximately 7 years later.

3.20.4.4 **Proposed Action – Direct and Indirect Impacts**

Due to an increase in surface disturbance and expansion onto National Forest System lands, vertical expansion of mining facilities (tailings storage facilities), and extension of the mine life for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, the proposed action would increase the potential for visual resource impacts compared to the no-action alternative and alternative 1. In general, the proposed action would cause weak to minor form, line, color, and texture visual contrasts to landforms, vegetation, and structures in the characteristic landscape, including in the public’s foreground, middleground, and background viewing experiences (map 3-23 in appendix A). The final elevation of Tailings Storage Facility No. 3 would increase by approximately 75 feet compared to alternative 1 and the no-action alternative. The final elevation of Tailings Storage Facility No. 4 would increase by approximately 160 feet compared to alternative 1 and would increase by approximately 292 feet compared to the no-action alternative. The final elevation of the Main Dump would increase by approximately 180 feet compared to alternative 1 and would increase by approximately 410 feet compared to the no-action alternative.

Potential visual resource impacts under the proposed action are expected to be greater than under the no-action alternative and alternative 1, but still minor relative to existing conditions in the analysis area, which is dominated by visual characteristics of a large-scale mining operation that has been visible for decades.

3.20.4.4.1 *Forest Service Visual Quality Objectives*

Whereas the no-action alternative and alternative 1 would not include any additional expansion of mining facilities onto National Forest System lands, the proposed action would result in new disturbance of approximately 229 acres of National Forest System lands. Table 3-114 indicates the acreage of new disturbance under the proposed action within each visual quality objective. Most new disturbance areas would occur within maximum modification areas, which allow for a high degree of visual change. Use of a potential new borrow area on National Forest System lands located directly east of the Cottonwood Tailings Impoundment could result in approximately 52 acres of new disturbance within partial retention areas; however, these borrow areas are unlikely to be disturbed due to the availability of borrow areas on private lands. In the unlikely scenario that borrow areas on National Forest System lands are utilized for mine reclamation, disturbances would be short-term and reclaimed to maintain consistency with the partial retention visual quality objective. Reclamation of mine features on National Forest System Lands in accordance with the reclamation plan for National Forest System lands as well as natural weathering processes during operations and post mining would, over time, reduce contrasts between mining-related disturbances and adjacent natural-appearing landscapes, resulting in a gradual transition of disturbed areas to meet current visual objectives.

Table 3-114. Forest Service visual quality objectives within new disturbance areas under the proposed action

Visual Quality Objective	Acres	Percentage
Partial Retention	52	23
Maximum Modification	177	77

3.20.4.4.2 *Forest Service Visual Variety and Bureau of Land Management Scenic Quality*

Proposed action mining operations at the Pinto Valley Mine would result in minor scenery impacts that are relatively similar to existing conditions, including visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and typically associated with an operating open pit mine.

These scenery impacts are not expected to further reduce the inventoried Forest Service variety class designations and Bureau of Land Management scenery class designations in the analysis area relative to existing conditions. As a result, direct and indirect impacts would be similar to those described for the no-action alternative and alternative 1, and minor relative to existing conditions. Table 3-115 shows the acreages and percentages of visual variety and scenic quality classes in the area where Pinto Valley Mine facilities, including modifications made under the proposed action, would generally be visible to viewers. The viewshed of the proposed action is shown on map 3-23 and the visual variety and scenic quality classes are shown on map 3-19 of appendix A. Refer to section 3.5.4, "Environmental Consequences," for a description of visual resource impacts on cultural resources and historic properties.

Table 3-115. Existing Forest Service variety classes and Bureau of Land Management scenery classes in the Pinto Valley Mine viewshed

Variety Classes and Scenic Quality	Acres	Percentage
Forest Service Variety Classes		
Class A	339	0.7
Class B	17,701	36.1
Class C	18,585	37.9
Not rated	7,640	15.6

Variety Classes and Scenic Quality	Acres	Percentage
Lands outside class extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	4,784	9.8
Bureau of Land Management Scenic Quality		
Class A	0	0
Class B	0	0
Class C	1,110	2.3
Not rated	0	0
Lands outside class extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	47,940	97.7

3.20.4.4.3 Forest Service User Sensitivity and Bureau of Land Management Sensitivity Levels

Proposed action mining operations at the Pinto Valley Mine would result in minor viewer impacts due to the relative similarity to existing conditions, including visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and typically associated with an operating open pit mine. The proposed action would result in minor changes in scenic quality for viewers in the foreground, middleground, and background distance zones and this level of minor impact is not expected to further reduce the inventoried Forest Service user sensitivity designations and Bureau of Land Management sensitivity level designations in the analysis area. Therefore, direct and indirect impacts on viewers would be minor, though slightly more than those of the no-action alternative and alternative 1. Table 3-116 shows the acreages and percentages of Forest Service user sensitivity zones for views to the mine area under the proposed action. Table 3-117 shows Bureau of Land Management sensitivity levels in the area where Pinto Valley Mine facilities, including modifications made under the proposed action, would generally be visible to viewers (viewshed). Table 3-118 shows the acreages and percentages of low impacts in Forest Service distance zones within the viewshed of the proposed action. Table 3-119 shows Bureau of Land Management distance zones within the viewshed of the proposed action. The viewshed of the proposed action is shown on map 3-23 in appendix A. The Forest Service user sensitivity and Bureau of Land Management sensitivity levels are shown on map 3-20 in appendix A. The distance zones are shown on map 3-21 in appendix A.

Table 3-116. Forest Service user sensitivity in the Pinto Valley Mine viewshed

Forest Service User Sensitivity	Acres	Percentage
Level 1	15,663	31.9
Level 2	568	1.2
Level 3	20,395	41.6
Not rated	7,640	15.6
Lands outside distance zone extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	4,784	9.8

Table 3-117. Bureau of Land Management user sensitivity in the Pinto Valley Mine viewshed

Bureau of Land Management Sensitivity Levels	Acres	Percentage
High	0	0
Moderate	1,110	2.3
Low	0	0
Not rated	0	0

Bureau of Land Management Sensitivity Levels	Acres	Percentage
Lands outside Bureau of Land Management extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	47,940	97.7

Table 3-118. Forest Service distance zones in the Pinto Valley Mine viewshed

Forest Service Distance Zones	Acres	Percentage
Foreground	4,800	9.8
Middleground	9,234	18.8
Background	2,197	4.5
Not rated	28,035	57.2
Lands outside distance zone extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	4,784	9.8

Table 3-119. Bureau of Land Management distance zones in the Pinto Valley Mine viewshed

Bureau of Land Management Distance Zones	Acres	Percentage
Foreground-Middleground	1,110	2.3
Background	0	0
Seldom Seen	0	0
Not rated	0	0
Lands outside Bureau of Land Management extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	47,940	97.7

3.20.4.4.4 Bureau of Land Management Visual Resource Inventory Classes

Proposed action mining operations at the Pinto Valley Mine would result in overall landscape values that are relatively similar to existing conditions, the no-action alternative, and alternative 1. The proposed action would result in minor changes to the landscape for viewers in the foreground, middleground, and background distance zones and this minor level of impact would not be expected to reduce the inventoried Bureau of Land Management visual resource inventory class designations in the analysis area. Therefore, direct and indirect impacts on viewers and scenery would be similar to those under the no-action alternative and alternative 1, and minor relative to existing conditions. Table 3-120 shows the acreages and percentages of minor impacts on existing Bureau of Land Management visual resource inventory classes in the viewshed of the proposed action. The viewshed of the proposed action is shown on map 3-23 in appendix A and the visual resource inventory classes are shown on map 3-20 in appendix A.

Table 3-120. Bureau of Land Management visual resource inventory classes in the Pinto Valley Mine viewshed

Bureau of Land Management Visual Resource Inventory Classes	Acres	Percentage
Class I	0	0
Class II	0	0
Class III	0	0
Class IV	1,110	2.3
Not rated	0	0
Lands outside class extent (Forest Service, private, San Carlos Indian Reservation, State Trust Land)	47,940	97.7

3.20.4.4.5 Dark Sky Conditions at Tonto National Monument

Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for alternative 1 except that nighttime lighting for mine operations would continue for approximately 12 more years under the proposed action. The effects of operational lighting would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Slight shifts in the locations of mobile light plants during mine operations under the proposed action are not anticipated to affect night sky conditions at the monument.

Decreases in nighttime lighting and associated contributions to light pollution would be the same as described for alternative 1 but would begin approximately 12 years later.

3.20.4.5 **Cumulative Impacts**

The cumulative impact analysis area for visual resources is the Pinto Valley Mine project boundary plus a 15-mile distance buffer around Pinto Valley Mine project facilities (map 3-17 in appendix A)—the same area in which direct and indirect effects on visual resources were analyzed in section 3.20.4, "Environmental Consequences." This analysis area encompasses approximately 909 square miles (approximately 581,951 acres) and is the extent of the area that could experience direct and indirect effects from the proposed action that could combine with effects from other past, ongoing, and reasonably foreseeable actions, resulting in cumulative effects. The temporal boundary for analyzing the cumulative impacts on visual resources begins with proposed expansion of mine facilities and extends through mine closure and final reclamation.

Section 3.20.3, "Affected Environment," describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on visual resources. Present effects of past actions have resulted in extensive landscape disturbance from historic and current mining operations and ancillary facilities such as roads, buildings, and utility structures within portions of the cumulative impacts analysis area. Characteristic landforms in the cumulative impacts analysis area range from flat basins to moderate to steep mountains and canyons including Grizzly Mountain, JK Mountain, Webster Mountain, and Ripper Canyon. The recent Woodbury Fire, which burned 124,000 acres in June and July of 2019 mostly within the Superstition Wilderness Area west of the analysis area, also burned areas along Little Campaign Creek northwest of the Pinto Valley Mine. In addition, in 2020 several other fires burned in the Tonto National Forest, affecting existing ecological conditions. The closest of these fires to the Pinto Valley Mine was the Salt Fire, which burned over 21,000 acres north and east of the Pinto Valley Mine in August and September of 2020. These fires have resulted in an alteration of the visual setting.

This cumulative analysis considers the present effects of past actions described in section 3.20.3, "Affected Environment," in combination with the present and reasonably foreseeable future actions that could affect visual resources in the future as identified in table 3-3 and further described in table 3-2.

3.20.4.5.1 Forest Service Visual Quality Objectives

Past disturbances from development of the Pinto Valley Mine and adjacent Carlota Copper Mine (Forest Service 1997) have cumulatively contributed to the diminished scenic quality of National Forest System lands relative to visual quality objectives established by the Tonto National Forest Plan. However, the incremental visual impacts of the proposed action are relatively minor within the context of the total area of existing mine-related disturbance on public and private lands within the Globe-Miami Mining District. Although generally not visible simultaneously from the same vantage points, Pinto Valley Mine, Carlota Copper Mine, and Freeport-McMoRan Miami Copper Mine have all contributed to the visual dominance of mining facilities along U.S. Highway 60 between Top-of-the-World and Claypool.

Table 3-121 shows the cumulative acreage of surface disturbance within the cumulative impacts analysis area from past actions, Pinto Valley Mining Corp.'s proposed action, and the reasonably foreseeable Resolution Copper Project and Land Exchange by visual quality objective. The existing Carlota Copper Mine, Pinto Valley Mining Corp.'s proposed action, and the reasonably foreseeable Resolution Copper Project and Land Exchange would cumulatively disturb National Forest System lands managed under retention or partial retention visual quality objectives. These disturbances would reduce the total area achieving these visual quality objectives as designated at a planning level by the Tonto National Forest Plan until disturbed areas are successfully reclaimed and revegetated.

Table 3-121. Surface disturbance within visual quality objective acreages on National Forest System lands within the cumulative impacts analysis area

Visual Quality Objective	Total Acres	Acres of Existing Disturbance	Acres of New Disturbance from Proposed Action	Acres of New Disturbance from other Reasonably Foreseeable Actions[114]	Total Acres of Cumulative Disturbance
Preservation	0	0	0	0	0
Retention	43,450	1,360	1	417	1,778
Partial Retention	145,957	1,555	52	1,556	3,163
Modification	83,729	156	0	408	564
Maximum Modification	81,509	248	177	0	425
Not rated	92,084	68	0	62	130
Lands outside visual quality objective extent (Bureau of Land Management, private, San Carlos Indian Reservation, State Trust Land)	135,222	20,634	1,087	8,983	30,704
Total	**581,951**	**24,021**	**1,317**	**11,426**	**36,764**

Source: Forest Service 1985, 2020c; U.S. Geological Survey 2013

The differences in cumulative impacts on Forest Service visual quality objectives among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.20.4.2 through 3.20.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Whereas the no-action alternative and alternative 1 would not include any additional expansion of mining facilities onto National Forest System lands, the proposed action would result in new disturbance of approximately 229 acres of National Forest System lands, which would increase the acreage of National Forest System lands on which mining is the visually dominant activity.
- The proposed action would extend the mine life for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on Forest Service visual quality objectives compared to the other alternatives. However, impacts are anticipated to

[114] For any National Forest System lands subject to the legislatively mandated land exchange related to the Resolution Copper Project, this final EIS considered potential cumulative effects based on the management of these lands as components of the National Forest System prior to completion of the land exchange and their transfer to private ownership.

be minor relative to existing conditions in the analysis area, which is dominated by visual characteristics of a large-scale mining operation that has been visible for decades.

3.20.4.5.2 Forest Service Visual Variety and Bureau of Land Management Scenic Quality

Present effects of the relevant past and present actions have resulted in the visual variety and scenic quality conditions presented in section 3.20.3, "Affected Environment." Proposed action mining operations at the Pinto Valley Mine would result in minor scenery impacts that are relatively similar to existing conditions, including visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and typically associated with an operating open pit mine.

Present and reasonably foreseeable actions that could contribute to visual variety and scenic quality impacts in the future are identified in table 3-3 and further described in table 3-2. The visual character of much of the analysis area is dominated by extensive, large-scale mining operations. Past and ongoing mining operations, Pinto Valley Mining Corp.'s proposed action, and the reasonably foreseeable Resolution Copper Project and Land Exchange may contribute to cumulative effects on Forest Service visual variety and Bureau of Land Management scenic quality in the analysis area. Within the context of this past and ongoing mining development, impacts contributed by the Pinto Valley Mine proposed action and alternatives are anticipated to be minimal and are not expected to further reduce the inventoried Forest Service visual variety class designations and Bureau of Land Management scenery class designations in the analysis area relative to existing conditions. Minor differences in cumulative impacts on visual variety and scenic quality among the alternatives would be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.20.4.2 through 3.20.4.4, and minor relative to existing conditions.

3.20.4.5.3 Forest Service User Sensitivity and Bureau of Land Management Sensitivity Levels

Present effects of the relevant past and present actions have resulted in the scenery conditions presented in section 3.20.3, "Affected Environment." Past and ongoing mining operations, Pinto Valley Mining Corp.'s proposed action, and the reasonably foreseeable Resolution Copper Project and Land Exchange may contribute to cumulative effects on Forest Service user sensitivity and Bureau of Land Management sensitivity levels in the analysis area. Within the context of this past and ongoing mining development, impacts contributed by the Pinto Valley Mine proposed action and alternatives are anticipated to be minimal and are not expected to further reduce the inventoried Forest Service user sensitivity designations and Bureau of Land Management sensitivity level designations in the analysis area relative to existing conditions. Minor differences in cumulative impacts on scenery among the alternatives would be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.20.4.2 through 3.20.4.4, and minor relative to existing conditions.

3.20.4.5.4 Bureau of Land Management Visual Resource Inventory Classes

Present effects of the relevant past and present actions have resulted in the inventoried Bureau of Land Management visual resource inventory class designations presented in section 3.20.3, "Affected Environment." Past and ongoing mining operations, Pinto Valley Mining Corp.'s proposed action, and the reasonably foreseeable Resolution Copper Project and Land Exchange may contribute to cumulative effects on Bureau of Land Management visual resource inventory classes in the analysis area. Within the context of this past and ongoing mining development, impacts contributed by the Pinto Valley Mine proposed action and alternatives are anticipated to be minimal and are not expected to further reduce the inventoried Bureau of Land Management visual resource inventory class designations in the analysis area relative to existing conditions. Minor differences in cumulative impacts among the alternatives would be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.20.4.2 through 3.20.4.4, and minor relative to existing conditions.

3.20.4.5.5 Dark Sky Conditions at Tonto National Monument

Present effects of the relevant past and present actions have resulted in the dark sky conditions at Tonto National Monument presented in section 3.20.3, “Affected Environment.” The types and amounts of artificial light sources at Pinto Valley Mine have generally remained consistent over the period during which sky brightness modeling and monitoring were conducted to support the designation of Tonto National Monument as an International Dark-Sky Park. Existing operations at Pinto Valley Mine utilize stationary, outdoor lighting around buildings and other facilities, mobile light plants stationed at active areas of the Open Pit and waste rock dumps, and headlights and safety beacons on vehicles. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument under the proposed action would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park.

A variety of ongoing and reasonably foreseeable actions could contribute to cumulative impacts on dark sky conditions, as indicated in table 3-3 in section 3.1.5.3, “Past, Present, and Reasonably Foreseeable Actions.” The Resolution Cooper Mine and Land Exchange Project is the primary reasonably foreseeable action that could contribute to cumulative effects on dark skies at Tonto National Monument when combined with incremental effects from lighting at Pinto Valley Mine. The “Impact Assessment of the Proposed Resolution Copper Mine on Night Sky Brightness” prepared in conjunction with the Resolution Copper Mine and Land Exchange draft EIS did not specifically analyze effects on the Tonto National Monument but did estimate increases in average sky luminescence of 5 to 40 percent in the direction of the proposed mining facilities over natural conditions (Dark Sky Partners LLC 2018). As a result, Resolution Copper Mining, LLC has committed to environmental protection measures including implementation of an outdoor lighting plan that would reduce potential impacts from artificial nighttime lighting (Forest Service 2019e).

Decreases in sky glow from Pinto Valley Mine due to reductions in nighttime lighting during closure and post-closure may be offset by new light sources from continued urban expansion around the Phoenix and Tucson metropolitan areas.

The differences in cumulative impacts on dark sky conditions at Tonto National Monument among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.20.4.2 through 3.20.4.4. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- Nighttime lighting for mine operations under the proposed action would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on dark sky conditions at Tonto National Monument compared to the other alternatives. However, the effects of operational lighting would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park.

3.21 Water Resources and Hydrogeochemistry

This section provides a summary of the affected environment, environmental consequences, and proposed monitoring and mitigation measures for water resources and geochemistry. A more detailed description of the affected environment and environmental consequences (including support tables, figures, and references) is provided in appendix E, “Water Resources and Geochemistry Technical Report.”

The study area for water resources and geochemistry (herein referred to as the hydrologic study area) encompasses approximately 200 square miles that includes the Pinto Creek watershed area (Hydrologic Unit Code 1506010307), as well as a small portion of the Miami Wash and Middle Pinal Creek watersheds that are part of the Pinal Creek watershed (Hydrologic Unit Code 1506010306) directly east of the Pinto Valley Mine (map 3-24). The project study area for direct and indirect impacts for water resources is defined as those areas within the hydrologic study area where groundwater or surface water could be affected by the proposed project.

The temporal boundary for analyzing the direct and indirect effects on water resources includes the timeframes associated with construction, operation, mine closure, and final reclamation. The analysis also evaluates potential long-term, post-closure impacts on water quantity and water quality that could persist into the post-closure period.

3.21.1 Relevant Laws, Regulations, and Policy

The regulation, appropriation, and preservation of water in Arizona falls under both Federal and State jurisdiction. Key water-related components of the Tonto National Forest Land and Resource Management Plan and Federal and State law are outlined below.

3.21.1.1 Federal Authorities

3.21.1.1.1 Forest Service Organic Administration Act of 1897

Basic authority for watershed management is in the Organic Administration Act of June 4, 1897 (30 Stat. 34, as amended, 16 U.S. Code 475). It states the securing of favorable water flow to be a purpose for establishing National Forests. The Act allows all waters within National Forest boundaries to be used for domestic, mining or irrigation purposes under the laws of the states wherein the National Forests are situated, or under United States laws, rules and regulations. A 1982 Colorado Supreme Court ruling (United States of America v. City and County of Denver, 656 P. 2d1) clarified that the 1897 Act grants only a permissive right to use waters within the National Forest.

3.21.1.1.2 The Federal Water Pollution Control Act (the Clean Water Act) of 1972 (33 U.S. Code §1251 et seq.)

This act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under this act, the following sections were considered in the analysis of the Pinto Valley Mine EIS.

The Federal Water Pollution Control Act section 303(d) authorizes listing impaired waters and developing total maximum daily loads for these waterbodies. The Arizona Department of Environmental Quality is responsible for conducting a comprehensive analysis of water quality data and prepares an assessment and impaired waters listing report every 2 years as required under the Federal Water Pollution Control Act.

Under section 401 of the Clean Water Act, a Federal agency may not issue a permit or license to conduct any activity that may result in any discharge into waters of the United States unless a Section 401 water quality certification is issued, verifying compliance with water quality requirements, or certification is waived.

The Federal Water Pollution Control Act section 402 establishes the National Pollutant Discharge Elimination System. The Arizona Department of Environmental Quality is the permitting authority in the State of Arizona for the issuance of point-source Arizona Pollutant Discharge Elimination System permits and the storm water permitting program (multisector general permit) pursuant to section 402 of the Federal Water Pollution Control Act.

The Federal Water Pollution Control Act section 404 regulates the discharge of dredged or fill material into waters of the U.S. The U.S. Army Corps of Engineers administers the Federal Water Pollution Control Act section 404 permit program, with oversight provided by the U.S. Environmental Protection Agency.

3.21.1.1.3 Executive Orders

- Executive Order 11990 (as amended by Executive Order 12608) – Protection of Wetlands. Provides for "no net loss" of wetlands policy outlined in an agreement between the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency.
- Executive Order 11988 (revised Executive Order 13690 was revoked by Executive Order 13807, reverted to Executive Order 11988) – Floodplain Management. Requires Federal agencies to avoid the long- and short-term adverse impacts associated with occupancy and modification of floodplains.

3.21.1.2 **<u>Forest Service Regulations, Policies, and Guidance</u>**

3.21.1.2.1 Tonto National Forest Land and Resource Management Plan, as Amended

The Tonto National Forest Land and Resource Management Plan provides the following management directions and prescriptions for water resources (Forest Service 1985):

- Meet minimum water quality standards.
- Emphasize improvement of water quality.
- Augment water supplies when compatible with other resources.
- Enhance riparian ecosystems, by improved management.
- Obtain water rights necessary to ensure orderly resource development.
- Manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, water quality maintenance, livestock forage production, and dispersed recreation. Watersheds will be managed so as to improve them to a satisfactory or better condition. Improve and manage the included riparian areas to benefit riparian dependent resources.

3.21.1.3 **<u>State and Local Laws, Regulations, and Policies</u>**

3.21.1.3.1 Arizona Department of Environmental Quality Aquifer Protection Permit

The Arizona Department of Environmental Quality Aquifer Protection Permit requires mine operators to obtain an Aquifer Protection Permit for tailings storage facilities, waste rock dumps, Leach Piles, ponds, and other facilities that have a potential to discharge contaminants to groundwater. The Aquifer Protection Permit includes terms and conditions that specify how groundwater will be protected by certain design, operation, monitoring, and response requirements. The Aquifer Protection Permit includes a variety of monitoring requirements for groundwater, water levels, discharges, and best available demonstrated control technology. The Aquifer Protection Permit also requires a closure and post-closure strategy that describes how facilities will be closed when operations are complete.

3.21.1.3.2 Arizona Department of Environmental Quality Authorization to Discharge under the Arizona Pollutant Discharge Elimination System

Requires authorization for industrial discharges of pollutants to surface waters in accordance with permitted effluent limitations, monitoring requirements, and other conditions to minimize discharge of pollutants to surface waters.

3.21.1.3.3 Arizona Department of Environmental Quality Notice of Intent Certificate to Comply with the Arizona Storm Water Multi-sector General Permit

Requires regulated facilities to maintain a storm water pollution prevention plan for managing, monitoring, and controlling storm water to minimize pollutants in storm water discharges.

3.21.1.3.4 Arizona Department of Water Resources, Dam Safety permit

The Arizona Department of Water Resources requires a dam safety permit for a jurisdictional dam, defined as an artificial barrier for the impoundment or diversion of water either 25 feet or more in height or having a storage capacity of more than 50 acre-feet (excluding mine tailings dams such as the Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 embankments).

3.21.1.3.5 Arizona Groundwater Management Act

The Arizona Groundwater Management Act was adopted in 1980 and is administered by the Arizona Department of Water Resources. The goals of the Groundwater Management Act were to control overdraft occurring at the time in several areas within the state, provide a means to allocate the state’s limited groundwater resources, and augment the state’s groundwater through water development.

3.21.1.3.6 The Arizona Administrative Code, Title 18. Environmental Quality, Chapter 11. Department of Environmental Quality – Water quality Standards Supplement 16-4

The Arizona Administrative Code defines numeric and narrative water quality standards for surface water and groundwater quality administered by the Arizona Department of Environmental Quality.

3.21.1.3.7 The Arizona Administrative Code, Title 18. Environmental Quality, Chapter 4. Safe Drinking Water Rules

Arizona's drinking water rules are located in Title 18, Chapter 4, of the Arizona Administrative Code (18 A.A.C. 4). The Arizona Department of Environmental Quality maintains enforcement authority for the Safe Drinking Water Act in accordance with A.R.S. §49-353(A)(2)(a).

3.21.1.3.8 The Arizona Administrative Code, Title 45, Chapter 1. Waters – Administration and General Provisions

The Arizona Public Water Code provides that beneficial use shall be the basis, measure, and limit to the use of water within the state. Arizona Revised Statute §45-151(A) defines beneficial uses as “domestic, municipal, irrigation, stock watering, water power, recreation, wildlife, including fish, nonrecoverable water storage pursuant to section 45-833.01 or mining uses.” The Arizona Department of Water

Resources, Surface Water Permitting Unit is responsible for issuing permits, certificates, and claims to the use of surface water within the State of Arizona, excluding the Lower Colorado River.

3.21.2 Resource Indicators

Table 3-122 provides the resource indicators and measures for assessing potential effects on water resources. This section and appendix E, "Water Resources and Geochemistry Technical Report," provide the best available existing information for water resources.

Table 3-122. Resource indicators and measures for assessing effects on water resources

Resource Element	Resource Indicator	Measure	Used to address: purpose and need or key issue?	Source
Surface Water quantity	Measurable changes in baseflow of perennial streams, springs, and seeps caused by mine-induced changes in water levels; impacts on jurisdictional waterways and drainages	Measurable changes in baseflow (gallons per minute); reduction of the length of perennial stream reach (miles); measurable reduction in discharge/flow from springs and seeps	Yes	Numerical groundwater modeling (SRK Consulting, Inc. 2019b), changes in water levels, surface water baseline inventory (AJAX, Ltd. 2018), surface water balance modeling (BGC Engineering USA, Inc. 2019a), Supplemental groundwater Simulations (SRK Consulting, Inc. 2020b)
Groundwater quantity	Changes in groundwater quantity for current users and water-dependent resources	Changes in groundwater levels (feet); reduction in groundwater available (acre-feet per year)	Yes	Numerical groundwater model (SRK Consulting, Inc. 2019b), Supplemental Groundwater Simulations (SRK Consulting, Inc. 2020a), water resources database
Surface Water quality	Changes in surface water quality	Exceedance of one or more numerical or narrative water quality standards established to protect applicable beneficial uses	Yes	Seepage evaluation (SRK Consulting, Inc. 2020b), numerical flow modeling (SRK Consulting, Inc. 2019b), Australian water balance model (BGC Engineering USA, Inc. 2019b)
Groundwater quality	Degradation of groundwater quality associated with the downgradient migration of leachate from project facilities	Exceedance of one or more numerical or narrative water quality standards established to protect applicable beneficial uses	Yes	Geochemical characterization, seepage evaluation, hydrochemical analysis, and numerical flow modeling (SRK Consulting, Inc. 2019b, 2019c), Supplemental Groundwater Simulations (SRK Consulting, Inc. 2020a)

Resource Element	Resource Indicator	Measure	Used to address: purpose and need or key issue?	Source
Water rights	Impacts on surface water rights	Identify water rights that may be affected by mine-induced changes in water levels	Yes	Numerical groundwater modeling (SRK Consulting, Inc. 2019b), Supplemental Groundwater Simulations (SRK Consulting, Inc. 2020a), changes in water levels, U.S. Geological Survey flow monitoring records, water rights inventory (WestLand Resources, Inc. 2018c)

3.21.3 Affected Environment

The Pinto Valley Mine is situated within the Pinto Creek watershed (Hydrologic Unit Code 1506010307), which is part of the Upper Salt River drainage basin (Hydrologic Unit Code 15060103). The Pinto Creek watershed is drained by Pinto Creek, a north-flowing stream that is predominantly intermittent with several perennial and ephemeral reaches and is a tributary to Salt River that discharges into Roosevelt Lake (map 3-24 in appendix A). The project is within a semiarid region with an average annual precipitation ranging from 16.65 inches to 17.28 inches as recorded at the two Pinto Valley Mine meteorological stations for the 2006 through 2015 period. The estimated average open-pan evaporation rate for the mine area is 72.1 inches per year.

3.21.3.1 **Groundwater Quantity**

Groundwater occurs both within the bedrock units that underlie the hydrologic study area and in alluvium that veneers bedrock in the valley bottom areas along the major drainage courses. The geology and structural conditions within the project area and across the hydrologic study area are complex. The geologic map and interpreted cross-sections constructed across the area identify 18 bedrock units and numerous faults. The movement and storage of groundwater in the bedrock units throughout the project area and hydrologic study area are generally controlled by the interconnection of fractures within the rock mass. The density (spacing), aperture, and interconnection of these fractures are highly variable within individual or between rock units. This variability is reflected in the results of aquifer testing conducted in the area around the Pinto Valley Mine and Carlota Mine that indicate that the bedrock complex is highly heterogeneous with respect to hydraulic conductivity.

The Gila Conglomerate is the principal aquifer in Globe-Miami Mining District, the Pinto Valley watershed, and for the Pinto Valley Mine. Pinto Valley Mine’s main water source is provided by extracting groundwater from the Peak Well field northwest of Tailings Storage Facility No. 4 on the east and west sides of Pinto Creek. The wells at the toe of Tailings Storage Facility No. 4 extract co-mingled groundwater and tailings seepage. The primary target for completion of these wells is the Gila Conglomerate and Dacite unit. Available information from the Peak Well field indicate that Gila Conglomerate and underlying Dacite unit are highly permeable and transmissivity in the well field area with yields of up to 1,100 gallons per minute reported for individual wells (SRK Consulting, Inc. 2019b).

Groundwater occurs in relatively thin alluvial deposits that veneer bedrock along stream channels and associated floodplain along sections of Pinto Creek and tributaries to Pinto Creek. Groundwater in alluvium is stored and transmitted through interconnected pores in the granular deposits. The thickness of the deposits is estimated to range from 0 to 10 feet where the stream channel is narrow and controlled by crystalline bedrock up to an estimated 80 to 100 feet where the channel widens at the confluence of major tributaries. The shallow alluvial groundwater system is assumed to be hydraulically connected to the deeper bedrock groundwater flow system, although the hydraulic connection to the underlying bedrock aquifer has not been specifically defined (SRK Consulting, Inc. 2019b).

Groundwater extraction for the Pinto Valley Mine occurs through pumping from selected production wells within the Peak Well field, and pumping of water collected in sumps excavated into the floor of the Open Pit. The Peak Well field extends northwest of Tailings Storage Facility No. 4 and includes production wells on the east and west sides of Pinto Creek, and two additional wells (Peak Wells 26 and 29) northwest of Tailings Storage Facility No. 3 located east of Pinto Creek (map 3-28 in appendix A). A major source of groundwater captured by the Peak Well field (estimated 40 to 60 percent) is artificial recharge from Tailings Storage Facility No. 4 (SRK Consulting, Inc. 2019b). Pumping rates for the well field range from 2,000 to 4,000 gallons per minute and averaged 2,980 gallons per minute for the 2013–2018 period (SRK Consulting, Inc. 2019b). The total averaged pumping rate reported for January through February 2019 was 3,297 gallons per minute. Groundwater inflows into the Pinto Valley Mine Open Pit historically ranged from 200 to 300 gallons per minute during mining. Two water supply wells (TW-2, BMW 32) associated with the Carlota Mine are adjacent to Pinto Creek west of the Pinto Valley Mine. The estimated total pumping rate for the two Carlota Mine water wells is 343 gallons per minute for the 2013–2017 period. The Carlota Mine has one open pit (Cactus-Carlota Open Pit) that extends below the regional groundwater table. The estimated average groundwater inflow into the Cactus-Carlota Open Pit is less than 50 gallons per minute.

A groundwater elevation contour map for the Pinto Creek watershed was developed based on measured water levels in available wells and the surface elevation of spring and stream sites with observed surface water recorded in June 2018 (map 3-29 in appendix A). The groundwater elevation contours indicate that the groundwater flow generally mimics the topography with flow from higher to lower elevations and from the southern to northern perimeters of the watershed. The groundwater contours also indicate that the predominant flow pattern in the area adjacent to and north of the mine in the watershed is toward Pinto Creek and Campaign Creek. The groundwater contours indicate that the groundwater flow pattern is disrupted by the pit dewatering because all groundwater flow in the area surrounding the pit is toward the pit.

Average inflow and outflow from the groundwater system were estimated to establish a baseline, quasi-steady-state water balance for the hydrologic study area. The estimated average annual quasi-steady-state (2011–2012 period) groundwater budget is presented in table 3-123. The quasi-steady-state period extends from January 2011 through December 2012 and corresponds to a “care and maintenance period” for the Pinto Valley Mine when mining operations were essentially shut down (SRK Consulting, Inc. 2019b). The phrase “quasi-steady-state” is used to acknowledge that the groundwater levels and baseflow may not represent a true steady-state condition because of the effects of historical mining-related impacts on groundwater levels and stream flow. Existing groundwater inflow components include precipitation recharge, artificial recharge (draindown from mine facilities), and surface and subsurface flow (stream recharge to the groundwater system). Groundwater outflow components include evapotranspiration from phreatophytes, evaporation and pumping from pit lakes (Pinto Valley Mine Pit, and Cactus Carlota Pit), groundwater pumping from existing Pinto Valley Mine and Carlota Mine operations, discharge to streams and springs, and subsurface outflow to adjacent areas outside the hydrologic study area (deep groundwater leaving the system along the northern boundary of the Pinto Creek watershed).

Table 3-123. Estimated annual groundwater budget for the hydrologic study area (quasi-steady state[115])

Budget Component	Gallons per Minute
Groundwater Inflow	
Precipitation Recharge	3,900
Artificial Recharge	2,250
Surface and Subsurface Inflow	400
Groundwater Inflows	0
Transfer to Haunted Canyon (returned to groundwater)	0
Total Inflow	**6,550**
Groundwater Outflow	
Evapotranspiration	3,000
Evaporation and pumping from pit lakes	150
Pinto Valley Mine Wells Pumping	10
Carlota Wells Pumping	500
Discharge to Surface Waters (Pinto Creek, springs)	2,500
Subsurface Outflow	100
Depleted storage due to long term historic pumping	290
Total Outflow	**6,550**

Source: SRK Consulting, Inc. 2019b

3.21.3.2 Surface Water Quantity

Major tributaries to Pinto Creek include the West Fork of Pinto Creek, Horrell Creek, and Campaign Creek in the Lower Pinto Creek drainage area (map 3-24 in appendix A). Other tributaries in the vicinity of the Pinto Valley Mine and adjacent Carlota Mine include Gold Gulch, Miller Gulch, Eastwater Canyon, Powers Gulch, and Haunted Canyon.

Pinto Creek is predominantly intermittent, although there are several perennial and ephemeral reaches (see appendix E, section 2.3.1, “Streams”). Pinto Creek is a dynamic creek and flows can vary from year to year and season to season based on flows into Pinto Creek, precipitation, drought conditions, climate, and other factors. As such, there may be variations in stream flow characteristics over time. Riparian conditions along Pinto Creek within the analysis area are described in section 3.3.3.1, “Vegetation.” Surface water flows in the Pinto Creek watershed are monitored by three U.S. Geological Survey gaging stations located along Pinto Creek (map 3-24):

- Pinto Creek above Haunted Canyon (U.S. Geological Survey Station 094985005)
- Pinto Creek below Haunted Canyon (U.S. Geological Survey Station 09498501)
- Pinto Creek near Miami, Arizona (U.S. Geological Survey Station 09498502)

Pinto Creek near Miami, Arizona (also known as the Magma Weir) downstream from Pinto Valley Mine has the longest monitoring period of record (October 1994 through present). The quality of automated stream flow records at the U.S. Geological Survey stations along Pinto Creek has varied since 2003 as discussed in appendix E, “Water Resources and Geochemistry Technical Report.”

A hydrologic modeling study of the Pinto Creek watershed was conducted to evaluate the surface flows and baseflow at the Magma Weir gaging station. The Australian Water Balance Model (BGC Engineering USA, Inc. 2019b) used Parameter-elevation Regressions on Independent Slopes Model precipitation and evapotranspiration as inputs for the watershed and was calibrated to flow conditions measured at

[115] 2011–2012 time period.

Magma Weir for the 1998–2006 period. This calibration period was selected because mining was shut down, and there was limited pumping at Pinto Valley Mine and no pumping activity at the Carlota Mine. The calibrated model was then applied to simulate flows at the Magma Weir for the 2007 to 2016 period. Statistical analysis indicated a deterioration in model fit for the simulated periods; that is, the predicted flows from the calibrated model no longer reflected the actual flows on the stream as they did during the calibration period. The period of the deterioration in model fit correlates with the initiation of high rates of pumping from the Peak Well field beginning in 2013 and continuing through 2016. Pumping rates for the Peak Well field during this period ranged from 2,000 to 4,000 gallons per minute (4.46 to 8.91 cubic feet per second). The Carlota Copper Mine also pumped an average of 343 gallons per minute over the 2013 to 2017 period. Approximately 40 percent of Carlota's average annual pumping was discharged to the alluvial aquifer in Haunted Canyon as artificial recharge (SRK Consulting, Inc. 2019b).

A seep and spring survey was conducted in May and June of 2018 to inventory springs and seeps in the region around the mine that may be affected by future mine-related groundwater pumping activities (AJAX, Ltd. 2018). Results from the survey identified 78 seep and spring sites (see map 3-25 in Appendix A). Thirty-eight of the sites had reported wet or flowing conditions and the remainder were reported dry (see map 3-25 in Appendix A). The survey occurred during an extreme drought period (National Weather Service 2018) and rainfall was between 25 percent and 50 percent of normal for the 2018 water year to date. Wet or flowing seeps and springs identified in the survey are considered perennial water sources because the wet or flowing conditions were observed during a period of extreme drought and therefore the flows would not likely have been influenced by recent rainfall.

Available information on the inventoried springs and seep sites is summarized in table A-1 in attachment A to appendix E. The field inventory included measurements of electrical conductance of the water at the identified wet and flowing springs and seeps. Three of the spring sites (SP47, SP53, and SP77) had anomalously high electrical conductivity measurements (greater than 1,500 micro-Seimens). These three sites are located in the vicinity and downgradient of unlined tailings facilities. The site locations and high electrical conductivity suggest that the discharge in these two springs is fed by seepage from the tailings facilities (SRK Consulting, Inc. 2019b).

The Pinto Valley Mine complex and the Pinto Creek watershed are in an area described as zone D, or an undetermined risk area, for flood hazards. These are areas where flood hazards are undetermined, but flooding is possible (Federal Emergency Management Agency 2017).

At the Pinto Valley Mine site, the topography has been altered in support of the storm water and seepage management system (table 3-124). Most of the site is maintained as a non-discharging area where storm water runoff is contained within impoundments and water containment systems (map 3-27 in appendix A). These systems are designed and managed to contain the 100-year, 24-hour storm event. Discharge from the Pinto Valley Mine facilities occurs only at monitored discharge points.

Table 3-124. Storm water basins and surface water monitoring at Pinto Valley Mine

Basin Name	Discharging Basin	Pinto Valley Mining Corp. Storm Water Features on National Forest System Lands	Arizona Pollutant Discharge Elimination System Compliance Monitoring Locations	Storm Water Monitoring Locations
Eastwater Canyon Basin	--	✓	--	--
North Basin	✓	--	--	--
West Basin	✓	✓	--	SW-WB3, MG-5b
Miller Gulch Basin	✓	✓	MPO-1b	--
Carlota Basin	✓	--	--	--

Basin Name	Discharging Basin	Pinto Valley Mining Corp. Storm Water Features on National Forest System Lands	Arizona Pollutant Discharge Elimination System Compliance Monitoring Locations	Storm Water Monitoring Locations
Lower Cottonwood Canyon Basin	✓	✓	Outfall PV004, MG2-8b	SW-LCC1
Cottonwood South Basin	✓	✓	Outfall PV005	--
East Basin	--	--	--	--
Baker sub-Basin	--	--	--	--
Cottonwood Reservoir Basin	--	✓	--	--
Gold Gulch Basin	--	--	MG1-12b (also an Aquifer Protection Permit compliance point)	--
Gold Gulch Basin	--	--	--	--
No. 1-2 Tailings Basin	--	✓	--	--
No. 1 Tailings Basin	--	✓	--	--
Tailings Storage Facility No. 1 Seepage Sub-Basin	--	--	Outfall PV002	--
No. 3 Tailings Basin	--	--	Outfall PV003	--
No. 4 Tailings Basin	--	✓	--	--
North Mill Basin	--	--	--	--
Pinto Mine Basin	--	✓	--	--
South Mill Basin	--	--	--	--
Tule sub-Basin	--	✓	--	--
Upper Catchment 1&2 Sub-Basin	--	--	--	--

Sources: Capstone Mining Corp. 2016a; Pinto Valley Mining Corp. 2015a
Note: ✓ = "yes" or occurs within basin, -- = "no" or does not occur within basin.

Waters of the United States surveys were conducted for the proposed expansion of the Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 in 2015 and 2017 (WestLand Resources, Inc., 2015a, 2015b, 2017d).[116] A large portion of the study area is located within an area where surface water features and natural topography have been significantly manipulated in support of the storm water and seepage management system at the mine. This area is designated as non-discharging to Pinto Creek and its tributaries, and is shown on map 3-27 in appendix A. Features identified within the non-discharge boundary are not considered jurisdictional by the U.S. Army Corps of Engineers (see appendix E, "Water Resources and Geochemistry Technical Report"). There were 14 ephemeral and intermittent drainages and 2 wetland areas identified within the discharging portion of the study area. Five of the drainage features identified as surface water features 1, 2, 3, 20, and 21 were considered jurisdictional waters (map 3-27 in appendix A) and are located within National Forest System lands. Features 1, 2, and 3 are downgradient extensions of drainage considered previously in Tailings Storage Facility No. 3 and are tributary to Pinto Creek. Feature 20 is also tributary to Pinto Creek and shares a similar downgradient flowpath and distance to Roosevelt Lake as features 1, 2, and 3. Feature 21 is a portion of the mainstem of Pinto Creek. This reach of Pinto Creek is intermittent and flows for more than 3 months of the year.

Pinto Creek was identified as a potentially eligible scenic river based on the 1993 Potential Wild and Scenic Rivers Designation Report (Forest Service 1993). As part of the Tonto National Forest Plan Revision process, under the direction of the 2012 Planning Rule (36 CFR Part 219), a new wild and scenic rivers eligibility study was conducted for the Tonto National Forest planning area (Forest Service 2017c).

[116] The Navigable Waters Protection Rule was updated in June 2020. Because the waters of the U.S. investigation was performed in 2015, it is possible that the jurisdictional designation of identified features discussed above may not be considered jurisdictional under the 2020 rule.

Pinto Creek was considered but found to be not eligible because it did not meet criteria of being spectacular or not common to other rivers in the region of comparison. Therefore, the Forest is not considering Pinto Creek as a potentially eligible scenic river.

3.21.3.3 **Groundwater and Surface Water Quality**

As part of the Arizona Department of Environmental Quality enforcement authority, they require that the mine operate under the stipulations provided in the Arizona Aquifer Protection Permit; and Arizona Pollutant Discharge Elimination System permit issued for the Pinto Valley Mine. The Aquifer Protection Permit covers the life of the facilities, including operation, closure and post-closure periods pursuant to A.A.C. R18-9-A213. The Aquifer Protection Permit requires that the mine meets the Aquifer Water Quality Standards at the Point(s) of Compliance; and, demonstrates Best Available Demonstrated Control Technology to reduce the discharge of pollutants to the "greatest degree achievable" before they reach the aquifer, or to prevent pollutants from reaching the aquifer. The Arizona Pollutant Discharge Elimination System permit for the Pinto Valley Mine addresses water quality associated with mine storm water mixed with process water and mine drainage under the National Pollutant Discharge Elimination System program. The Arizona Pollutant Discharge Elimination System for the mine specifies effluent limitations designed to maintain the Water Quality Standards listed in Appendix B, A.A.C. R18-11-101 for designated uses of the receiving water (Pinto Creek). Pinto Creek is not designated for use (protected) as a "Domestic Water Source" (the use of the surface water as a source of potable water). Therefore, regulations and standards under the Safe Drinking Water Act do not apply to Pinto Creek.

Beneficial uses identified for Pinto Creek (Arizona Department of Environmental Quality 2009) in the vicinity of the Pinto Valley Mine are:

- Aquatic and wildlife (warm water)
- Full body contact
- Fish consumption
- Agricultural irrigation
- Agricultural livestock watering

Water quality standards established for the protection of these beneficial uses are listed in table 2-6 in appendix E, "Water Resources and Geochemistry Technical Report."

The Arizona Department of Environmental Quality has classified three segments of Pinto Creek as impaired for copper, or for selenium and copper (Arizona Department of Environmental Quality 2016) (shown on figure 2-3 in appendix E, "Water Resources and Geochemistry Technical Report"); the specific stream segments and impairments include the following (Arizona Department of Environmental Quality 2017b):

- Pinto Creek from the headwaters to the confluence of West Fork Pinto Creek with Pinto Creek: impaired for dissolved copper
- Five Point Tributary from the headwaters of the tributary to the confluence with Pinto Creek: impaired for dissolved copper
- Pinto Creek from the confluence of West Fork Pinto Creek to Roosevelt Lake: impaired for total selenium and dissolved copper

The Gibson Mine has been the largest source of copper to Pinto Creek, and remediation projects completed at the mine since 2007 have reduced the dissolved copper concentrations by 85 percent

(Arizona Department of Environmental Quality 2017b). Refer to appendix E, “Water Resources and Geochemistry Technical Report,” for more information on impaired segments of Pinto Creek.

Three permits set compliance monitoring requirements for storm water discharge and groundwater quality at points of compliance at the Pinto Valley Mine. Baseline water quality for the mine was reviewed for the 2014–2016 period. This three -year period (2014-2016) was selected based on the recent data available data at the time the Pinto Valley Mine EIS process was initiated in early 2017. Surface water quality summaries are provided in appendix E, table B-1. Parameters that have exceeded permit requirements (once or more for the period) for surface water quality include dissolved selenium and total selenium (see table B-1 in appendix E, “Water Resources and Geochemistry Technical Report”). Average annual data for parameters with one or more points that exceeded permit requirements are shown in table 3-125. Average annual levels for dissolved selenium exceeded the Arizona Water Quality Standards in 2014 and 2015 for MG1-12b and in 2014 for MPO-1b. Average annual levels for total selenium did not exceed the permit requirement.

The Arizona Pollutant Discharge Elimination System permit also requires that total dissolved solids, dissolved sulfate, and total sulfate be monitored and reported. However, there are no surface water quality standards (or exceedance limits) assigned to these parameters in the Arizona Pollutant Discharge Elimination System permit.

Groundwater quality summaries are provided in table C-1 in appendix E, “Water Resources and Geochemistry Technical Report.” Average annual data for parameters with one or more points that exceeded permit requirements under the Aquifer Protection Permit are shown in table 3-125. The parameters of concern at Pinto Valley Mine that were reported as exceeding the Aquifer Protection Permit requirements were total dissolved solids (alert level), sulfate (alert level), and gross alpha (aquifer quality limit). The alert levels for total dissolved solids and sulfate were removed in the fourth quarter of 2015. Total dissolved solids and sulfate are currently designated in the compliance permit as “monitor only.” Monitoring wells located downgradient from Tailings Storage Facility Nos. 1 and 2, Tailings Storage Facility No. 3, and Tailings Storage Facility No. 4 have high concentrations of total dissolved solids and sulfate that exceed the non-enforceable National Secondary maximum contaminant levels (table 3-126 and map 3-30 in appendix A). Results from APP-3A and APP-3B for gross alpha (total and dissolved) exceeded the aquifer quality limit of 15 picocuries per liter consistently from the first quarter of 2014 through the third quarter of 2015. In the fourth quarter of 2015, the aquifer quality limit was removed from the permit. The requirement for gross alpha (total and dissolved) from the fourth quarter of 2015 through present is “monitor only.” It should be noted that gross adjusted alpha 6 for APP-3A and APP-3B was found to be below the aquifer quality limit of 15 picocuries per liter from first quarter 2014 through fourth quarter 2016.

Table 3-125. Average Arizona Pollutant Discharge Elimination System data for selected parameters: 2014–2016 at Pinto Valley Mine

Arizona Pollutant Discharge Elimination System Monitoring Station and Year	Chromium, Total Recoverable (milligrams per liter) (Arizona Surface Water Quality Discharge Standards 0.1 milligram per liter)[117]	Selenium, Dissolved (milligrams per liter) (Arizona Surface Water Quality Discharge Standards 0.002 milligram per liter)	Selenium, Total Recoverable (milligrams per liter) (Arizona Surface Water Quality Discharge Standards 0.002 milligram per liter)	Sulfate, Total (milligrams per liter) (Secondary Maximum Contaminant Level 250 milligrams per liter)	Sulfate, Dissolved (milligrams per liter) (Secondary Maximum Contaminant Level 250 milligrams per liter)	Total Dissolved Solids (milligrams per liter) (Arizona Surface Water Quality Discharge Standards Monitor only, Secondary Maximum Contaminant Level 500 milligrams per liter)
APP - Spring Gold Gulch (MG1-12b)						
Average 2014	0.0030	0.0028	0.0009	-	1,850	2,925
Average 2015	0.0018	0.0022	0.0017	-	1,810	2,835
Average 2016	0.0030	0.0014	0.0007	-	1,910	3,108
Average 2014–2016	**0.0027**	**0.0019**	**0.0010**	-	**1,870**	**2,994**
MG2-8b						
Average 2014	0.0030	0.0019	0.0006	1,790	-	2,830
Average 2015	0.0018	0.0014	0.0008	1,630	-	2,650
Average 2016	0.0030	0.0005	0.0005	1,765	-	2,995
Average 2014–2016	**0.0026**	**0.0013**	**0.0006**	**1,728**	-	**2,825**
MPO-1b						
Average 2014	0.0030	0.0025	0.0006	1,815	-	2,855
Average 2015	0.0024	0.0020	0.0006	1,805	-	2,965
Average 2016	0.0030	0.0013	0.0008	1,715	-	2,835
Average 2014–2016	**0.0028**	**0.0019**	**0.0007**	**1,778**	-	**2,885**
Arizona Pollutant Discharge Elimination System Outfall PV005						
Average 2014	0.0078	-	0.0006	-	-	-
Average 2015	0.0072	-	0.0005	-	-	2,090
Average 2016	0.0064	-	0.0005	-	-	2,123
Average 2014–2016	**0.0071**	-	**0.0005**	-	-	**2,115**

Sources: Pinto Valley Mining Corp. 2015a, 2016c, 2017b; Arizona Department of Environmental Quality 2019a
Federal secondary maximum contaminant levels for sulfate and total dissolved solids are provided for reference (Arizona does not have enforceable secondary standards for these constituents).

[117] PV005 reported a total chromium result higher than the limit of 0.008 milligram per liter in quarter 1 of 2014 (0.0081 milligram per liter on 2-4-14). According to the Arizona Pollutant Discharge Elimination System permit, if total chromium exceeds 0.008 milligram per liter, Pinto Valley Mining Corp. must sample for chromium VI for the remainder of the permit. Averages were calculated using half detection limit for non-detected parameters.

Table 3-126. Average Aquifer Protection Permit data for select parameters: 2014–2016 at Pinto Valley Mine

Aquifer Protection Permit Monitoring Station, Year	Total Dissolved Solids (milligrams per liter) (Secondary Maximum Contaminant Level 500 milligrams per liter)	Sulfate, Dissolved (milligrams per liter) (Secondary Maximum Contaminant Level 250 milligrams per liter)	Gross Alpha, Total (picocuries per liter) (Aquifer Protection Permit aquifer quality limit=15 picocuries per liter)
Aquifer Protection Permit - Spring Gold Gulch (MG1-12b)	***Alert level for total dissolved solids = 3,402 milligrams per liter***	***Alert level for sulfate = 2,225 milligrams per liter***	-
Average 2014	2,925	1,850	-
Average 2015	2,835	1,810	-
Average 2016	3,108	1,910	4
Average 2014–2016	**2,994**	**1,870**	**4**
APP - Spring North Draw 1	***No alert level***	***No alert level***	-
Average 2014	592	199	-
Average 2015	1,460	708	-
Average 2016	542	152	-
Average 2014–2016	**865**	**353**	-
APP-1A	***Alert level for total dissolved solids = 2,586 milligrams per liter***	***Alert level for sulfate = 1,579 milligrams per liter***	-
Average 2014	2,433	1,523	3
Average 2015	2,383	1,508	-
Average 2016	2,445	1,490	5
Average 2014–2016	**2,420**	**1,507**	**4**
APP-1BR	***Alert level for total dissolved solids = 797 milligrams per liter***	***Alert level for sulfate = 304 milligrams per liter***	-
Average 2014	1,016	480	5
Average 2015	1,126	572	-
Average 2016	1,283	679	5
Average 2014–2016	**1,111**	**554**	**5**
APP-2	***Alert level for total dissolved solids = 1,923 milligrams per liter***	***Alert level for sulfate = 1,162 milligrams per liter***	-
Average 2014	1,019	573	1
Average 2015	974	524	-
Average 2016	1,006	556	5
Average 2014–2016	**1,002**	**553**	**3**

Aquifer Protection Permit Monitoring Station, Year	Total Dissolved Solids (milligrams per liter) (Secondary Maximum Contaminant Level 500 milligrams per liter)	Sulfate, Dissolved (milligrams per liter) (Secondary Maximum Contaminant Level 250 milligrams per liter)	Gross Alpha, Total (picocuries per liter) (Aquifer Protection Permit aquifer quality limit=15 picocuries per liter)
APP-3A	***Alert level for total dissolved solids = 2,300 milligrams per liter***	***Alert level for sulfate = 1,316 milligrams per liter***	-
Average 2014	1,985	1,265	69
Average 2015	2,148	1,334	64
Average 2016	2,145	1,295	76
Average 2014–2016	**2,093**	**1,301**	**68**
APP-3B	***Alert level for total dissolved solids = 414 milligrams per liter***	***Alert level for sulfate = 56 milligrams per liter***	-
Average 2014	371	49	43
Average 2015	376	46	50
Average 2016	373	46	55
Average 2014–2016	**373**	**47**	**46**
APP-4	***Alert level for total dissolved solids = 2,735 milligrams per liter***	***Alert level for sulfate = 1,663 milligrams per liter***	-
Average 2014	1,410	730	5
Average 2015	1,348	687	-
Average 2016	1,388	719	5
Average 2014–2016	**1,382**	**712**	**5**
APP-5A	***Alert level for total dissolved solids = 2,901 milligrams per liter***	***Alert level for sulfate = 1,783 milligrams per liter***	-
Average 2014	2,440	1,598	6
Average 2015	2,510	1,550	-
Average 2016	2,480	1,543	9
Average 2014–2016	**2,477**	**1,563**	**8**
APP-5B	***Alert level for total dissolved solids = 3,303 milligrams per liter***	***Alert level for sulfate = 1,863 milligrams per liter***	-
Average 2014	2,493	1,618	7
Average 2015	2,518	1,548	-
Average 2016	2,518	1,595	10
Average 2014–2016	**2,509**	**1,587**	**8**

Aquifer Protection Permit Monitoring Station, Year	Total Dissolved Solids (milligrams per liter) (Secondary Maximum Contaminant Level 500 milligrams per liter)	Sulfate, Dissolved (milligrams per liter) (Secondary Maximum Contaminant Level 250 milligrams per liter)	Gross Alpha, Total (picocuries per liter) (Aquifer Protection Permit aquifer quality limit=15 picocuries per liter)
APP-6	***Alert level for total dissolved solids = 380 milligrams per liter***	***Alert level for sulfate = 6.8 milligrams per liter***	**-**
Average 2014	328	5.5	14
Average 2015	333	5.5	-
Average 2016	334	5.7	16
Average 2014–2016	**332**	**5.6**	**15**
APP-7	***Alert level for total dissolved solids = 776 milligrams per liter***	***Alert level for sulfate = 190 milligrams per liter***	**-**
Average 2014	1,208	177	11
Average 2015	1,336	181	-
Average 2016	1,278	176	12
Average 2014–2016	**1,262**	**178**	**12**

Sources: Pinto Valley Mining Corp. 2015b, 2016c, 2017a
Federal secondary maximum contaminant levels provided for reference (Arizona does not have enforceable secondary standards).
Alert level for total dissolved solids and sulfate (D, T) are specific to compliance point.
Averages calculated using 1/2 detection limit for non-detected parameters.

3.21.3.3.1 Rock Geochemistry

This section provides a summary of rock geochemistry and characteristics at the Pinto Valley Mine. The natural characteristics of the rocks, such as the percentages of acid-neutralizing and acid-generating minerals and the results geochemical laboratory test work, are used to predict short- and long-term geochemical behavior and seepage chemistry of the mine waste materials after contact with oxygen and precipitation. Refer to appendix E, “Water Resources and Geochemistry Technical Report,” for additional information on rock geochemistry.

Sampling and Testing. Mine rock and tailings have been collected and geochemically analyzed at the Pinto Valley Mine beginning in 1995 and continuing through 2016. Sampling has been conducted at several major facilities associated with the Pinto Valley Mine site, as well as some locations not specifically identified as discrete facilities. The results of the sampling and geochemical testing were used to define the rock geochemistry of the existing site conditions.

Historical waste rock, tailings, and Leach Pile rock have been submitted for various geochemical bulk characterization tests. Standard geochemical analyses of mine rock and tailings have included acid-base accounting; meteoric water mobility procedure and synthetic precipitation leaching procedure; whole rock analysis; net acid generating leachate; and kinetic humidity cell testing. Representative samples were taken of tailings and waste rock materials for the proposed action mine life and were tested for 53 weeks and 61 weeks, respectively, using humidity cell testing.

Geochemical Characterization. Using acid-base accounting test results, mine materials may be classified as potentially acid generating, or not potentially acid generating. Using the Arizona Best Available Demonstrated Control Technology criteria, 65 percent of waste rock is not potentially acid generating, 29 percent is likely to generate acid rock drainage, and 6 percent is uncertain. For tailings, 17 percent is not potentially acid generating, 69 percent is likely to generate acid rock drainage, and 14 percent is uncertain. Materials classified as likely to produce acid rock drainage are dominated by most tailings samples and quartz monzonite (Ruin Granite), with some diabase. Quartz monzonite is the dominant waste rock material for the proposed action. Not potentially acid generating material samples are dominated by altered limestone and Gila Conglomerate. These materials have abundant calcium carbonate and very little, or no, sulfide mineralization.

Humidity cell testing work on historical Pinto Valley Mine rock indicates that quartz monzonite and diabase have a potential to produce acid rock drainage. Two samples of historical tailings have been characterized using humidity cell testing. Although neither sample produced acidic leachate during the test, acid-base accounting characterization of the samples and depletion rates of neutralization potential and acid potential indicate they are likely to ultimately produce acid rock drainage.

As described in section 3.9, “Geology, Minerals, and Geotechnical Stability,” and depicted on map 3-7 in appendix A, Apache Leap Tuff (dacite) occurs in and around the Pinto Valley Mine. Based on acid-based accounting and test work in and around the Pinto Valley Mine, Apache Leap Tuff is an inert, acid-neutralizing formation that has the potential to neutralize acidic seepage (SRK Consulting, Inc. 2021b). While Apache Leap Tuff possesses acid-neutralizing characteristics, it is generally a hard material in which water flow is typically confined to fractures.

Regardless of the results of acid-base accounting and humidity cell testing analyses, the discharge of acid rock drainage in the field is closely linked to the water balance of mine rock. Even if sulfide mineral oxidation reactions occur to produce the chemical ingredients of acid rock drainage, there must be sufficient water to dissolve and mobilize these constituents. Alternatively, as with tailings, reactive sulfide grains can be, and are to a variable extent, encapsulated in unreactive minerals (such as quartz) that can significantly slow the release of acid rock drainage chemical constituents. This delays the onset of acid rock drainage from tailings that may have acid-base accounting results that indicate likely acid formation.

Existing Facilities. The water entrained in tailings storage facilities is a neutral pH solution with high concentrations of sulfate and other chemical constituents such as calcium and magnesium. The neutral pH inhibits any elevated concentrations of metals. Monitoring wells immediately downgradient from the tailings storage facilities reflect the high-sulfate water quality within the tailings storage facilities.

The Leach Pile currently discharges acidic leachate ("pregnant leach solution") as part of the engineered recovery of copper. The solutions did not form their acidic character through the natural weathering of the rock but from the addition of sulfuric acid and physical crushing, which exposes mineral grains to natural oxidation. Material in the leach dump facilities is classified as likely to produce acid rock drainage.

Most of the leachate generated from the Leach Pile is recovered and processed for copper. However, the facility is unlined and a small percentage (less than 5 percent) of the current total pregnant leach solution is assumed to seep into groundwater directly beneath the footprint of the facility (SRK Consulting, Inc. 2019b). An estimated 60 percent of this seepage to groundwater is captured within the drawdown cone associated with active pit dewatering that is known as the Active Containment Capture Zone (SRK Consulting, Inc. 2019b). The seepage from the Leach Pile contained within the capture zone discharges into the pit through fracture flow and as seepage in the pit wall (SRK Consulting, Inc. 2019b). The remaining 40 percent of the seepage from the Leach Pile that enters into the groundwater system (that is not captured by the lined process ponds and process pump-back system) located outside this capture zone would flow toward Pinto Creek (SRK Consulting, Inc. 2016c, 2019b). Water quality sampling and analyses from the groundwater monitoring well located downgradient and west of the facility in Gold Gulch APP-7 (between the Leach Piles and Pinto Creek) has not indicated the presence of low pH or elevated metal concentration (appendix E, table C-4). SRK Consulting, Inc. (2016c) estimates that seepage that infiltrates and mixes with groundwater and flows toward Pinto Creek will have an estimated travel time ranging from greater than 100 years to 500 years based on the low permeability of the bedrock and distance to Pinto Creek. SRK Consulting, Inc. (2016c) also notes that "Facility-specific closure plans will address the post-closure mine water management and potential draindown toward Pinto Creek."

Discharges of acid rock drainage or metal-bearing solutions from waste rock are controlled by best management practices under Pinto Valley Mining Corp.'s Aquifer Protection Permit and have not been detected in surface water or groundwater monitoring proximal to waste rock facilities. Refer to appendix E, "Water Resources and Geochemistry Technical Report," tables B-1 and C-1 for additional information. In addition, as discussed above, the Apache Leap Tuff geologic unit possess acid-neutralizing characteristics that has the potential to neutralize acidic seepage (SRK Consulting, Inc. 2021b).

3.21.3.4 **Water Rights**

An inventory of certificated water rights that occur within the region surrounding the Pinto Valley Mine was prepared for the project (WestLand Resources, Inc. 2018d) (map 3-31 in appendix A). The surface water right inventory identified 24 water rights that include 18 owned by the Tonto National Forest, 3 owned by Havens Ranch, and 3 owned by Cyprus Miami Mining Corp. All of the water rights except one (described below) were established as a source of water for stock or stock and wildlife. Water rights in Arizona are managed by the Arizona Department of Water Resources.

The Tonto National Forest has an instream flow right for waters flowing in Pinto Creek for recreation and wildlife, including fish, under Certificate No. 33-89109. The priority date for this water right is December 14, 1983 (Arizona Department of Water Resources 1999). The water right is limited to 1,794.2 acre-feet per year (approximately 2.48 cubic feet per second on an annual basis) measured at the Pinto Creek near Miami, Arizona station. The amount of the water right is based on a detailed study from 1991 of the volume of water necessary to maintain vegetation from April to October and sustain baseflows for fish year-round (Forest Service 1991). Instream flow requirements vary by month as specified in Certificate No. 33-89109.

Table 3-127 shows a comparison of actual flow volume at the Pinto Creek near Miami, AZ (09498502) gauge to the flow volume specified in Certificate No. 33-89109. There are many months throughout the record where monthly or annual volume is less than the volume specified in the permit. While there are times throughout the record where monthly or annual volume is less than the volume specified in the certificate, in recent years, the number of consecutive months recording zero flow has increased. There were no months recording zero flow in the period of record until 2014, and 26 months recording zero flow between January 2014 and December 2018.[118]

There are no water rights for individual or community users located in areas that are adjacent to and downgradient of the Pinto Valley Mine.

As described in section 3.21.1, “Relevant Laws, Regulations, and Policy,” the Arizona Department of Water Resources has jurisdiction over administering water rights in Arizona. In response to ongoing concerns by the Tonto National Forest and comments received on the draft EIS regarding impacts on the instream flow right on Pinto Creek, the Tonto National Forest submitted a request for determination of appropriability for Pinto Valley Mine Corp.’s wells in May 2020. In September 2020, the Arizona Department of Water Resources replied that it would not consider the Tonto National Forest’s request at this time.

[118]Gauge data from the Magma Weir gauge are generally considered to be fair (Rantz 1982). There were three years of poor estimated daily records (2008 to 2010), four years of good estimated daily records (2003 to 2005 and 2011) and no records available for water year 2017 because funding for operation of the gauge was not available. Refer to section 2.3.1, “Streams.” in appendix E, “Water Resources and Geochemistry Technical Report,” for additional information on data quality at the Magma Weir gauge.

Table 3-127. Recorded flow volume at Pinto Creek near Miami, AZ (U.S. Geological Survey 09498502) compared to the flow volumes specified in the Tonto National Forest instream flow water right (permit 33-89109) (acre-feet)

Calendar Year	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume (acre-feet per year)
Monthly Flow Volumes Specified in the Pinto Creek Instream Flow Right Permit No. 33-89109 (Acre-Feet)													
	116.8	**127.7**	**215.2**	**208.2**	**341.2**	**166.6**	**153.7**	**126**	**95.2**	**86.1**	**71.4**	**86.1**	**1,794.2**
Recorded Monthly Flow Volumes at Pinto Creek Monitoring Gauge (Acre-Feet)													
1999	39	42	61	73	108	92	134	172	202	108	115	125	1,271
2000	120	118	213	143	138	126	113	1,020	82	797	1,550	191	4,611
2001	210	800	1,600	1,500	303	202	262	192	212	140	123	101	5,645
2002	95	107	145	135	121	96	73	46	54	53	53	54	1,032
2003	58	2,670	696	183	192	132	115	188	94	54	57	61	4,500
2004	62	68	1,850	162	166	122	90	75	65	60	63	830	3,613
2005	10,560	23,310	2,560	594	369	303	261	332	179	144	122	129	38,863
2006	112	97	152	155	135	105	207	276	89	56	56	63	1,503
2007	57	62	93	83	189	68	194	208	48	39	48	5,080	6,169
2008	14,210	3,010	756	365	269	231	208	158	207	109	82	2,500	22,105
2009	442	2,440	406	292	212	234	149	92	66	48	38	120	4,539
2010	15,520	5,250	5,130	801	402	282	251	206	158	128	95	215	28,438
2011	130	139	140	190	252	178	165	119	130	98	110	529	2,180
2012	165	159	177	162	130	117	93	386	88	84	97	470	2,128
2013	2,270	338	812	210	191	114	96	52	38	14	10.3	1.21	4,147
2014	0	0	235	14.8	0	0	0	214	16.6	1.25	0	0	482
2015	223	20.6	0	0	0	0	0	0	0	0	0	0	244
2016	3,827	97.1	68.3	45.1	33.8	18.6	56.1	137	4.58	25.2	11.1	0	4,324
2017	No Data								614	12.68	11.03	No Data	---
2018	0	0	0	0	0	0	16.2	96.6	53.8	60.3	0	0	227

Source: U.S. Geological Survey 2019b, 2019c.

Note: Values in highlighted cells are less than the monthly or annual volume in acre-feet specified in Arizona Water Rights Certificate No. 33-89109

3.21.4 Environmental Consequences

3.21.4.1 **Analysis Methodology and Assumptions**

Groundwater Modeling. A calibrated three-dimensional numerical groundwater flow model was developed for the EIS to estimate effects on groundwater and surface water resources resulting from groundwater extraction and water management activities that would occur under the no-action alternative, alternative 1, proposed action, and cumulative scenarios (SRK Consulting, Inc. 2019b, 2020a). The groundwater model domain encompasses the entire hydrologic study area (approximately 200 square miles). The model was calibrated to both a quasi-steady-state and transient conditions. The quasi-steady-state period extends from January 2011 through December 2012 and corresponds to a “care and maintenance period” for the Pinto Valley Mine, when groundwater was only minimally pumped. The transient period for model calibration was defined as the period extending from January 2013 through December 2018. The transient period corresponds to the period when full mine operations were resumed and continued without interruption. The calibrated numerical model was used to evaluate or estimate: (1) areal extent, magnitude, and timing of drawdown and recovery of groundwater levels through the mining and post-mining periods; (2) changes in baseflow to Pinto Creek; and (3) development of the post-mining pit lake including groundwater inflow and outflow rates through the pit, and final surface water elevations of the pit lake.

The model was calibrated to measured groundwater levels, water supply pumping rates, estimates of groundwater baseflow discharge rates to Pinto Creek, and pit inflow estimates. Simulations for quasi-steady-state and transient period were based on actual average monthly pumping rates. Simulation of future conditions through the life of mine under the no-action alternative and proposed action scenarios assumed that pumping would continue at a constant rate based on the average rate measured for the January through February 2019 period (3,247 gallons per minute), and that the Carlota Mine would pump at an average annual pumping rate of 290 gallons per minute from 2019 through 2024 (SRK Consulting, Inc. 2019b). If the actual pumping rates vary from these assumed rates, the model simulations would likely change. Details regarding the conceptual hydrogeologic model, modeling approach and setup, quasi-steady-state and transient calibrations, and simulations are presented in the “Pinto Valley Mine Groundwater Modeling for Mine Extension (Revised)” (SRK Consulting, Inc. 2019b).

The calibration of groundwater-flow models generally involves reproducing water levels, which can be closely measured, while balancing estimated values for hydraulic conductivity, recharge, and boundary conditions. Hydraulic conductivity is not “measured,” but is estimated from pumping tests in representative aquifer materials. However, the bulk hydraulic conductivity value for an entire unit cannot be determined through a single test and is typically estimated within the range of test values for specific units. Recharge generally cannot be measured, but is estimated within ranges constrained by empirical studies. Boundary conditions are assigned according to industry conventions. Consequently, there is uncertainty in both the hydraulic conductivity values and recharge rates assumed in the numerical model. Another source of uncertainty is potential changes in climate and effects on the long-term average annual precipitation (and therefore recharge) rate over the mining and post-mining period. The groundwater model simulations for the future mining and post-mining conditions predict the relative change that would be anticipated using the historic average annual precipitation patterns. The actual drawdown and baseflow changes would likely change during periods of prolonged drought or climate change.

Evaluation of Impacts on Groundwater Levels. The calibrated groundwater model was used to simulate the groundwater levels and change in groundwater levels and flow rates that have occurred (through

2018) and are projected to occur in the future as a result of mine development and groundwater extraction activities associated with the alternative mining scenarios. The projected changes in groundwater levels represent the difference between the model-simulated groundwater elevations and simulated quasi-steady-state baseline groundwater elevations that existed at the end of 2012 (prior to the reinitiating of mining and groundwater extraction activities at Pinto Valley Mine).

Evaluation of Impacts on Surface Water Resources. The impact assessment identifies and evaluates potential impacts on streams, springs, and seeps located within the maximum extent of the projected 5-foot groundwater drawdown contour. The 5-foot drawdown contour defines the area where the water table would be lowered by 5 feet or more at some point in time during the mining or post-mining period and represents the maximum extent of drawdown impacts under the alternatives. Potential impacts on riparian vegetation resulting from drawdown and baseflow reductions are discussed in section 3.3, "Biological Resources."

Evaluation of Impacts on Pinto Creek Baseflow. As summarized in section 3.21.3, a hydrologic model was developed for Pinto Creek for the Magma Weir gaging station located downstream of the Pinto Valley Mine using the Australian Water Balance Model (BGC Engineering USA, Inc. 2019a). The purpose of the hydrologic modeling effort was to provide an independent evaluation of surface flow and baseflow at the Magma Weir.

SRK Consulting, Inc. developed a calibrated groundwater model for the EIS to estimate effects on groundwater and surface water resources (SRK Consulting, Inc. 2019b). SRK Consulting, Inc. used the results of the Australian Water Balance Model as an indirect calibration target to estimate groundwater discharge at Magma Weir for the 2011 and 2012 (quasi-steady-state) period. The results of the groundwater model calibration for the 2011 and 2012 period indicated that the simulated groundwater discharge to Pinto Creek (1,070 gallons per minute) compared favorably to the average baseflow calculated by the Australian Water Balance Model (1,150 gallons per minute) for the 2011 and 2012 period (SRK Consulting, Inc. 2019a, figure 37). Based on these results, the model-simulated groundwater discharge to Pinto Creek at the Magma Weir (1,070 gallons per minute[119]) for the 2011 and 2012 period was used as a reference for comparison to evaluate the potential changes to the groundwater discharge to Pinto Creek resulting from reactivation of the mine (including groundwater pumping from the Peak Well field) that was initiated in 2013 and assumed to continue through the life of the mine under the no-action alternative, alternative 1, and the proposed action.

Predicted Drawdown and Baseflow Reduction (2013–2018). The groundwater model was used to simulate the changes in groundwater elevations and groundwater discharge rates that occurred after restarting active mining at the Pinto Valley Mine at the beginning of 2013 through the end of 2018. At the end of 2018, the simulated drawdown associated with the Pinto Valley Mine consists of two separate drawdown cones: one associated with the portion of the Peak Well field that extends north-northwest of Tailings Storage Facility No. 4, and the other that consists of drawdown area around the pit and adjacent areas located west of the pit (map 3-32). The model also predicts that mounding (an increase in groundwater levels) would occur beneath Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 and in the Haunted Canyon area. Mounding beneath the Tailings Storage Facility No. 4 facilities results from seepage out of the base of the unlined facility; mounding in Haunted Canyon results from Carlota's mitigation discharges to supplement surface flows. The model results also predict that over the 2013–2018 period, the baseflow to Pinto Creek was substantially reduced from an initial

[119]The 1,070 gallons per minute estimate includes all contributions to groundwater (natural recharge and tailings seepage) and considers various losses such as upstream pumping at the Carlota Mine, inflows to the Pinto Valley Mine Open Pit, and evapotranspiration losses in the Pinto Creek stream channel.

rate of 1,070 gallons per minute (start of 2013) to 188 gallons per minute (end of 2018) (figure 3-18). This represents an 82 percent reduction in baseflow compared to the estimated average baseflow conditions at the Magma Weir at the end of 2012.

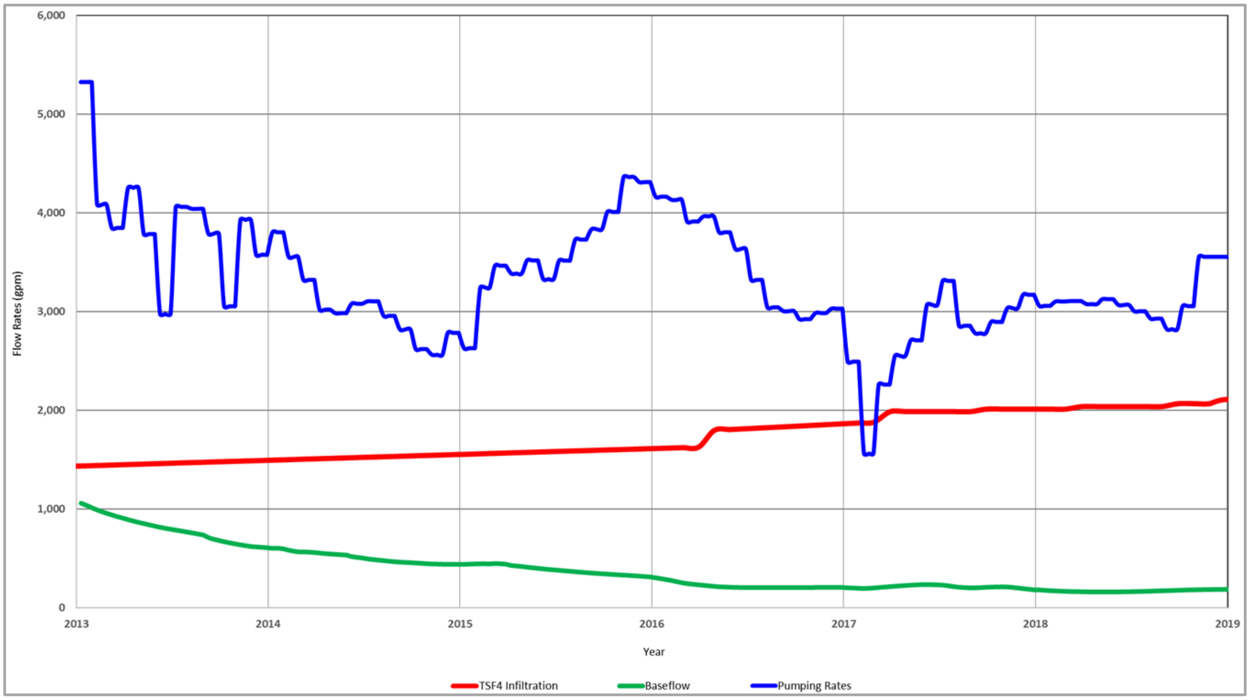


Figure 3-18. Simulated pumping, Tailings Storage Facility No. 4 infiltration, and baseflow at the Magma Weir (2013–2019)

Source: SRK Consulting, Inc. 2019b

Comparison of the average streamflow and number of zero flow days recorded at the Magma Weir before and after the beginning of 2013 show similar trends to those predicted by the groundwater model for baseflow. For example, the average streamflow at the Magma Weir was approximately 10 cubic feet per second during the 1998–2006 period, which was used as a baseline for calibration of the surface water flow model (BGC Engineering USA, Inc. 2019a). After the restarting active mining operations at the Pinto Valley Mine, the average streamflow at the Magma Weir over the 2013–2016 period was reduced to approximately 4.3 cubic feet per second. In addition, the number of days with zero flow increased substantially over the 2013–2016 period. However, the average annual precipitation during the surface water model calibration period of 1998–2006 was 17.8 inches, compared to 19.7 inches for the 2013–2016 period. These results suggest that the reduction in the average streamflow and increase in the number of zero flow days observed over the 2013–2016 period are not attributable to reductions in the annual precipitation (BGC Engineering USA, Inc. 2019a).

Pit Lake Geochemistry Modeling. A hydrochemical evaluation of pit lake water quality was performed for the proposed project (SRK Consulting, Inc. 2019c). In this evaluation, water quality in the pit was estimated from modeling that included the following inputs and reactions: (1) the quality and quantity of groundwater inflow; (2) chemical releases from oxidized wall rock; (3) aqueous geochemical reactions in the pit lake; (4) evaporation from the pit lake surfaces; (5) direct precipitation into the pit lake; (6) runoff from pit walls; and (7) exchange of carbon dioxide between the pit lake and the atmosphere. Details regarding pit lake modeling assumptions and methodology are provided in the pit lake geochemistry modeling report for the proposed project (SRK Consulting, Inc. 2019d).

The Forest Service acknowledges the limited information related to stream flows in Pinto Creek, how stream flows have specifically been affected by historical and ongoing operations at the Pinto Valley Mine, pre-mining baseflow records, groundwater and surface water interactions, and other information. In cases where additional baseline information and monitoring is required to understand mine-related impacts, the Forest Service has included monitoring and mitigation measures in appendix H, “Environmental Protection Measures, Monitoring, and Mitigation,” that provide for a mechanism to collect additional data to inform subsequent adaptive management and mitigation.

Refer to appendix E, “Water Resources and Geochemistry Technical Report,” for additional information on the methods and assumptions used in the groundwater modeling.

3.21.4.2 **No-action Alternative – Direct and Indirect Impacts**

Under the no-action alternative there would be 367 acres of new disturbance on private land, resulting in a total of 4,283 acres of disturbance at the Pinto Valley Mine (3,717 total acres on private land and 566 total acres on National Forest System lands).

Most of the disturbed areas at the Pinto Valley Mine currently fall within the non-discharging boundary located within the Upper Pinto Creek subwatershed. Of the 4,018 acres of surface disturbance in the Upper Pinto Creek subwatershed as a result of the no-action alternative, approximately 3,326 acres of that disturbance would be within the non-discharging boundary. Runoff from the remaining 692-acre disturbance area in the Upper Pinto Creek subwatershed would discharge to Pinto Creek. Under existing conditions, there are 659 acres of disturbance within the discharging area. There would be an increase of surface disturbance within the discharging portion of the Pinto Valley Mine of 33 acres under the no-action alternative. Based on the relatively small increase in surface disturbance compared to the existing conditions, the impacts of surface disturbance under the no-action alternative from the discharging areas at the Pinto Valley Mine on flow quantities monitored at Magma Weir gaging station would likely not be measurable.

3.21.4.2.1 Groundwater Quantity

The predicted changes in groundwater levels under the no-action alternative at the end of mining (2021) and 100 years post-mining are shown on map 3-33 and map 3-34 in appendix A. The predicted changes in groundwater levels under the no-action alternative indicate an increase in the area affected by drawdown as compared to simulated end-of-2018 conditions (map 3-32 in appendix A). The area predicted to experience a reduction in groundwater levels of 5 feet or more is predicted to encompass 15.6 square miles at the end of mining and expand to 35.7 square miles at 100 years post-closure.

The model also predicts that mounding (an increase in groundwater levels) would occur beneath Tailings Storage Facility No. 4 and in the Haunted Canyon area at the end of mining (map 3-33 in appendix A). Mounding beneath the tailings storage facilities results from seepage out of the base of the unlined facility; mounding in Haunted Canyon results from Carlota’s mitigation discharges to supplement surface flows. The mounding beneath Tailings Storage Facility No. 4 is predicted to dissipate prior to the 25-years post-mining timeframe (SRK Consulting, Inc. 2019b).

The maximum areal extent of the 5-foot drawdown contour under the no-action alternative is presented on map 3-35 in appendix A. This map shows the predicted outer limit of the 5-foot drawdown contour as determined by overlaying a series of 5-foot drawdown contours for representative points in time over the 100-year post-mining period (SRK Consulting, Inc. 2020a). The maximum area of drawdown (defined by the 5-foot contour) is a southeast to northwest–oriented elongated area that extends from the southeastern margin to the center of the hydrologic study area.

The numerical groundwater flow model developed for the project was used to predict the rate of recovery and pit lake development for the final Open Pit configuration under the no-action alternative. The model predicted development (or rate of filling) of the pit lake over the post-mining period as illustrated on figure 3-19. The model simulations predict that a pit lake would start to develop in 2022 and reach 95 percent of full recovery within approximately 75 years after closure. The projected area of the final pit lake is shown on map 3-37 in appendix A, and the predicted surface area, volume, groundwater inflow, and evaporation rates at full recovery are summarized in table 3-128.

At full recovery, the pit lake on private land is predicted to have a groundwater inflow rate of 99 gallons per minute (of total inflow rate of 319 gallons per minute from all sources) and evaporation rate of 313 gallons per minute. The pit lake is expected to behave as a strong hydraulic sink (hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater system) (SRK Consulting, Inc. 2020a). The water quality of the predicted pit lake is discussed below.

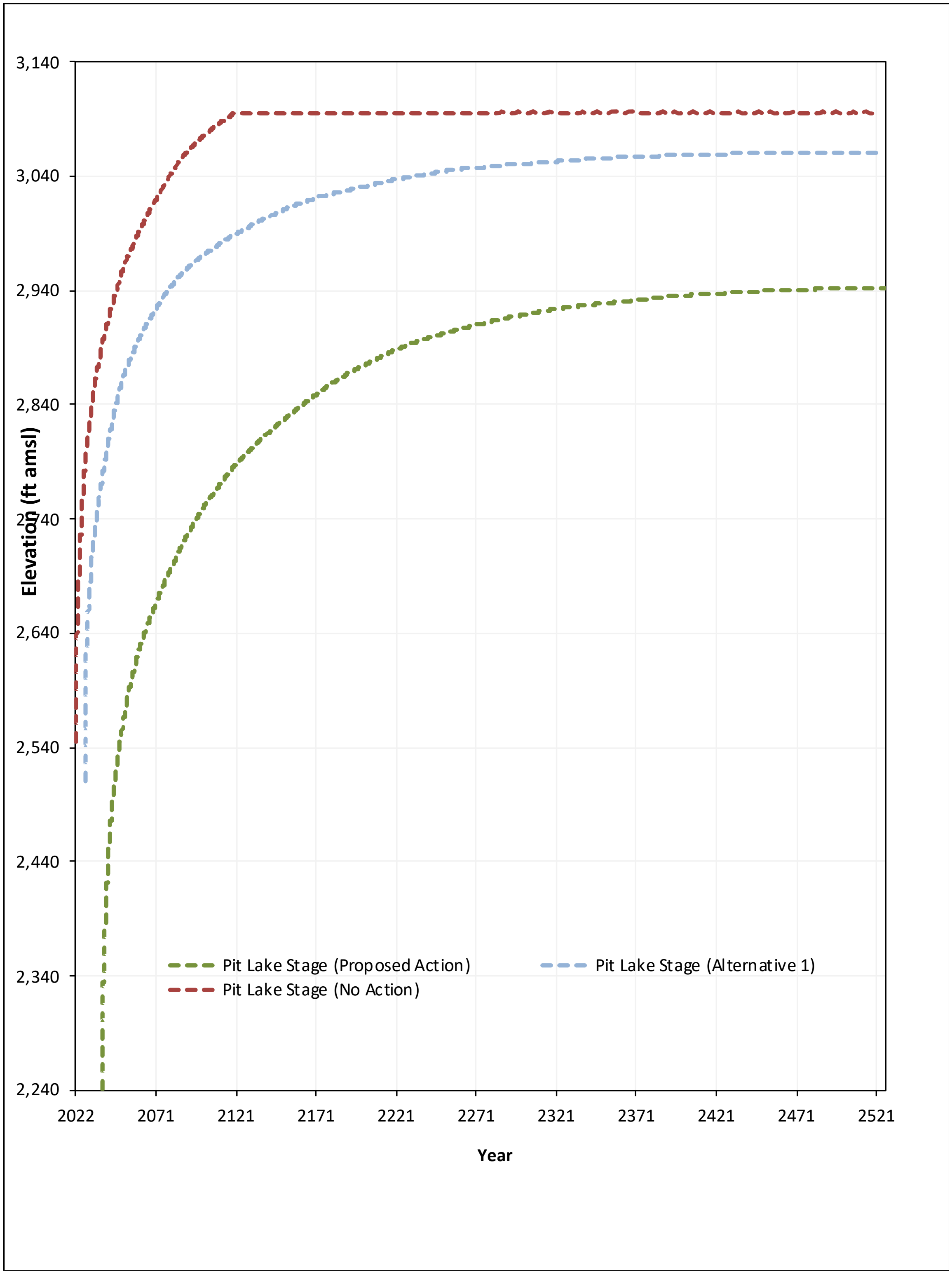


Figure 3-19. Predicted rate of post-mining pit lake development (no-action alternative, alternative 1, and proposed action)

Source: SRK Consulting, Inc. 2020a

Table 3-128. Predicted pit lake development summary (no-action alternative, alternative 1, and proposed action)

	Unit	No-action Alternative	Alternative 1	Proposed Action
Pit Floor Elevation (deepest)	feet above mean sea level	2,545	2,510	2,240
Maximum Lake Surface Elevation[120]	feet above mean sea level	3,095	3,061	2,942
Maximum Depth	feet	550	551	702
Lake Surface Area[121]	acre	122	122	154
Lake Volume[122]	acre-feet	19,840	27,161	43,697
Time to Reach 95% of Predicted Maximum Elevation	Years post-mining	75	182	220
Average Groundwater Inflow Rate[123]	gallons per minute	99	99	121
Direct Precipitation to Pit Lake[124]	gallons per minute	125	121	154
Average Runoff from Pit Walls[125]	gallons per minute	33	33	32
Average Runoff from Upstream of Pit[126]	gallons per minute	37	34	65
Pregnant Leach Solution Draindown Pumped to Pit[127]	gallons per minute	25	25	25
Total Inflow	gallons per minute	319	313	396
Evaporation[128]	gallons per minute	313	310	392
Total Outflow	gallons per minute	313	310	392
Groundwater Outflow	**Yes/No**	**No**	**No**	**No**
Groundwater Capture Zone around the Pit Lake (at steady-state)	**Square miles**	**3.8**	**3.9**	**4.4**
Portion of Leach Pile Footprint within the Groundwater Capture Zone around the Pit Lake (at steady-state)	**Percentage**	**71**	**72**	**94**

Source: SRK Consulting, Inc. 2019b, 2020a

3.21.4.2.2 Surface Water Quantity

Storm Water Control

Pinto Valley Mining Corp. has developed a storm water pollution prevention plan for all Pinto Valley Mine facility operations, on private and public lands, in accordance with the requirements of the Arizona Pollutant Discharge Elimination System storm water multi-sector general permit (Arizona Department of Environmental Quality 2015, 2019b). The storm water management system is generally designed and

[120] Once lake reaches steady-state (full stage) conditions.
[121] Ibid.
[122] Ibid.
[123] Ibid.
[124] Ibid.
[125] Ibid.
[126] Ibid.
[127] Ibid.
[128] Ibid.

maintained to contain the 100-year, 24-hour storm event. Storm water would continue to be managed in accordance with the storm water pollution prevention plan and storm water multi-sector general permit (and any future revisions) under the no-action alternative. In addition to coverage under the storm water multi-sector general permit, Pinto Valley Mining Corp. maintains coverage under an individual Arizona Pollutant Discharge Elimination System permit (#AZ0020401) for process water and storm water discharges that do not qualify for coverage under the storm water multi-sector general permit. Discharges from Arizona Pollutant Discharge Elimination System Outfall Nos. 004 and 005 and Seep MG2-8b are authorized under the individual Arizona Pollutant Discharge Elimination System permit and occur on National Forest System lands; these discharges would continue under the no-action alternative. This permit also requires ambient seep monitoring.

Perennial Stream Water Quantity Impacts

Potential impacts on streams were evaluated by (1) using available baseline data to identify perennial stream reaches within the drawdown area; and (2) performing model simulations of baseflow reduction at Pinto Creek at the Magma Weir. The drawdown is projected to encompass a total of 5.49 miles of perennial stream length that includes portions of Pinto Creek (4.43 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). Table 3-129 identifies perennial stream reaches in the hydrologic study area and the mileages of those stream reaches that are within the modeled drawdown area for the alternatives analyzed in detail. This analysis assumes that baseflow in the specific stream reaches identified above are controlled in large part by discharge from the regional groundwater flow system. The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. A reduction in baseflows would likely affect the perennial stream reach (reduce the length of or eliminate the perennial stream reach affected by drawdown). The model results for the no-action alternative scenario predict that impacts on baseflow occurred as a result of pumping from the Peak Well field during the 2013–2018 period (figure 3-20). Continued pumping from the Peak Well field under the no-action alternative scenario is predicted to sustain those impacts (and result in a 9-percent increase in baseflow reduction) through the end of the two-month active mining period. Other conditions such as potential future climate change (less precipitation or warmer temperatures) may also affect perennial stream resources by decreasing the amount of overland flow or increasing the stream losses owing to evaporation.

Recovery of groundwater discharge (baseflow) to Pinto Creek is predicted to vary over the closure and post-closure period (figure 3-21). During the first 10 years after groundwater pumping ceases, the baseflow is predicted to fully recover to approximately 1,070 gallons per minute (compared to the pre-pumping flow rate at the end of 2012) as a result of continued high infiltration from Tailings Storage Facility No. 4 (SRK Consulting, Inc. 2020a, 2020b). From 10 years to 100 years post-closure the baseflow is predicted to gradually decrease from approximately 1,070 gallons per minute to approximately 430 gallons per minute due to combined effects of progressively reduced seepage (reduced artificial recharge) from mine facilities (particularly Tailings Storage Facility No. 4), and residual drawdown and groundwater inflow associated with the pit lake. The predicted baseflow rate of approximately 430 gallons per minute at 100 years post-mining represents an approximate 60-percent reduction in baseflow as compared to the simulated pre-pumping conditions (1,070 gallons per minute) at the end of 2012. The predicted long-term reduction of baseflow in Pinto Creek during the post-mining period is attributed to (1) a reduction of natural groundwater discharge associated with the residual drawdown and groundwater inflow into the Open Pit; and (2) gradual reduction in seepage to Pinto Creek from the mine tailings facilities (particularly Tailings Storage Facility No. 4).

As noted on figure 3-21, evaluations conducted by SRK Consulting, Inc. (SRK Consulting, Inc. 2020b) interpret that the baseflow at the end of 2012 (assumed as the quasi-steady-state conditions for the purpose of the EIS analysis) was influenced by artificial recharge from the existing mining facilities (particularly Tailings Storage Facility No. 4). However, the proportion of artificial recharge from tailing seepage that contributed to groundwater discharge to the stream as baseflow at the end of 2012 cannot be directly verified. The estimate is based on a calibrated groundwater model using the available groundwater data and surface water flow and surface water quality data for the 2011 to 2012 period. The predicted post-mining baseflow recovery for Pinto Creek presented on figure 3-21 assumes that seepage that is captured by the Peak Wellfield would no longer occur after the mining and milling operations ceases.

Other conditions such as past and potential future climate change (warmer temperatures and less precipitation) may also affect perennial stream resources by increasing stream losses through evaporation. If climate change resulted in a long-term reduction in the average annual precipitation (or prolonged or increased the severity of drought cycles), a reduction in natural recharge to groundwater would occur that could result in a corresponding reduction in groundwater levels that control groundwater discharge to the stream as baseflow. A reduction in precipitation would also result in reduced overland flow and runoff that contribute to stream flows.

Under the groundwater model scenario (SRK Consulting, Inc. 2020a), the continuation of reductions in baseflow over the mine life included under the no-action alternative is anticipated to increase the duration of the impacts on baseflow (that occurred between 2013–2018) through mid-2021. A long-term reduction in baseflow resulting from groundwater pumping would likely result in a measurable reduction in flow (or elimination of surface flow) during the low-flow periods, and a corresponding reduction in the length of perennial stream reaches that existed prior to being affected by groundwater pumping and other factors such as climate change. As a consequence, segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration (approximately 3 years). The reduction of stream flow in segments of Pinto Creek could adversely affect surface water quality in those reaches, particularly during low-flow conditions.

Table 3-129. Perennial stream miles within the projected drawdown areas (no-action alternative, alternative 1, and proposed action)

Perennial Stream Reach	Map ID[129]	Total Perennial Stream Miles (baseline)	Perennial Stream Miles Located within the Projected Drawdown Areas[130]			
			2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
Spring Creek	ST01	0.88	-	-	-	-
Pinto Creek (Total 14.5 miles)	ST02	5.55	-	-	-	-
	ST03	2.99	0.1	-	0.11	0.12
	ST10	5.96	1.42	4.43	4.51	4.68
Campaign Creek	ST04	2.93	-	-	-	-
Unnamed Tributary to Horrell Creek	ST05	0.59	-	-	-	-
	ST06	1.28	-	-	-	-

[129] Map IDs indicate the location of stream segments shown on figure 2-2 of appendix E.

[130] Perennial stream reaches identified for the transient period include those segments located within the maximum extent of predicted 5-foot drawdown contour at the end of the 2013–2018 period. Perennial stream reaches identified for the no-action alternative, alternative 1, and proposed action includes those segments located within the predicted maximum extent of 5-foot drawdown contour over the mining and post-mining period for each respective scenario.

Perennial Stream Reach	Map ID[129]	Total Perennial Stream Miles (baseline)	Perennial Stream Miles Located within the Projected Drawdown Areas[130]			
			2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
West Fork Pinto Creek (Total 1.65 miles)	ST07	0.14	-	-	-	-
	ST08	0.16	-	-	-	-
	ST09	0.07	-	-	-	-
Haunted Canyon	ST11	1.17	-	-	-	-
Miller Springs Gulch	ST12	0.88	0.01	0.81	0.81	0.82
Unnamed Tributary to Upper Pinto Creek	ST13	0.25		0.25	0.25	0.25
Total miles		**22.85**	**1.53**	**5.49**	**5.68**	**5.86**
Percent		**-**	**7%**	**24%**	**25%**	**26%**

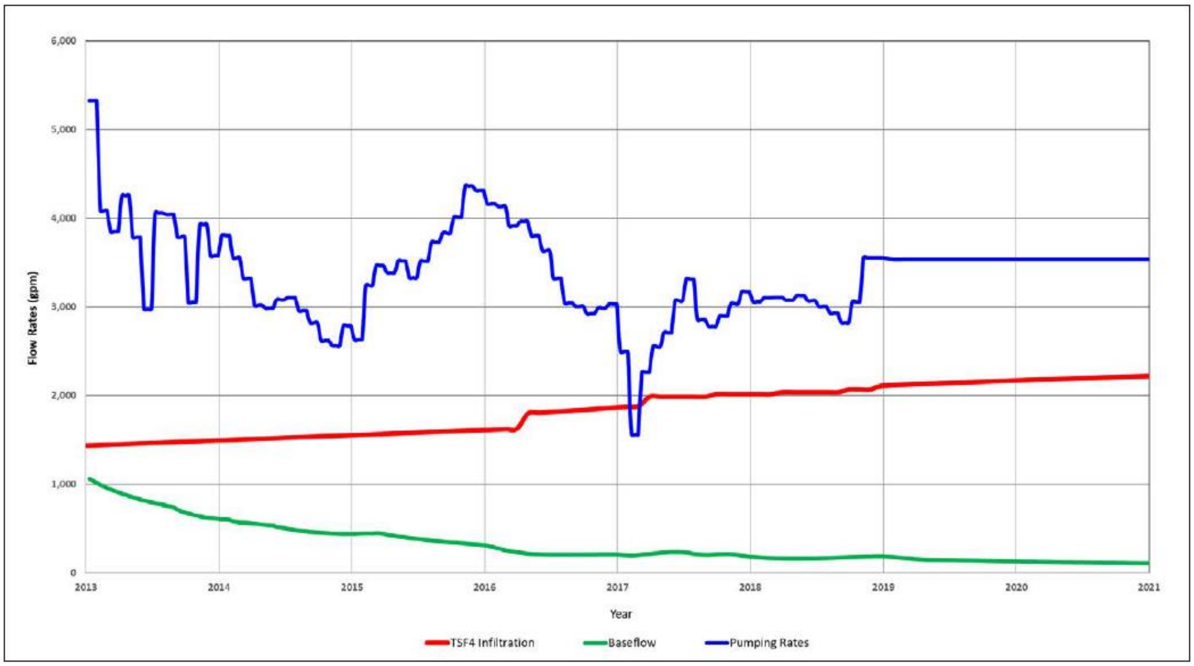
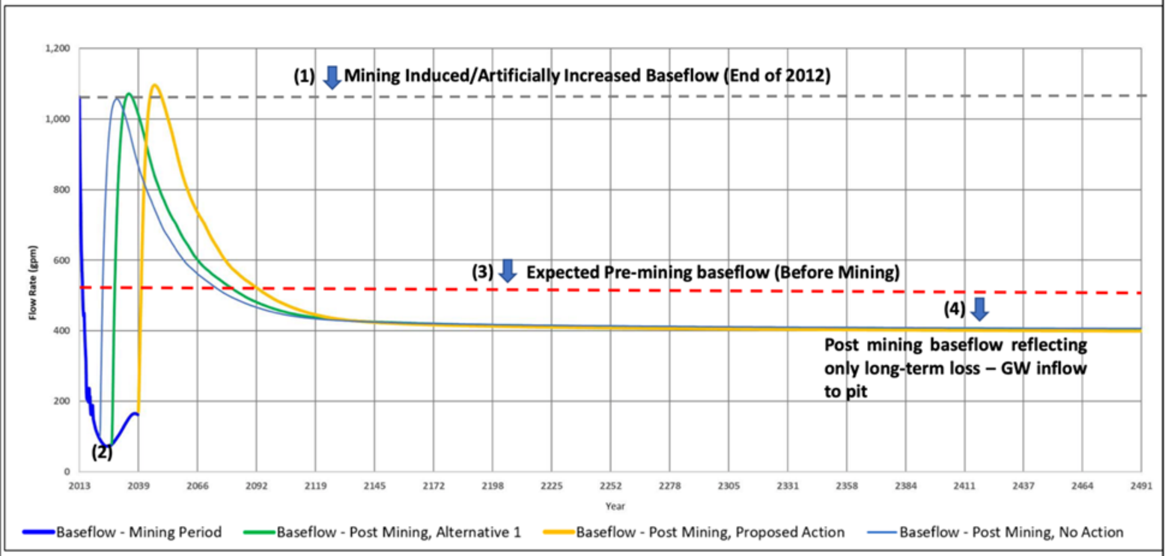


Figure 3-20. Simulated pumping, Tailings Storage Facility No. 4 infiltration, and baseflow at the Magma Weir – no-action alternative (2013–2021)

Source: SRK Consulting, Inc. 2020a



1) The quasi steady state model has been calibrated to Magma Weir data in 2011-2012. This baseflow is altered by mining (i.e., infiltration from tailings, pumping, and pit inflows)
2) With the Peak well pumping re-start in 2013, a sharp reduction is calculated in Years 2013 to 2019, and reduction continues slowly as the system re-equilibrates to new steady state.
3) The pre-mining baseflow rate at the Magma Weir is estimated to be around 500 gpm.
4) The three scenarios reach the same baseflow rates near Year 2120. Post-mining baseflow rate will be approximately 100 gpm less than the pre-mining owing the GW inflow to pit lake. In long term, there will be no other physical impact other than the groundwater discharge to pit lake.

Figure 3-21. Simulated mining and post-mining baseflow at the Magma Weir – no-action alternative, alternative 1, and proposed action

Source: SRK Consulting, Inc. 2020b

Perennial Springs Water Quantity Impacts

The locations of springs and seeps within the drawdown areas under the no-action alternative are shown on map 3-35 in appendix A. There are 15 inventoried spring sites (six wet and nine dry) within the drawdown area (table 3-130). The six wet (flowing) springs are considered perennial springs that could be affected by changes in groundwater levels as described below. Drawdown or changes in groundwater levels are not expected to affect the nine dry or ephemeral spring sites.

Three of the six perennial springs (SP47, SP53, and SP77) are located downgradient from tailings facilities (Tailings Storage Facilities No. 4, No. 3, and No. 1, respectively). These three springs also had high electrical conductivity recorded during the June 2018 field survey that are similar to high electrical conductivity values measured in tailings porewater (SRK Consulting, Inc. 2019b). The location of these three springs and their measured high electrical conductivity values suggest that the flow observed at these springs is controlled by seepage from the adjacent unlined tailings facilities. During the post-mining period, these three springs are predicted to dry up (and remain dry over the post-mining period) because reduced seepage from the tailings facilities would no longer support spring discharge (SRK Consulting, Inc. 2020a). The other three perennial springs (SP46, SP48, and SP49) are apparently natural springs that could be affected by drawdown.

The actual impacts on individual seeps, springs, or stream reaches would depend on the source of groundwater that sustains the perennial flow (perched or hydraulically isolated aquifer versus regional groundwater system) and the actual extent of mine-induced groundwater drawdown that would occur in the area. The interconnection (or lack of interconnection) between the perennial surface waters and deeper groundwater sources is largely controlled by the specific hydrogeologic conditions that occur at each site. Considering the uncertainty between the actual groundwater elevations and model-simulated groundwater elevations in this area, and the absence of data to define if these springs are perched or connected to the deeper groundwater aquifer system, this analysis conservatively assumed that there is a potential risk that mine-induced drawdown associated with groundwater pumping for the mine could reduce baseflow to the three natural perennial springs identified within the drawdown area (SP46, SP48, and SP49) that are not associated with seepage from unlined tailings facilities. Depending on the severity of the reductions in flow, this could result in the drying up of springs and a reduction in the size of any associated wet soil or wetland vegetation areas. The groundwater modeling results indicate that residual drawdown would persist for at least 100 years after mine closure (map 3-34 in appendix A). Therefore, any reduction in flow at these spring sites resulting from mine-induced drawdown could persist for the foreseeable future.

Other conditions such as past and potential future climate change (warmer temperatures and less precipitation) may also affect perennial stream resources by increasing the stream losses through evaporation. If climate change has resulted in a long-term reduction in the average annual precipitation (or prolonged or increased the severity of drought cycles), a reduction in natural recharge to groundwater would occur that could result in a corresponding reduction in groundwater levels that control groundwater discharge to the stream as baseflow. A reduction in precipitation would also result in reduced overland flow and runoff that contribute to stream flows.

Table 3-130. Summary of seeps and springs within the drawdown area (no-action alternative, alternative 1, and proposed action)

Map ID	Spring Name	June 2018 Observation (Wet/Dry)	June 2018 Flow Rate (gpm)	Comments	5-foot Drawdown Contour			
					2013–2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
SP21	Cedar Spring	Wet Spring	2.5	-				X
SP46	Ripper Spring #2	Wet Spring	1	-		X	X	X
SP47	Unnamed Spring 1	Wet Spring	NM	Downgradient from Tailings Storage Facility No. 4; elevated electrical conductivity values.		X	X	X
SP48	Cherry Spring	Wet Spring	NM			X	X	X
SP49	Eastwater Canyon Spring	Wet Spring	NM			X	X	X
SP50	Gallina Spring	Dry Spring	NM			X	X	X
SP51	Moonshine Spring	Dry Spring	NM			X	X	X
SP52	Owl Spring	Dry Spring	NM			X	X	X
SP53	Pinto Creek 2	Wet Spring	NM	Downgradient from Tailings Storage Facility No. 3; elevated electrical conductivity values.		X	X	X
SP54	Kit Spring	Dry Spring	NM			X	X	X
SP55	Coon Spring	Dry Spring	NM					X

Map ID	Spring Name	June 2018 Observation (Wet/Dry)	June 2018 Flow Rate (gpm)	Comments	5-foot Drawdown Contour			
					2013–2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
SP61	Pinto Creek Spring #2	Dry Spring	NM		X	X	X	X
SP62	W337	Dry Spring	NM		X	X	X	X
SP63	Dynamite Spring	Dry Spring	NM		X	X	X	X
SP64	Ardilla Spring	Dry Spring	NM			X	X	X
SP65	Grey Saddle Spring	Dry Spring	NM		X	X	X	X
SP66	Frenchy Spring	Dry Spring	NM				X	X
SP77	W42	Wet Spring	12.8	Downgradient from Tailings Storage Facility No. 1; elevated electrical conductivity values.		X	X	X
SP78	Miller Spring	Dry Spring	NM		X	X	X	X
				Total Wet	**0**	**6**	**6**	**7**
				Total Dry	**4**	**9**	**11**	**12**
				Total	**4**	**15**	**17**	**19**

gpm = gallons per minute; NM = not measured
Note: An "X" identifies specific a spring or seep located within the model predicted drawdown area (defined by the maximum extent of the 5-foot drawdown contour).

Waters of the United States

The no-action alternative would not result in any direct disturbance from the expansion of Tailings Storage Facility No. 3 to the five jurisdictional drainages identified in section 3.21.3. As such, there are no anticipated impacts on jurisdictional waters of the United States.[131]

3.21.4.2.3 Groundwater and Surface Water Quality

Tailings Storage Facilities Water Quality Impacts

Currently, tailings storage facilities discharge alkaline water with high total dissolved solids and sulfate concentration and variable but low metal concentrations. Some acid rock drainage storm water runoff may occur from embankments, but the embankment will be covered with a Gila Conglomerate soil and rock armor that could be acid neutralizing. These conditions would persist under the no-action alternative. During mining, the high-sulfate water leachate would continue to drain through the tailings, seep out of the base of the facility, and enter the groundwater flow system. A series of existing groundwater production wells that are part of the Peak Well field is used to capture and pump back the high total dissolved solids and sulfate water immediately downgradient from Tailings Storage Facility No. 4 and Tailings Storage Facility No. 3. This pump-back system serves to reduce the potential for high total

[131] The draft EIS was published in December 2019. The Navigable Waters Protection Rule was updated in June 2020. Because the waters of the U.S. investigation was performed in 2015 and 2017, it is possible that the jurisdictional designation of identified features discussed above may not be considered jurisdictional under the 2020 rule. However, the conclusion that the identified features are not affected by the proposed expansion of Tailings Storage Facility No. 3 would not change.

dissolved solids and sulfate process water in the tailings storage facilities from migrating outside of the analysis area or discharging into Pinto Creek.

Closure of the tailings storage facilities under the no-action alternative would be in accordance with a closure plan submitted to the Arizona Department of Environmental Quality to minimize seepage and dust, though the closure plan may need to be modified based on transitioning to closure within 6 months of the record of decision. After reclamation and closure activities are completed, approximately 98 percent of the top surface of Tailings Storage Facility No. 4 is expected to be covered, and 2 percent of the top surface (15 acres of an estimated 620 acres) may remain uncovered in the lowest topographic portion of the surface. This low area would accumulate storm water during seasonal storm events and may experience seasonal ponding. Seasonal ponding in the low area is expected to dry up within a few weeks to 2 months following the winter and summer storm events. Pinto Valley Mining Corp. is exploring options such as solar-powered misters to enhance evaporation, if needed seasonally. SRK Consulting, Inc. has noted that, based on observations of inactive tailings facilities elsewhere in southern Arizona, the uncovered pond area would eventually develop a 0.5- to 2-foot-thick crust of interlayered calcium carbonate (caliche) and fine sediment that acts to impede infiltration (SRK Consulting, Inc. 2020a).

After closure, seepage resulting from draindown from Tailings Storage Facility No. 4 is predicted to continue at progressively reduced rates until approximately year 2080 (SRK Consulting, Inc. 2019b). However, the current mine closure and post-closure plans do not include a commitment for the construction, long-term operation, and maintenance of a pump-back system (seepage capture system) and treatment system to manage the predicted seepage. Without long-term capture and treatment, seepage from Tailings Storage Facility No. 4 would migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek. Therefore, under the no-action alternative, there is a potential for long-term impacts on groundwater and surface water quality from draindown of entrained process water during the post-closure period. Furthermore, as described above, long-term impacts from formation and discharge of acid rock drainage are possible, but not considered likely to be significant.

Leach Pile Water Quality Impacts

Under the no-action alternative, draindown of residual acidic leachate generated from the Leach Pile facility would continue to drain at progressively reduced rates over the closure and post-closure periods compared to the active operation period. At closure (2021), the draindown rate from the facility is estimated to be approximately 250 gallons per minute. In the post-closure period, the rate is predicted to gradually reduce to approximately 25 gallons per minute, which is projected to be the average steady-state post-closure drainage rate (SRK Consulting, Inc. 2019b).

At the end of draindown, the remaining rock in the facility would continue to chemically weather any remaining sulfide minerals. Acid-base accounting and humidity cell testing characteristics of the Leach Pile materials suggest that the formation of acid rock drainage is likely (Schafer & Associates 1995) given sufficient infiltration to produce discharge. Over the long term during the closure period, the Leach Pile facility is modeled to discharge low pH, high total dissolved solids, metal-laden water for hundreds of years (SRK Consulting, Inc. 2015, 2019c). Acidic draindown from the Leach Piles could be attenuated if it flows through the Apache Leap Tuff geologic unit, which has been shown to possess acid-neutralizing characteristics (SRK Consulting, Inc. 2021b).

The Leach Pile facility is situated on low-permeability Ruin Granite, and during the closure and post-closure periods most of the seepage out of the facility would be captured in a lined pond located at the toe of the facility and discharged by pumping into the Open Pit (pit lake). A small portion of the seepage (less than 5 percent) is assumed to infiltrate directly into the low-permeability substrate beneath the Leach Piles footprint (SRK Consulting, Inc. 2019b).

A groundwater capture zone currently exists around the pit where the drawdown of groundwater levels around the pit results in steep groundwater flow gradients toward the Open Pit such that all groundwater flow within this zone is captured and flows (and eventually discharges into) the Open Pit. Residual drawdown is predicted to persist around the pit during the closure and post-closure periods. As a result, the groundwater capture zone is predicted to persist in the area around the pit over the closure and post-closure periods. Most of the seepage that infiltrates to groundwater beneath the Leach Pile facility during the operation, closure, and post-closure periods would flow into the Open Pit. At 500 years post-closure, an estimated 71 percent of the Leach Pile facility would be within the groundwater capture zone and would flow toward and ultimately discharge into the pit lake. The remaining 29 percent of the seepage that infiltrates to groundwater would be located outside of the groundwater capture zone. For this area, the seepage would enter and mix with the groundwater system and flow west toward Pinto Creek. The portion of the seepage that is predicted to flow toward Pinto Creek has the potential to degrade groundwater quality west of the facility and could potentially affect the water quality in Pinto Creek.

Waste Rock Facilities Water Quality Impacts

The basic observations for historical, existing waste rock (see section 2.6.1.2 in appendix E, “Water Resources and Geochemistry Technical Report”) apply under the no-action alternative. Acid rock drainage products can be expected to accumulate as highly water-soluble salts on waste rock due to exposure to air, occasional rain, and humidity. In response to more pronounced precipitation events, acid rock drainage–like solutions with low pH and elevated sulfate and metals are likely to be temporarily released in storm water that is retained on-site pursuant to the storm water pollution prevention plan. For waste rock dumps, any production of acid rock drainage in response to rain events will interact with other rock materials, which may act to dilute and neutralize the acidic drainage. In addition, acidic drainage may be neutralized if it flows through Apache Leap Tuff (dacite).

Planned reclamation activities for the waste rock dumps would vary depending on the location and acid-generating potential as described in the “2016 Closure and Post-Closure Strategy, Pinto Valley Mine” document (SRK Consulting, Inc. 2016d). For example, inert waste rock dumps that may be used as cover for other facilities such as the 19 Dump would be graded as necessary for storm water control, but would not be covered or reseeded to establish vegetation, whereas portions of waste rock dumps located outside the long-term passive containment zone that are determined to have the potential to generate acid drainage would be covered within inert material. Storm water control features would be constructed as the dump facilities are built to reduce erosion by directing runoff to site-wide storm water channels. Waste rock dumps would be seeded, as necessary, to encourage the growth of vegetation. Successful implementation of these closure and reclamation measures would reduce the infiltration of meteoric waters through waste rock dumps that have the potential to generate acid drainage.

Currently, groundwater wells proximal to waste rock dumps do not show impacts from acid rock drainage. This and the absence of reported routine or sporadic acid rock drainage seeps or runoff suggest that infiltration of meteoric water into the waste rock dumps is insufficient to produce a discharge of acid rock drainage in the long term.

Pit Lake Water Quality Impacts

The development of a pit lake on private land after mining ceases under the no-action alternative scenario is described in the “Groundwater Quantity” section above, and summarized in table 3-132. For the no-action alternative, the water quality of the pit lake is expected to have low pH, high sulfate concentrations, and high metal concentrations during the post-mining period, similar to the model-predicted pH and concentrations presented in table 3-132. The chemical composition of the lake would be largely controlled by the addition of pregnant leach draindown solution that is predicted to have a low pH (ranging from 2.2 to 3.1), high sulfate concentrations (ranging from 71,500 to 86,207 milligrams per liter), and high metal concentrations (table 8, SRK Consulting, Inc. 2019c).

The pit lake is predicted to behave as a strong hydraulic sink (no outflow to groundwater) (SRK Consulting, Inc. 2020a). Therefore, the pit lake water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the private land pit lake boundaries. Potential impacts on terrestrial and avian life associated with exposure to the pit lake water are discussed in section 3.3, “Biological Resources.”

3.21.4.2.4 Water Rights

Surface water rights within the predicted maximum extent of the drawdown area are shown on map 3-36 in appendix A and listed in table 3-131. There are 25 surface water rights in the drawdown area under the no-action alternative that include 16 used for livestock, eight used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow) used for recreation and wildlife. Nine of these surface water rights also occurred within the projected drawdown area resulting from pumping between 2013 and 2018 (transient period). There are no water rights for individual or community users located in areas that are adjacent to and downgradient of the Pinto Valley Mine. As such, there are no anticipated impacts on community drinking water sources or private wells.

The actual impacts on individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only those waters sustained by discharge from the regional groundwater system would be likely to be affected. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right.

Table 3-131. Surface water rights within the predicted drawdown area (no-action alternative, alternative 1, and proposed action)

Map ID	Source	Registration No.	Priority Date	Owner Name	Type of Use	Quantity	5-foot Drawdown Contour			
							2013–2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
WR01	Pinto Creek (in-stream)	33-89109	12/14/1983	Tonto National Forest	Recreation Wildlife	1,794.2 AFA	X	X	X	X
WR08	Cedar Spring	4A-3593.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA			X	X
WR10	North Apache Spring	4A-3595.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA		X	X	X
WR12	Unnamed Canyon (7)	38-23858.0	12/31/1958	Tonto National Forest	Stock Wildlife	0.18 AFA	X	X	X	X
WR13	Apache Spring	4A-3587.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA	X	X	X	X
WR18	West Fork, Pinto Creek (1) and (2)	4A-3584.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA	X	X	X	X
WR19	Home Pasture Canyon	3R-1355.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA	X	X	X	X
WR20	Ripper Spring	4A-3592.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA		X	X	X
WR21	Walnut Spring	4A-4262.1	9/16/1957	Cyprus Miami Mining Corp.	Stock	150,000 GPA		X	X	X
WR23	Grapevine Spring (1)	4A-4263.1	9/16/1957	Cyprus Miami Mining Corp.	Stock	200,000 GPA		X	X	X
WR24	Cherry Spring	4A-3598.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA		X	X	X
WR25	Continental Tank Canyon	3R-1356.5	11/20/1956	Tonto National Forest	Stock	300,000 GPA		X	X	X
WR26	East Water Spring	4A-4279.2	9/16/1957	Magma Copper Company	Stock	200,000 GPA		X	X	X
WR27	Unnamed Canyon (5)	38-14616.0	12/31/1967	Tonto National Forest	Stock Wildlife	0.3 AFA		X	X	X
WR28	Unnamed Canyon (4)	38-14615.0	12/31/1968	Tonto National Forest	Stock Wildlife	0.3 AFA		X	X	X
WR29	Unnamed Canyon (3)	38-14619.0	12/31/1958	Tonto National Forest	Stock Wildlife	0.04 AFA		X	X	X

Map ID	Source	Registration No.	Priority Date	Owner Name	Type of Use	Quantity	5-foot Drawdown Contour			
							2013–2018 (Transient Period)	*No-action Alternative*	*Alternative 1*	*Proposed Action*
WR34	Unnamed Canyon (6)	38-23943.0	12/31/1957	Tonto National Forest	Stock Wildlife	0.34 AFA		X	X	X
WR35	Pinto Creek (2)	4A-3583.5	11/20/1956	Tonto National Forest	Stock	2,044,000 GPA	X	X	X	X
WR41	Bootlegger Spring (1)	4A-4272.2	9/16/1957	Cyprus Miami Mining Corp.	Stock	150,000 GPA	X	X	X	X
WR42	Continental Spring	4A-4280.3	9/16/1957	Cyprus Miami Mining Corp.	Stock	200,000 GPA		X	X	X
WR43	Unnamed Canyon (2)	38-14618.0	12/31/1957	Tonto National Forest	Stock Wildlife	0.39 AFA		X	X	X
WR47	Buckhorn Spring	4A-4283.2	9/16/1957	Cyprus Miami Mining Corp	Stock	200,000 GPA		X	X	X
WR48	Little Pinto Creek	38-14620.0	12/31/1944	Tonto National Forest	Stock Wildlife	0.34 AFA		X	X	X
WR49	Unnamed Canyon (1)	38-14614.0	12/31/1967	Tonto National Forest	Stock Wildlife	0.17 AFA		X	X	X
WR50	Black Tunnel Spring	4A-4284.2	9/16/1957	Cyprus Miami Mining Corp.	Stock	100,000 GPA	X	X	X	X
WR51	Miller Spring	4A-4285.2	9/16/1957	Cyprus Miami Mining Corp.	Stock	150,000 GPA	X	X	X	X
						Total	**9**	**25**	**26**	**26**

AFA = acre feet per annum; GPA = gallons per acre

Note: An "X" identifies a specific water right located within the model predicted drawdown area (defined by the maximum extent of the 5-foot drawdown contour).

3.21.4.3 **Alternative 1 – Direct and Indirect Impacts**

Under alternative 1 there would be 909 acres of new disturbance on private land, resulting in a total of 4,823 acres of disturbance at the Pinto Valley Mine (4,258 total acres on private land and 566 total acres on National Forest System lands).

Most of the disturbed areas at the Pinto Valley Mine currently fall within the non-discharging boundary located within the Upper Pinto Creek subwatershed. Of the 4,553 acres of surface disturbance in the Upper Pinto Creek subwatershed as a result of alternative 1, approximately 3,862 acres of that disturbance would be within the non-discharging boundary. Runoff from the remaining 691-acre disturbance area in the Upper Pinto Creek subwatershed would discharge to Pinto Creek. Under existing conditions, there are 659 acres of disturbance within the discharging area. There would be an increase of surface disturbance within the discharging portion of the Pinto Valley Mine of 32 acres under alternative 1. Based on the relatively small increase in surface disturbance compared to the existing conditions, the impacts of surface disturbance under alternative 1 from the discharging areas at the Pinto Valley Mine on flow quantities monitored at Magma Weir gaging station would likely not be measurable.

3.21.4.3.1 Groundwater Quantity

The modeled changes in groundwater levels under alternative 1 indicate that the drawdown area (defined as the area predicted to experience a reduction in groundwater levels of 5 feet or more at any point in time over the mining or post-mining periods) would expand drawdown as compared to the 2018 conditions and the no-action alternative (map 3-35 in appendix A). The drawdown results also indicate the drawdown area is predicted to continue to expand during the post-mining period from 18.9 square miles at the end of mining (map 3-38 in appendix A) to 36.2 square miles at 100 years post-closure (map 3-39 in appendix A).

Similar to the no-action alternative, the model also predicts that mounding (an increase in groundwater levels) would occur beneath Tailings Storage Facility No. 4 and in the Haunted Canyon area at the end of mining (map 3-38 in appendix A). Mounding beneath the tailings storage facilities results from seepage out of the base of the unlined facility; mounding in Haunted Canyon results from Carlota’s mitigation discharges to supplement surface flows. The mounding beneath Tailings Storage Facility No. 4 is predicted to dissipate within the first 25-years after closure (SRK Consulting, Inc. 2019b).

The maximum areal extent of the 5-foot drawdown contour under alternative 1 is presented on map 3-35 in appendix A. This map shows the predicted outer limit of the 5-foot drawdown contour as determined by overlaying a series of 5-foot drawdown contours for representative points in time over the 100-year post-mining period (SRK Consulting, Inc. 2019b). The maximum drawdown area under alternative 1 is similar to, but slightly larger toward the northwest than, the maximum drawdown area projected under the no-action alternative.

The groundwater model simulations predict that a pit lake on private land would start to develop in 2027 and reach 95 percent of full recovery within approximately 182 years after closure. The model-predicted development (or rate of filling) of the pit lake over the post-mining period is illustrated on figure 3-19. The projected area of the final pit lake is shown on map 3-37 in appendix A, and the predicted surface area, volume, groundwater inflow, and evaporation rates at full recovery are summarized in table 3-128.

At full recovery, the pit lake on private land is predicted to have a groundwater inflow rate of 99 gallons per minute (of total inflow rate of 313 gallons per minute from all sources) and evaporation rate of 310 gallons per minute (table 3-128). The numerical modeling results indicate that the pit lake would behave as a strong hydraulic sink (hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater system) (SRK Consulting, Inc. 2019b).

3.21.4.3.2 Surface Water Quantity

Storm Water Control

The planned storm water controls during mining and post-mining from Tailings Storage Facilities No. 3 and No. 4 are described in appendix F, "Geotechnical Stability Appendix," and in attachment C of appendix H, "Environmental Protection Measures, Monitoring, and Mitigation." During active mining, storm water from contributing watersheds above and including the surface area of both Tailings Storage Facilities No. 3 and No. 4 is to be managed by storage within the impoundment areas upstream from the dams. The facilities are designed with sufficient freeboard to fully contain flood water volumes up to a probable maximum precipitation event, on top of the maximum operational reclaim pool elevations. After mining, storm water will be managed by constructing systems of open channels to capture and convey storm water around and across the surfaces of both tailings storage facilities. The post-closure drainage designs are based on a 100-year, 24-hour design storm event. Channels are sized and armored with riprap to safely convey predicted peak flows and velocities resulting from the 100-year design event, and with sufficient freeboard on the channels to contain, without overtopping, the flows from a 500-year event.

Steep storm water channel sections include segments of the east channel, which essentially serves as a spillway on the east groin of Tailings Storage Facility No. 4 dam, and a drop channel referred to as DC3-1 on the northeast side of Tailings Storage Facility No. 3. These steep channel sections will be armored with concrete, articulated concrete blocks, or other heavy armoring measures to withstand the high hydraulic forces. Energy dissipation structures will need to be designed for the downstream end of these steep chutes to prevent erosion of the downstream channels and undercutting of the steep channel lining systems. In addition to the storm water collection and conveyance systems, the downstream faces of both Tailings Storage Facilities No. 3 and No. 4 are to be covered and protected from erosion by placement of rock surfacing.

The top surface of the tailings storage facilities would be graded to promote drainage and prevent the capture and accumulation of runoff. Therefore, the seasonal ponding anticipated on Tailings Storage Facility No. 4 that would occur under the no-action alternative, would not occur under alternative 1. During the last 10 years of active mining, Tailings Storage Facility No. 4 will be modified by construction of internal benches and berms on top of the facility to create three separate cells for storage of tailings, process water, and storm water (this would not occur under the no-action alternative). Tailings will be deposited behind the benches to create an approximately flat tailings surface. Berms will be constructed on top of the benches to provide freeboard for storing storm water. The total storage capacity within the three cells, behind the berms, is sufficient to store storm water volumes resulting from the probable maximum flood event from the contributing watersheds to each cell. The grading of the top surface of the tailings storage facilities described above for alternative 1 would not occur under the no-action alternative.

Pinto Valley Mining Corp. has developed a "Post-Closure Tailings Stormwater Control, Inspection, and Maintenance Plan" for the project (see appendix H, "Environmental Protection Measures, Monitoring, and Mitigation"). The plan was developed to address concerns regarding the long-term, post-closure monitoring and maintenance of storm water control features on Tailing Storage Facilities No. 3 and No.

4. The plan describes inspection of the storm water management system and identifies triggers for maintenance and repair and agency reporting requirements.

Perennial Stream Water Quantity Impacts

Potential impacts on streams were evaluated by (1) using available baseline data to identify perennial stream reaches located within the drawdown area; and (2) performing model simulations of baseflow reduction at Pinto Creek at the Magma Weir gaging station. The drawdown is projected to encompass a total of 5.68 miles of perennial stream length that includes portions of Pinto Creek (4.62 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile) (table 3-129). This analysis assumes that baseflow in the specific stream reaches identified above are controlled in large part by discharge from the groundwater flow system. The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. A reduction in baseflows would likely affect the perennial stream reach (reduce the length of or eliminate the perennial stream reach affected by drawdown).

The model results for alternative 1 include the predictions for the 2013–2018 period discussed previously that indicate a simulated reduction from an initial 1,070 gallons per minute (start of 2013) to 188 gallons per minute (end of 2018)—an 82-percent reduction. Continued pumping from the Peak Well field under the alternative 1 scenario is predicted to sustain those impacts (and result in an additional 10-percent decrease in baseflow) through the end of mining. Compared to the no-action alternative scenario, the projected maximum baseflow reductions are similar; however, alternative 1 would extend the duration of maximum impacts on baseflow for an additional 7 years.

As indicated on figure 3-22, recovery of groundwater discharge (baseflow) to Pinto Creek is predicted to vary over the closure and post-closure periods and would follow nearly the same recovery pattern described for the no-action alternative and shown on figure 3-21. The recovery pattern consists of a rapid recovery curve with baseflow reaching a maximum rate approximately 10 years after pumping ceases. Compared to the no-action alternative, the peak baseflow recovery for alternative 1 is projected to occur approximately 8 years later. From approximately 10 years to 100 years post-closure, the baseflow is predicted to gradually decrease from approximately 1,070 gallons per minute to approximately 430 gallons per minute due to combined effects of progressively reduced seepage (reduced artificial recharge) from mine facilities (particularly Tailings Storage Facility No. 4), and residual drawdown and groundwater inflow associated with the pit lake.

The continuation of substantial reductions in baseflow over the mine life included under alternative 1 is anticipated to increase the duration of the impacts on baseflow projected to occur under the no-action alternative. A substantial long-term reduction in baseflow resulting from groundwater pumping would likely result in a measurable reduction in flow (or elimination of surface flow) during the low-flow periods, and a corresponding reduction in the length of perennial stream reaches that existed prior to being affected by groundwater pumping. As a consequence, segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration. The reduction of stream flow in segments of Pinto Creek could adversely affect surface water quality in those reaches, particularly during low-flow conditions. Other conditions such as potential future climate change (warmer temperatures) may also affect perennial stream resources in the same manner discussed under the no-action alternative.

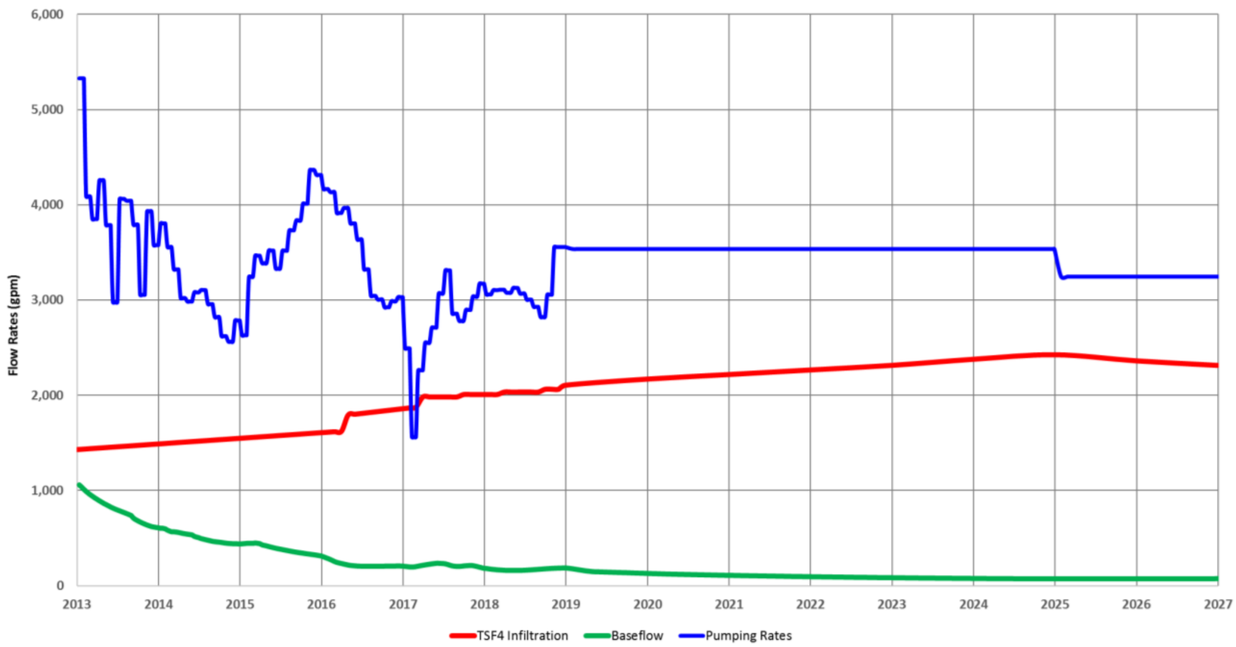


Figure 3-22. Simulated pumping, Tailings Storage Facility No. 4 infiltration, and baseflow at the Magma Weir – alternative 1 (2013–2027)

Source: SRK Consulting, Inc. 2019b

Perennial Spring Water Quantity Impacts

The locations of springs and seeps within the drawdown areas under alternative 1 are shown on map 3-35 in appendix A. There are 17 inventoried spring sites (6 wet and 11 dry) within the drawdown area as summarized in table 3-130. The six wet (flowing) springs are considered perennial springs that could be affected by changes in groundwater levels. Drawdown or changes in groundwater levels is not expected to affect the 11 dry or ephemeral spring sites. Potential impacts on the six perennial springs would be the same as described for the no-action alternative which states that three of the six perennial springs (SP47, SP53, and SP77) appear to be controlled by seepage from adjacent unlined tailings facilities and are predicted to dry up as seepage is reduced during the post-closure period. The other three perennial springs (SP46, SP48, and SP49) are apparently natural springs that could be affected by drawdown.

Pinto Valley Mining Corp. has developed a "Comprehensive Water Resource Monitoring and Mitigation Plan" for the proposed mine expansion (see appendix H, "Environmental Protection Measures, Monitoring, and Mitigation") to address potential impacts on surface water resources.

Waters of the United States

Similar to the no-action alternative, alternative 1 would not result in any direct disturbance including filling, excavation, or any other surface disturbance to jurisdictional drainages. As such, there are no anticipated impacts on jurisdictional waters of the United States.[132]

[132] The draft EIS was published in December 2019. The Navigable Waters Protection Rule was updated in June 2020. Because the waters of the U.S. investigation was performed in 2015, it is possible that the jurisdictional designation of identified features discussed above may not be considered jurisdictional under the 2020 rule. However, the conclusion that the identified features are not affected by the proposed expansion of Tailings Storage Facility No. 3 would not change.

3.21.4.3.3 Groundwater and Surface Water Quality

Tailings Storage Facilities Water Quality Impacts

Impacts on water quality from tailings storage facilities would be approximately the same or similar to those previously described under the no-action alternative.

After closure, seepage resulting from draindown from Tailings Storage Facility No. 4 is predicted to continue at progressively reduced rates until approximately year 2080 (SRK Consulting, Inc. 2019b). However, similar to the no-action alternative the current closure and post-closure plans do not include a commitment for the construction, long-term operation, and maintenance of a pump-back system (seepage capture system) and treatment system to manage the predicted seepage. Without long-term capture and treatment, seepage from Tailings Storage Facility No. 4 would migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek. Therefore, under alternative 1, there is a potential for long-term impacts on groundwater and surface water quality from draindown of entrained process water during the post-closure period. Furthermore, as described for the no-action alternative, long-term impacts from formation and discharge of acid rock drainage are possible, but not considered likely to be significant.

Pinto Valley Mining Corp. has developed a “Post-Closure Tailings Seepage Management and Mitigation Plan” for the project (see appendix H, “Environmental Protection Measures, Monitoring, and Mitigation”) to address concerns regarding seepage from unlined Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. The plan summarizes the hydrogeological and geochemical modeling that has been completed to date, and will be performed in advance of closure, to predict the impact of tailings seepage on groundwater downgradient of Tailings Storage Facilities No. 3 and No. 4. The plan specifies monitoring of groundwater and surface water downgradient of the tailings storage facilities during the remaining life of the mine and through the post-closure period. The plan summarizes mitigation measures that will be implemented in the event tailings seepage entering Pinto Creek exceeds relevant regulatory surface water or groundwater water quality standards.

Leach Pile Water Quality Impacts

Under alternative 1, seepage of residual acidic leachate generated from the Leach Pile facility would continue to drain at progressively reduced rates over the closure and post-closure periods compared to the active operation period as predicted under the no-action alternative. However, under alternative 1, closure would occur approximately 7 years later than under the no-action alternative due to the extended operational life of the mine under alternative 1. At closure (2028), the seepage rate from the facility is estimated to be approximately 250 gallons per minute. From 2028 to 2050, the seepage rate is predicted to gradually reduce to approximately 25 gallons per minute, which is projected to be the average quasi-steady-state seepage rate for the post-closure period after 2050 (SRK Consulting, Inc. 2019b).

Similar to the no-action alternative, at the end of draindown, the remaining rock in the facility would continue to chemically weather any remaining sulfide minerals with the potential formation of acid rock drainage. Over the long term during the closure period, the Leach Pile facility is modeled to discharge low pH, high total dissolved solids, metal-laden water for hundreds of years (SRK Consulting, Inc. 2015, 2019d).

The Leach Pile facility is situated on low-permeability Ruin Granite, and during the closure and post-closure periods most of the seepage out of the facility would be captured in a lined pond located at the toe of the facility and discharged by pumping into the Open Pit (pit lake). A small portion of the seepage (less than 5 percent) is assumed to infiltrate directly into the low-permeability substrate beneath the Leach Piles footprint (SRK Consulting, Inc. 2019b).

A groundwater capture zone currently exists around the pit where the drawdown of groundwater levels around the pit results in steep groundwater flow gradients toward the Open Pit such that all groundwater flow within this zone is captured and flows (and eventually discharges into) the Open Pit. Residual drawdown is predicted to persist around the pit during the closure and post-closure periods. As a result, the groundwater capture zone is predicted to persist in the area around the pit over the closure and post-closure period. Most of the seepage that infiltrates to groundwater beneath the facility during the operation, closure, and post-closure periods would flow into the Open Pit. At 500 years post-closure, an estimated 72 percent of the facility would be within the groundwater capture zone and would flow toward and ultimately discharge into the pit lake. The remaining 28 percent of the seepage that infiltrates to groundwater would be located outside of the groundwater capture zone. For this area, the seepage would enter and mix with the groundwater system and flow west toward Pinto Creek. The portion of the seepage that is predicted to flow toward Pinto Creek has the potential to degrade groundwater quality west of the facility and could potentially affect the water quality in Pinto Creek.

Waste Rock Facilities Water Quality Impacts

Planned reclamation activities for the waste rock dumps would be the same as summarized for the no-action alternative. Similar to the no-action alternative, the basic observations for historical, existing waste rock dumps apply under alternative 1 and the actual release of acid rock drainage products from waste rock is dependent upon the presence of sufficient water to result in discharge from the facility. However, under alternative 1, potential impacts from waste rock facilities could increase due to the increased volume of waste rock associated with the approximate 7-year extension of active mining operations under alternative 1.

Pit Lake Water Quality Impacts

For alternative 1, the water quality of the pit lake on private land is predicted to have low pH (2.02–2.22 standard units), high sulfate concentrations (20,336–32,814 milligrams per liter), and high metal concentrations over the simulated post-mining period (table 3-132). Although chemical weathering of pit wall rock is anticipated to provide a source of chemical loading to the lake, the chemical composition of the lake is fundamentally dictated by the addition of pregnant leach solution. Because the pit lake is expected to behave as a strong hydraulic sink, the pit lake water would be fully contained within the pit on private land and would not discharge to groundwater or surface water resources outside the pit boundaries. An ecological risk assessment was used to evaluate risk to terrestrial and avian life from potable consumption and interaction with the pit lake water quality (SRK Consulting, Inc. 2019d). The results of the ecological risk assessment and the evaluation of potential impacts on terrestrial and avian life are provided in section 3.3, "Biological Resources."

Table 3-132. Predicted pit lake water quality (alternative 1)

Analyte (milligrams per liter unless noted)	Arizona Drinking Water Quality Standards[133]	Year 1	Year 5	Year 10	Year 70	Year 180	Year 500
pH (standard unit)	5.0 to 9.0	2.02	2.11	2.15	2.2	2.15	2.22
Aluminum	-	2817	2221	1996	1688	1980	1753

[133] Arizona primary maximum contaminant levels for surface water unless otherwise noted (included for comparative purposes).

Analyte (milligrams per liter unless noted)	Arizona Drinking Water Quality Standards[133]	Year 1	Year 5	Year 10	Year 70	Year 180	Year 500
Antimony	0.006	0.004	0.004	0.004	0.005	0.008	0.02
Arsenic	0.05	0.042	0.033	0.03	0.052	0.092	0.344
Barium	2	0.001	0.002	0.002	0.002	0.002	0.002
Beryllium	0.004	0.918	0.715	0.641	0.472	0.588	0.638
Boron	1.4	0.028	0.045	0.051	0.104	0.173	0.366
Cadmium	0.005	1.36	1.06	0.95	0.7	0.81	0.81
Calcium	-	72	83	89	97	88	90
Chloride	-	95	82	79	83	117	196
Chromium	0.1	0.27	0.21	0.19	0.15	0.2	0.23
Copper	1.3	165	128	115	83	92	89
Fluoride	4	582	453	406	277	329	339
Iron	-	532	414	371	253	300	256
Lead	0.05	0.009	0.007	0.006	0.005	0.006	0.007
Magnesium	-	3494	2733	2453	1842	2168	2173
Manganese	0.98	727	566	507	386	494	559
Mercury	0.002	0.00011	0.00011	0.00012	0.00015	0.00025	0.00052
Nickel	0.1	8.3	6.5	5.8	4.3	5	4.9
Nitrate-N	10	0.42	0.51	0.65	1.25	2.55	5.97
Selenium	0.05	0.178	0.139	0.125	0.094	0.106	0.111
Silicon	-	32	29	29	31	44	44
Silver	0.035	0.02	0.017	0.016	0.01	0.012	0.023
Sulfate	250[134]	32,814	25,695	23,065	20,336	24,386	22,459
Thallium	0.002	0.00202	0.0017	0.0017	0.0013	0.0019	0.0039
Uranium	0.03	3.4	2.7	2.4	4.8	6.9	6.8
Zinc	2.1	266	207	185	136	160	158

Source: SRK Consulting, Inc. 2019c; Arizona Department of Environmental Quality 2019c

3.21.4.3.4 Water Rights

There are 26 surface water rights in the alternative 1 drawdown area that include 17 used for livestock, 7 used for stock and wildlife, and 1 (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife (table 3-131 and map 3-36 in appendix A). Of these 26 water rights, 18 are owned by the Forest Service and eight are owned by mining companies. Nine of these 26 surface water rights also occurred within the projected drawdown area resulting from pumping between 2013 and 2018 (transient period), and 25 of the 26 water rights also occur within the projected drawdown area under the no-action alternative.

The actual impacts on individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only those waters sustained by discharge from the regional groundwater system would be likely to be affected. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right.

[134] Federal secondary maximum contaminant level (non-enforceable)

Similar to the no-action alternative, there are no anticipated impacts on drinking water sources or private wells.

3.21.4.4 **Proposed Action – Direct and Indirect Impacts**

Under the proposed action there would be 1,087 acres of new disturbance on private land and 229 acres of new disturbance on National Forest System lands, resulting in a total of 5,232 acres of disturbance at the Pinto Valley Mine (4,436 total acres on private land and 795 total acres on National Forest System lands).

Most of the disturbed areas at the Pinto Valley Mine currently fall within the non-discharging boundary. Of the 4,961 acres of surface disturbance in the Upper Pinto Creek subwatershed as a result of the proposed action, 4,215 acres of that disturbance would be within the non-discharging boundary. Runoff from the remaining 746-acre disturbance area in the Upper Pinto Creek subwatershed would discharge to Pinto Creek. Under existing conditions, there are 659 acres of disturbance within the discharging area. There would be an increase of surface disturbance within the discharging portion of the Pinto Valley Mine of 87 acres under the proposed action. The impacts of the surface disturbance under the proposed action would be similar to those under the no-action alternative and would likely not be measurable.

3.21.4.4.1 Groundwater Quantity

The predicted changes in groundwater levels under the proposed action indicate the drawdown area is predicted to continue to expand during the post-mining period from 23.8 square miles at the end of mining (map 3-40 in appendix A) to 37.9 square miles at 100 years post-closure (map 3-41 in appendix A). At the 100-year post-mining timeframe, the proposed action drawdown area is 6 percent larger than under the no-action alternative scenario, and 1 percent larger than under the alternative 1 scenario.

Similar to the no-action alternative and alternative 1, the model also predicts that mounding (an increase in groundwater levels compared to conditions at the end of 2012) would occur beneath Tailings Storage Facility No. 4 and in the Haunted Canyon area at the end of mining (map 3-40 in appendix A). Mounding beneath the tailings storage facilities results from seepage out of the base of the unlined facility; mounding in Haunted Canyon results from Carlota's mitigation discharges to supplement surface flows. The mounding beneath Tailings Storage Facility No. 4 is predicted to dissipate prior to the 25-years post-mining timeframe (SRK Consulting, Inc. 2019b).

The maximum areal extent of the 5-foot drawdown contour under the proposed action scenario is presented on map 3-35 in appendix A. This map shows the predicted outer limit of the 5-foot drawdown contour as determined by overlaying a series of 5-foot drawdown contours for representative points in time over the 100-year post-mining period (SRK Consulting, Inc. 2019b). The maximum drawdown area under the proposed action is similar to, but slightly larger (particularly toward the northwest) than, the maximum drawdown areas projected under the no-action alternative and alternative 1.

The groundwater model simulations predict a pit lake on private land would start to develop in 2038 during the first year after Open Pit mining ceases as a result of passive inflow of groundwater. The pit lake is projected to reach 95 percent of full recovery within approximately 220 years after closure (figure 3-19). The projected area of the final pit lake is shown on map 3-37 in appendix A, and the predicted surface area, volume, groundwater inflow, and evaporation rates at full recovery are summarized in table 3-128.

In comparison to the pit lake predicted to develop under the no-action alternative and alternative 1, the proposed action pit lake would be deeper and have a larger surface area and volume and proportionally larger rate of groundwater inflow and net evaporation. At full recovery, the pit lake is predicted to have a groundwater inflow rate of 121 gallons per minute (of total inflow rate of 396 gallons per minute from all sources) and evaporation rate of 392 gallons per minute (table 3-128). The pit lake is expected to behave as a strong hydraulic sink (hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater system) (SRK Consulting, Inc. 2019b).

3.21.4.4.2 Surface Water Quantity

Storm Water Control

Potential impacts related to the design and maintenance of storm water control features during operation, closure, and post-closure would be the same as described under alternative 1. In addition, similar to alternative 1, Pinto Valley Mining Corp. has developed a “Post-Closure Tailings Stormwater Control, Inspection, and Maintenance Plan” (see appendix H, “Environmental Protection Measures, Monitoring, and Mitigation”) for the project. The plan was developed to address concerns regarding the long-term, post-closure monitoring and maintenance of storm water control features on Tailing Storage Facilities No. 3 and No. 4. The plan describes inspection of the storm water management system and identifies triggers for maintenance and repair and agency reporting requirements.

Perennial Stream Water Quantity Impacts

Potential impacts on streams were evaluated by (1) using available baseline data to identify perennial stream reaches located within the drawdown area; and (2) performing model simulations of baseflow reduction at Pinto Creek at the Magma Weir monitoring gage. The drawdown is projected to encompass a total of 5.86 miles of perennial stream length that includes portions of Pinto Creek (4.80 miles), Miller Springs Gulch (0.82 mile), and an unnamed tributary to Pinto Creek (0.25 mile) (table 3-130). These results are similar to but slightly larger than those defined under the no-action alternative and alternative 1. The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. A reduction in baseflows would likely affect the perennial stream reach (reduce the length of or eliminate the perennial stream reach affected by drawdown).

Model simulations predict that impacts on baseflow occurred as a result of pumping from the Peak Well field during the 2013–2018 period, would continue at slightly greater magnitude under the no-action alternative (2019–2022) and alternative 1 (2019–2027), and would continue at a similar magnitude until pumping ceases under the proposed action (2038) (figure 3-23). Continued pumping from the Peak Well field under the proposed action scenario is predicted to extend the duration of the predicted impacts on baseflow for an additional 19 years compared to the no-action alternative and an additional 12 years compared to alternative 1. The potential impacts on baseflow and on perennial stream flow in Pinto Creek in the affected area would be the same as those described under the no-action alternative in that long-term reduction in baseflow would likely result in a measurable reduction in flow (or elimination of surface flow) that would be particularly noticeable during the low-flow periods. As a consequence, segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration.

Recovery of groundwater discharge (baseflow) to Pinto Creek is predicted to follow the same pattern as described under the no-action alternative and alternative 1 over the closure and post-closure periods (figure 3-21). During the first 10 years after groundwater pumping ceases, the baseflow is predicted to fully recover to approximately 1,070 gallons per minute (the pre-pumping 2013 flow rate) as a result of continued high infiltration from Tailings Storage Facility No. 4. From 10 years to 100 years post-closure, the baseflow is predicted to gradually decrease from approximately 1,070 gallons per minute to approximately 430 gallons per minute due to combined effects of residual drawdown and progressively reduced infiltration from draindown of Tailings Storage Facility No. 4. The predicted baseflow rate of 430 gallons per minute at 100-years post mining represents an approximate 60 percent reduction in baseflow as compared to the simulated pre-pumping conditions (1,070 gallons per minute) at the start of 2013. After 100 years post-mining, the baseflow is predicted to eventually reach a steady-state condition of approximately 407 gallons per minute, which represents a 62 percent reduction in flow compared to conditions at the start of 2013. The predicted long-term reduction of baseflow in Pinto Creek during the post-mining period is attributed to residual drawdown from groundwater pumping and Open Pit mining activities.

Similar to under the no-action alternative and alternative 1, the reduction of stream flow under the proposed action in segments of Pinto Creek could adversely affect the surface water quality in those reaches, particularly during low-flow conditions. Other conditions such as potential future climate change (warmer temperatures) may also affect perennial stream resources in the same manner discussed under the no-action alternative.

Similar to alternative 1, Pinto Valley Mining Corp. would apply the “Comprehensive Water Resource Monitoring and Mitigation Plan” for the proposed mine expansion (see appendix H, “Environmental Protection Measures, Monitoring, and Mitigation”).

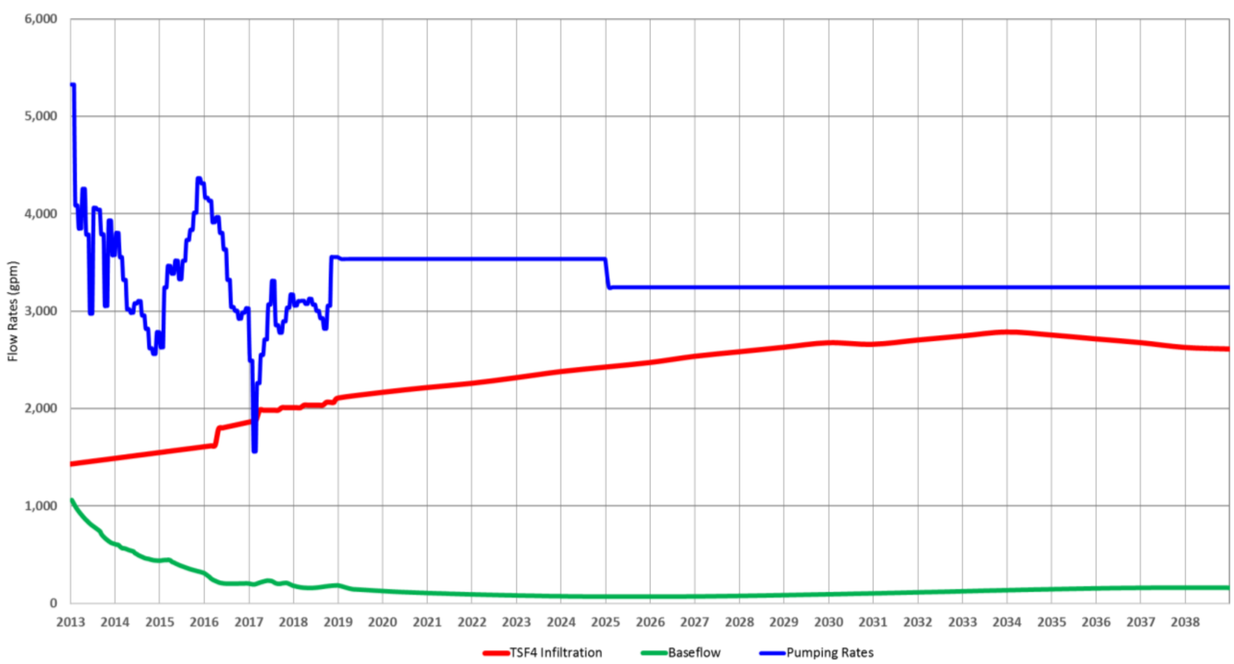


Figure 3-23. Simulated pumping, Tailings Storage Facility No. 4 infiltration, and baseflow at the Magma Weir – proposed action (2013–2038)

Source: SRK Consulting, Inc. 2019b

Perennial Springs Water Quantity Impacts

There are 19 inventoried spring sites (7 wet and 12 dry) within the drawdown area (table 3-129 and map 3-35 in appendix A). The seven wet (flowing) springs include six springs that also occur within the drawdown area defined under the no-action alternative. Drawdown or changes in groundwater levels are not expected to affect the 11 dry or ephemeral spring sites. The seven wet (flowing) springs include six springs that also occur within the drawdown area defined under the no-action alternative and alternative 1. Potential impacts on flow in these six springs would be the same as described under the no-action alternative. The seventh perennial spring (SP21) only occurs within the proposed action drawdown area.

As described under the no-action alternative, which states that three of the six perennial springs (SP47, SP53, and SP77) appear to be controlled by seepage from adjacent unlined tailings facilities and are predicted to dry up as seepage is reduced during the post-closure period. The other four perennial springs (SP21, SP46, SP48, and SP49) are apparently natural springs that could be affected by drawdown.

Potential impacts on the natural perennial springs would be the same as those described for the no-action alternative and alternative 1. In summary, there is a potential risk that drawdown associated with groundwater pumping for the mine could reduce baseflow to these four perennial springs identified within the drawdown area. Depending on the severity of the reductions in flow, this could result in the drying up of springs and a reduction in the size of any associated wet soil or wetland vegetation areas. The groundwater modeling results for the proposed action indicate that residual drawdown would persist for at least 100 years after mine closure. Therefore, any reduction in flow at these spring sites resulting from mine-induced drawdown would likely persist for the foreseeable future.

As described above, Pinto Valley Mining Corp. has developed a “Comprehensive Water Resource Monitoring and Mitigation Plan” for the proposed mine expansion (see appendix H, “Environmental Protection Measures, Monitoring, and Mitigation”) to address potential impacts on surface water resources.

Waters of the United States

Similar to the no-action alternative and alternative 1, the proposed action would not result in any direct disturbance including filling, excavation, or any other surface disturbance to jurisdictional drainages. As such, there are no anticipated impacts on jurisdictional waters of the United States.

3.21.4.4.3 Groundwater and Surface Water Quality

Tailings Storage Facilities Water Quality Impacts

The potential impact on water resources from the tailings storage facilities under proposed action would be similar to but greater than those described for the no-action alternative and alternative 1. Owing to the expanded volume of tailings storage under the proposed action, a greater volume of neutral pH, high total dissolved solids, high sulfate leachate would be generated and stored in the larger facility. During mining, the high total dissolved solids, high sulfate leachate would continue to drain through the tailings, seep out of the base of the facility, and enter the groundwater flow system. A series of existing groundwater production wells that are part of the Peak Well field are used to capture and pump back the high-sulfate water immediately downgradient from Tailings Storage Facility No. 4 and Tailings Storage Facility No. 3. This pump-back system serves to prevent high-sulfate process water in the tailings facilities from migrating outside of the project area or discharging into Pinto Creek.

As part of closure and reclamation, the top surface for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would be covered with a minimum of 1 foot of cover material and revegetated, and the side slopes would be covered with a minimum of 2 feet of cover material followed by 6 inches of rock armor. Seepage from Tailings Storage Facility No. 3 would continue at progressively reduced rates during the closure and post-closure period until about 2050 (under the no-action alternative, alternative 1, and proposed action). Seepage resulting from draindown from Tailings Storage Facility No. 4 is predicted to continue at progressively reduced rates until approximately year 2100 when the flow is projected to reach a long-term steady-state condition (SRK Consulting, Inc. 2019b). The length of time estimated to reach steady-state under the proposed action is approximately 20 years longer than predicted under alternative 1.

Similar to the no-action alternative and alternative 1, the current closure and post-closure strategy does not include a commitment for the construction, long-term operation, and maintenance of a pump-back (seepage capture system) and treatment system to manage the predicted seepage over the post-closure period for Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4. Without long-term capture and treatment, seepage from Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 would likely migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek. The high total dissolved solids, high sulfate concentrations in the seepage from the facilities would likely degrade water quality in the groundwater system and in Pinto Creek downgradient of these facilities. Therefore, under the proposed action there is a potential for long-term impacts on groundwater and surface water quality during the post-closure period. Because the tailings solids are considered to be likely to generate acid rock drainage, discharge of low pH water with variable metal concentrations could potentially occur. However, the combination of reclamation and the relatively arid climate is expected to limit the influx of water through tailings after initial draindown. Therefore, problematic discharge of acid rock drainage negatively affecting water resources is not regarded as a significant threat.

Similar to alternative 1, Pinto Valley Mining Corp. has developed a “Post-Closure Tailings Seepage Management and Mitigation Plan” for the project to address concerns regarding seepage from unlined Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 (see appendix H, “Environmental Protection Measures, Monitoring, and Mitigation”).

Leach Pile Water Quality Impacts

There would be no change to the currently authorized operation and planned closure of the Leach Pile facility under the proposed action. Potential impacts associated with the closure of the Leach Pile facility would be similar to those described under the no-action alternative and alternative 1. The footprint of the Leach Pile facility is the same under all alternatives. However, because the long-term residual drawdown area is larger under the proposed action compared to the no-action alternative and alternative 1, the percentage of the facility area that would be within the groundwater capture zone is larger under the proposed action (94 percent) compared to the no-action alternative (71 percent) and alternative 1 (72 percent). Consequently, the facility area located outside of the groundwater capture zone is smaller (6 percent) compared to the no-action alternative (28 percent) and alternative 1 (29 percent). Therefore, the rate of seepage that would enter and mix with the groundwater system and flow west toward Pinto Creek would be less than projected under the no-action alternative and alternative 1. As with the no-action alternative and alternative 1, the small portion of the seepage that is predicted to flow toward Pinto Creek has the potential to degrade groundwater quality west of the facility and could potentially affect the water quality in Pinto Creek.

Waste Rock Facilities Water Quality Impacts

Similar to alternative 1, the basic observations for historical, existing waste rock dumps apply under alternative 1 and the actual release of acid rock drainage products from waste rock is dependent upon the presence of sufficient water to result in discharge from the facility. However, under the proposed action, potential impacts from waste rock facilities could increase due to the increased volume of waste rock associated with the approximate 12-year extension of active mining operations under the proposed action compared to alternative 1.

Pit Lake Water Quality Impacts

The water quality of the pit lake on private land is predicted to have a low pH, high sulfate concentrations, and high metal concentrations over the entire post-mining period (table 3-133). Compared to both the no-action alternative and alternative 1, the proposed action would result in a larger pit with a larger pit lake and a larger pit lake volume; this larger volume would act to dilute the effect of pregnant leach solution. As a result, the proposed action pit lake water quality is predicted to be better than expected for the pit lake that would develop under the no-action alternative and alternative 1. For comparison, over the first 100 years following closure, the alternative 1 pit lake is predicted to have a pH ranging from 2.0 to 2.2, sulfate range from 19,574 to 32,814 milligrams per liter. In comparison, the proposed action pit lake is predicted to have a pH range from 2.3 to 2.4, and sulfate range of 12,688 to 15,459 milligrams per liter. As with the no-action alternative and alternative 1 pit lake, the proposed action pit lake water would be fully contained within the pit on private land and would not discharge to groundwater or surface water resources outside the pit boundaries. An ecological risk assessment was used to evaluate risk to terrestrial and avian life from potable consumption and interaction with the pit lake water quality. The results of the ecological risk assessment and the evaluation of potential impacts on terrestrial and avian life are provided in section 3.3, "Biological Resources."

Table 3-133. Predicted pit lake water quality (proposed action)

Analyte (milligrams per liter unless noted)	Arizona Drinking Water Quality Standards[135]	Year 1	Year 5	Year 10	Year 70	Year 180	Year 500
pH (standard unit)	5.0 to 9.0	2.28	2.29	2.37	2.34	2.31	2.44
Aluminum	-	1385	1330	1086	1120	1250	960
Antimony	0.006	0.0027	0.0027	0.0027	0.0035	0.0051	0.0114
Arsenic	0.05	0.0211	0.021	0.017	0.038	0.061	0.226
Barium	2	0.0022	0.0023	0.0025	0.0023	0.0022	0.0024
Beryllium	0.004	0.44	0.42	0.34	0.3	0.36	0.0001
Boron	1.4	0.06	0.06	0.07	0.1	0.14	0.28
Cadmium	0.005	0.65	0.62	0.51	0.45	0.5	0.45
Calcium	-	110	112	125	122	114	123
Chloride	-	62	62	58	69	91	154
Chromium	0.1	0.132	0.128	0.106	0.097	0.124	0.135
Copper	1.3	78	75	62	53	55	47
Fluoride	4	278	267	219	177	200	188
Iron	-	247	236	188	152	170	121
Lead	0.05	0.0045	0.0044	0.0037	0.0032	0.0038	0.0045
Magnesium	-	1689	1626	1343	1204	1339	1215
Manganese	0.98	346	333	272	250	303	316
Mercury	0.002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004
Nickel	0.1	4	3.8	3.1	2.8	3	2.7
Nitrate-N	10	0.59	0.71	0.78	1.4	2.38	5.91
Selenium	0.05	0.086	0.083	0.068	0.061	0.065	0.063
Silicon	-	25	26	25	31	44	46

[135] Drinking Water Quality Standards (Arizona primary maximum contaminant levels for surface water unless noted otherwise) included for comparative purposes.

Analyte (milligrams per liter unless noted)	Arizona Drinking Water Quality Standards[135]	Year 1	Year 5	Year 10	Year 70	Year 180	Year 500
Silver	0.035	0.012	0.012	0.01	0.008	0.009	0.017
Sulfate	250[136]	15,939	15,328	12,608	13,604	15,367	12,688
Thallium	0.002	0.0011	0.0011	0.001	0.0009	0.0012	0.0024
Uranium	0.03	1.7	1.6	1.3	3.4	4.5	4.3
Zinc	2.1	127	122	100	88	98	88

Source: SRK Consulting, Inc. 2019c; Arizona Department of Environmental Quality 2019c

3.21.4.4.4 Water Rights

There are 26 surface water rights in the proposed action drawdown area that include 17 used for livestock, 7 used for stock and wildlife, and 1 (the Tonto National Forest Pinto Creek in-stream flow) used for recreation and wildlife (table 3-131 and map 3-36 in appendix A). Nine of these 26 surface water rights also occurred within the projected drawdown area resulting from pumping between 2013–2018 (transient period), and 25 of the 26 water rights also occur within the projected drawdown area under the no-action alternative. The same 26 water rights identified within the drawdown area under the proposed action were identified within the projected drawdown area under alternative 1.

The actual impacts on individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only those waters sustained by discharge from the regional groundwater system would be likely to be affected. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right. Similar to the no-action alternative and alternative 1, there are no anticipated impacts on drinking water sources or private wells.

The results of the groundwater modeling indicate that the duration of impacts on baseflow in Pinto Creek would persist for a longer period under the proposed action compared to the no-action alternative and alternative 1. For example, the peak recovery in baseflow is predicted to occur in year 2028 under the no-action alternative, year 2035 under alternative 1, and 2048 under the proposed action (figure 3-21). Therefore, under the proposed action, potential impacts on the Forest Service in-stream flow right could persist for a longer period compared to the no-action alternative and alternative 1.

3.21.4.5 <u>**Cumulative Impacts**</u>

The cumulative impacts analysis area for water resources and hydrogeochemistry includes the entire Pinto Creek watershed area, as well as a small portion of the Miami Wash and Middle Pinal Creek watersheds directly east of the Pinto Valley Mine. The cumulative impacts analysis area encompasses the greatest geographic extent of surface disturbance, water use, discharge, and other project-related activities under all of the alternatives that could affect water resources and water users and the hydrologic basins in which those activities occur. The cumulative impacts analysis area encompasses approximately 200 square miles (127,000 acres). The cumulative impacts timeframe for water resources encompasses the operational life of the mine under the alternatives and a 100-year post-mining period, which coincides with the post-mining timeframe included in the groundwater modeling and represents

[136] Federal secondary maximum contaminant level (non-enforceable).

the greatest timeframe under all of the alternatives where residual drawdown could persist after mine closure (SRK Consulting, Inc. 2019b).

Section 3.21.3, “Affected Environment,” describes the present effects of past actions that warrant consideration and that could contribute to cumulative effects on water resources. The primary types of past actions that have resulted in present effects that contribute to cumulative impacts on water resources include historical mining operations, linear infrastructure and utilities, livestock grazing, and wildfires.

The groundwater modeling results presented in the direct and indirect impacts analysis include past and present water use and discharge activities in the cumulative impacts analysis area, such as water supply pumping and mitigation activities at the adjacent Carlota Mine and pumping by other parties in the cumulative impacts analysis area. As such, the results of the groundwater modeling account for contributions to cumulative impacts from past disturbance and activities in the cumulative impacts analysis area.

Existing surface disturbance within the water resource cumulative impacts analysis area encompasses an estimated 5,003 acres, which represents approximately 4 percent of the 127,000 acres in the cumulative impacts analysis area. The proposed action would result in an estimated total of 1,317 acres of additional surface disturbance in the cumulative impacts analysis area. There are no identified reasonably foreseeable actions that would occur within the cumulative impacts analysis area that would contribute to cumulative surface disturbance. As a result, the total surface disturbance in the cumulative impacts analysis area is estimated at 6,320 acres, which is approximately 5 percent of the cumulative impacts analysis area. In general, the majority of this cumulative surface disturbance would be contained within the non-discharging boundary of the Upper Pinto Creek subwatershed. As such, runoff and sedimentation resulting from the cumulative surface disturbance would typically be contained within impoundments and water containment systems and cumulative impacts on Pinto Creek from disturbance, erosion, and sedimentation are expected to be minimal.

This cumulative analysis considers the present effects of past actions described in section 3.21.3, “Affected Environment,” in combination with the present and reasonably foreseeable future actions that could affect water resources in the future as identified in table 3-3 and further described in table 3-2.

3.21.4.5.1 Groundwater Quantity

Present effects of the relevant past and present actions have resulted in the groundwater quantity conditions presented in section 3.21.3, “Affected Environment.” The calibrated groundwater model was used to simulate the cumulative change in groundwater levels and flow rates that are projected to occur in the future as a result of mine development and groundwater extraction activities under the alternatives. As such, the cumulative impacts on groundwater quantity and drawdown (including Pinto Creek) would generally be the same as those described in sections 3.21.4.2 through 3.21.4.4, because all of the model drawdown predictive simulations presented in the direct and indirect impacts analysis represent cumulative effects in that they incorporate other major water pumping stresses in the cumulative impacts analysis area.

The drawdown results for all alternatives indicate the cumulative drawdown area is predicted to continue to expand during the 100-year post-mining period. The maximum areal extent of the cumulative 5-foot drawdown contour under the alternatives, including other past, present, and reasonably foreseeable actions, is presented on map 3-35 in appendix A. This map show the predicted outer limits of the 5-foot drawdown contour as determined by overlaying a series of 5-foot drawdown contours for representative points in time over the 100-year post-mining period (SRK Consulting, Inc. 2019b) for each alternative.

Present and reasonably foreseeable actions that could contribute to cumulative water resource impacts in the future are identified in table 3-3 and further described in table 3-2. Similar to surface water quantity cumulative effects, reasonably foreseeable actions that could result in additional drawdown and associated impacts on groundwater quantity could include ongoing activity at the Carlota Mine and changes in grazing permit authorizations that changes livestock water use, water use for fire suppression activities, and other minor uses of water in the cumulative impacts analysis area. However, water use for these reasonably foreseeable actions would generally be negligible in relation to other past and present groundwater water uses that are captured in the groundwater modeling. In addition, water resource management direction in the pending Tonto National Forest Plan Revision could result in and contribute to cumulative impacts on groundwater quantity if management in the forest plan revision results in increased development and water use, more or less stringent water management practices, and other management actions and decisions that affect groundwater quantity.

Overall, the potential cumulative impacts on groundwater quantity in the cumulative impacts analysis area would generally be the same as those presented in sections 3.21.4.2 through 3.21.4.4 and in appendix E, “Water Resources and Geochemistry Technical Report,” because the analysis of direct and indirect impacts incorporates other major water uses in the cumulative impacts analysis area and the other reasonably foreseeable actions identified above are not anticipated to consume notable amounts of water in relation to other water uses included in the modeling.

The differences in cumulative impacts on surface water quantity among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.21.4.4. Continued pumping from the Peak Well field under the proposed action would extend the duration of operational water use and is predicted to extend the duration of impacts on groundwater drawdown for an additional 19 years compared to the no-action alternative and an additional 12 years compared to alternative 1. Due to the extended life of the mine and associated increases in operational water use, the maximum areal extent of the cumulative 5-foot drawdown contour under the proposed action is predicted to be similar to, but slightly larger (particularly toward the northwest) than, the maximum drawdown areas projected under the no-action alternative and alternative 1. Additionally, the pit lake predicted to develop under the proposed action would be deeper and have a larger surface area and volume and proportionally larger rate of groundwater inflow and net evaporation than under the no-action alternative or alternative 1.

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on groundwater quantity compared to the other alternatives.

3.21.4.5.2 Surface Water Quantity

Present effects of the relevant past and present actions have resulted in the surface water quantity conditions presented in section 3.21.3, “Affected Environment.” The cumulative impacts on surface water quantity (including Pinto Creek) would generally be the same as those described in sections 3.21.4.2 through 3.21.4.4, because all of the model drawdown predictive simulations presented in the direct and indirect impacts analysis incorporate other major water pumping stresses in the cumulative impacts analysis area, including water supply pumping and mitigation activities at the adjacent Carlota Mine and pumping by other parties in the cumulative effects analysis area. Drawdown associated with operational water use under the proposed action and alternatives is projected to encompass perennial stream lengths that include portions of Pinto Creek, Miller Springs Gulch, and an unnamed tributary to

Pinto Creek (table 3-129). Under all alternatives there is a potential risk that drawdown associated with groundwater pumping for the mine could reduce baseflow to four perennial springs identified within the drawdown area.

Present and reasonably foreseeable actions that could contribute to cumulative water resource impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable action that could contribute to cumulative impacts on water quantity is the Carlota Mine. As noted above, water supply pumping from the Carlota Mine is incorporated into the groundwater model drawdown predictive simulations for the alternatives analyzed in detail in this final EIS and impacts on water quantity are described in sections 3.21.4.2 through 3.21.4.4. Other present and reasonably foreseeable actions that could result in additional drawdown and associated impacts on surface water quantity could include changes in grazing permit authorizations that change livestock water use, water use for fire suppression activities, and other minor uses of water in the cumulative impacts analysis area. However, water use for these reasonably foreseeable actions would generally be negligible in relation to other past and present water uses. In addition, water resource management objectives in the pending Tonto National Forest Plan Revision could result in and contribute to cumulative impacts on surface water quantity if changes in management direction result in increased development and water use, more or less stringent water management practices, and other management actions and that affect water resources.

In addition to the identified reasonably foreseeable actions, potential future climate change and associated warmer temperatures and more extreme weather events may also affect surface water quantity by increasing surface water losses through evaporation. If climate change results in a long-term reduction in the average annual precipitation, or prolonged or increased severity of drought cycles, in the Pinto Creek watershed, this would result in a reduction in natural recharge to groundwater and corresponding reduction in groundwater levels that control groundwater discharge to the surface water as baseflow. A reduction in precipitation would also result in reduced overland flow and runoff that contribute to stream flows.

Overall, the potential cumulative impacts on surface water quantity in the cumulative impacts analysis area would generally be the same as those presented in sections 3.21.4.2 through 3.21.4.4 and in appendix E, "Water Resources and Geochemistry Technical Report," as the analysis of direct and indirect impacts incorporates other major water uses in the cumulative impacts analysis area and the reasonably foreseeable actions that would contribute to cumulative effects (see table 3-3) are not anticipated to consume notable amounts of water in relation to other water uses included in the modeling.

The differences in cumulative impacts on surface water quantity among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.21.4.4. Continued pumping from the Peak Well field under the proposed action would extend the duration of operational water use and is generally predicted to extend the duration of impacts on baseflow and drawdown for an additional 19 years compared to the no-action alternative and an additional 12 years compared to alternative 1. Key differences among the alternatives when considering their specific incremental contributions to cumulative impacts are:

- The predicted expansion of mine-induced drawdown is anticipated to affect a slightly greater length of perennial stream reaches under the proposed action than under the no-action alternative or alternative 1.
- The predicted drawdown area for the proposed action encompasses and could reduce the flow of one additional perennial spring in addition to the six potentially affected perennial springs

that occur within the predicted drawdown areas of the no-action alternative and the proposed action.

Based on the factors listed above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on surface water quantity compared to the other alternatives.

The degree to which climate change could affect evaporation rates, precipitation, and surface water quantity is uncertain; however, the degree to which climate change could contribute to cumulative impacts is generally relative to the amount of changes in average and extreme temperatures, annual precipitation, extreme weather events (such as drought), and other climate change effects.

3.21.4.5.3 Groundwater and Surface Water Quality

Present effects of the relevant past and present actions have resulted in the groundwater and surface water quality conditions presented in section 3.21.3, "Affected Environment." Potential impacts on groundwater and surface water quality associated with the alternatives are described in sections 3.21.4.2 through 3.21.4.4. The primary impacts on groundwater and surface water quality associated with the alternatives include drainage of a high volume of neutral pH, high total dissolved solids, and high sulfate water from the tailings storage facilities into the groundwater/surface water system during the closure and post-closure periods. Discharge from tailings storage facilities could develop acid rock drainage characteristics over time depending on the degree and success of reclamation that could limit oxygen and water ingress. Acidic seepage from the tailings storage facilities could be attenuated if it flows through Apache Leap Tuff (dacite), which has been shown to possess acid-neutralizing characteristics (SRK Consulting, Inc. 2021b).

Present and reasonably foreseeable actions that could contribute to cumulative water resource impacts in the future are identified in table 3-3 and further described in table 3-2. The primary present and reasonably foreseeable actions that could contribute to cumulative impacts on water quality include the Carlota Mine, Gibson Mine, and Pinal Creek Groundwater Remediation Project. As active mining operations at the Carlota Mine wind down and monitoring and mitigation activities continue, groundwater and surface water quality in the analysis area could improve over time. Similarly, additional remedial activities at the Gibson Mine could reduce lingering contamination and improve groundwater and surface water quality. Other reasonably foreseeable actions that could contribute to cumulative impacts on groundwater and surface water quality include future livestock grazing and associated potential effects on groundwater and surface water quality (such as discharge of fecal matter into surface water features) and potential future wildfires and associated impacts on sedimentation and erosion that can affect water quality. In addition, potential changes to travel management in the pending Tonto National Forest Motorized Travel Management Plan could contribute to cumulative effects on water quality (such as sedimentation) from vehicle activity and roads depending on the degree to which management direction affects the road network, motorized vehicle use, and vehicle activity in the cumulative impacts analysis area. In addition, water resource management direction in the pending Tonto National Forest Plan Revision could result in and contribute to cumulative impacts on groundwater and surface water quality if resulting management allows increased development and water use, more or less stringent water management practices, and other management actions and decisions that affect groundwater and surface water quality.

Overall, the potential cumulative impacts on groundwater and surface water quality in the cumulative impacts analysis area would generally be the same as those presented in sections 3.21.4.2 through 3.21.4.4 and in appendix E, "Water Resources and Geochemistry Technical Report," as the analysis of direct and indirect impacts incorporates other major projects that affect groundwater and surface water quality and the other reasonably foreseeable actions identified above are not anticipated to notably contribute to discharge and contamination of groundwater and surface water quality.

The differences in cumulative impacts on surface water and groundwater quality among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.21.4.4. Key differences among the alternatives when considering their incremental contributions to cumulative impacts are:

- The greater maximum volume of the tailings storage facilities under the proposed action compared to the no-action alternative and alternative 1 would result in a greater volume of neutral pH, high total dissolved solids, high sulfate leachate that could migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek during the post-closure period.

Based on the factors above, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, would generally result in increased potential for cumulative impacts on groundwater and surface water quality compared to the other alternatives.

3.21.4.5.4 Water Rights

The cumulative impacts on water rights (including Pinto Creek) would generally be the same as those described in sections 3.21.4.2 through 3.21.4.4, because all of the model drawdown predictive simulations and impacts on flows presented in the direct and indirect impacts analysis incorporate other major water pumping stresses in the cumulative impacts analysis area, including water supply pumping and mitigation activities at the adjacent Carlota Mine and pumping by other parties in the cumulative effects analysis area.

Reasonably foreseeable actions that could result in additional drawdown and associated impacts on water rights would be the same as those discussed above in section 3.21.4.5.2, “Surface Water Quantity,” including changes in livestock grazing authorizations, fire suppression, other minor water uses in the cumulative impacts analysis area, changes in water management direction in the pending Tonto National Forest Plan Revision, and potential future climate change. The degree to which climate change could affect evaporation rates, precipitation, and water rights is uncertain; however, the degree to which climate change could contribute to cumulative impacts on water rights is generally relative to the amount of changes in average and extreme temperatures, annual precipitation, extreme weather events (such as drought), and other climate change effects.

The differences in cumulative impacts on water rights among the alternatives would generally be commensurate with the differences in direct and indirect impacts among the alternatives described in sections 3.21.4.2 through 3.21.4.4. All alternatives would have similar impacts on surface water rights that are dependent on groundwater discharge; however, the predicted drawdown areas for alternative 1 and the proposed action impacts would include 26 surface water rights, one more than the no-action alternative drawdown area. Potential impacts on these water rights, including the Forest Service in-stream flow right for Pinto Creek, could persist for a longer duration under the proposed action compared to the no-action alternative and alternative 1 (19 more years or 12 more years, respectively).

Based on these factors, the proposed action, in combination with other past, present, and reasonably foreseeable future actions, is anticipated to result in greater cumulative impacts on water rights compared to the other alternatives.

3.21.5 Mitigation Measures

The Forest Service identified four mitigation measures to address potential adverse impacts on water resources. This section provides a summary of monitoring and mitigation measures for water resources. Refer to appendix H, "Environmental Protection Measures, Monitoring, and Mitigation," section 4.4.12, "Water Resources and Hydrogeochemistry," for additional information on the mitigation measures and the impacts being mitigated, the timing of the measures, the regulatory authority for the measures, and the potential effectiveness of the measures.

- **Mitigation Measure WR-1: Comprehensive Water Resource Monitoring and Mitigation Plan.** This plan addresses mine-related drawdown and potential contamination of water resources from mine-related facilities that could affect groundwater and surface water quantity and quality. This plan provides for a comprehensive approach to monitoring and tracking potential changes in groundwater quality and quantity in the shallow alluvial and deeper bedrock aquifers in and around the Pinto Valley Mine, surface water in Pinto Creek and selected tributaries, and selected seeps and springs. The plan also identifies monitoring triggers and mitigation measures, actions, and adaptive management that would be considered to reduce potential impacts.
- **Mitigation Measure WR-2: Post-Closure Tailings Seepage Management Plan.** This plan addresses the potential seepage resulting from draindown from Tailings Storage Facility No. 3, Tailings Storage Facility No. 4, and the Cottonwood Tailings Impoundment that is predicted to continue at progressively reduced rates for several decades after mine closure and then reach a low steady-state flow rate that would persist for the foreseeable future. The seepage may migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow in Pinto Creek. The high total dissolved solids and sulfate concentrations in the seepage from the facilities could degrade water quality in the groundwater system and in Pinto Creek downgradient of these facilities during the post-closure period and affect potential beneficial uses. This plan provides a comprehensive approach to managing post-closure tailings seepage, including information on the expected conditions of tailings storage facilities, modeling that has been performed to predict post-closure flow routes and water quality, planned post-closure tailings seepage monitoring, contingency plans for exceedances of water quality and site condition requirements, mitigation trigger thresholds, and adaptive management and contingency planning if there are monitored exceedances of thresholds.
- **Mitigation Measure WR-3: Watershed Workshop.** Pinto Valley Mining Corp. would host and facilitate meetings annually, or as deemed necessary, that would include other Pinto Creek stakeholders including basin surface water rights holders and other agencies as deemed appropriate based on vested rights and interests. The purpose of these meeting is to discuss Pinto Valley Mine water use and the water budget for the Pinto Valley watershed. This group would review observed and modeled surface water flows, collaboratively examine the causes for divergence, and could propose additional recommended monitoring and mitigation measures to minimize potential impacts, which would include reviewing options for acquisition of future water supplies from elsewhere within or outside the Pinto Creek basin in order to reduce the impacts on Pinto Creek surface resources from groundwater withdrawals. Workshop recommendations could pertain to actions including 1.) the design and implementation of any modifications to the monitoring plan; 2.) site-specific mitigation plans; or 3.) modifications to any implemented mitigation measures, if necessary. Pinto Valley Mining Corp. would publish the proceedings of the workshop in an annual report for the Forest Service's administrative project record.

- **Mitigation Measure WR-4: Water Rights Mitigation.** This measure would address mine-induced drawdown and well field pumping that could potentially reduce water levels and affect the active water rights within the projected drawdown areas. This measure would require Pinto Valley Mining Corp. to be responsible for monitoring groundwater levels between the mine and surface water rights within the projected mine-related and well field-related drawdown areas as part of the “Comprehensive Water Resource Monitoring and Mitigation Plan” (Mitigation Measure WR-1). Adverse impacts on water wells and surface rights would be identified and mitigated by Pinto Valley Mining Corp., as required under Arizona State law.

3.22 Other Required Disclosures

In addition to the analyses discussed previously in this chapter, the National Environmental Policy Act requires an evaluation of the potential impacts from the proposed action related to the relationship between local short-term and long-term productivity, unavoidable adverse impacts, and any irreversible or irretrievable commitment of resources. The following sections provide descriptions of these potential effects and Table 3-134 provides an evaluation of effects under the proposed action and alternatives for each resource area analyzed in detail for this EIS.

3.22.1 Short-term Uses and Long-term Productivity

The National Environmental Policy Act implementing regulations require consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). This portion of the National Environmental Policy Act regulations recognizes that short-term uses may have corollary opportunity costs in terms of forgone options and productivity continuing into the future. For this analysis, “short term” refers to the duration of active mining, whereas “long term” refers to an indefinite period extending beyond closure and final reclamation of the mine.

3.22.2 Unavoidable Adverse Effects

As required by Council on Environmental Quality regulations implementing the National Environmental Policy Act (40 CFR 1502.16), this EIS describes the adverse or significant environmental effects that cannot be avoided from implementation of the proposed action and alternatives. Table 3-134 identifies any direct, indirect, or cumulative effects that are both unavoidable and adverse.

3.22.3 Irreversible and Irretrievable Commitments of Resources

As required by the National Environmental Policy Act, table 3-134 describes any irreversible or irretrievable commitments of resources from implementing the proposed action and alternatives. Irreversible and irretrievable are defined in Forest Service Handbook 1909.15 as follows:

Irretrievable: A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible: A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods of time.

Table 3-134 Summary of Short-Term Uses and Long-Term Productivity, Unavoidable Adverse Effects, and Irreversible and Irretrievable Commitment of Resources by Resource Area

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Air Quality	No	Yes	No	Impacts on air quality for which maintenance of long-term productivity is a concern are not anticipated. Adverse ecosystem effects from nitrogen deposition in the Superstition Wilderness may be unavoidable but no air quality impacts are anticipated to be irreversible or irretrievable.
Biological Resources	Yes	Yes	Yes	Short-term uses of lands within Pinto Valley Mine would reduce the long-term productivity of vegetation communities and associated wildlife habitat. The proposed action would result in the greatest adverse effects on vegetation communities due to the larger acreage of vegetation clearing, followed by alternative 1, then the no-action alternative. Additionally, alteration of water drainage patterns as a result of mine-related activities could contribute to long-term loss of riparian vegetation along Pinto Creek under the alternatives. Due to the greater duration and magnitude of the reduction in Pinto Creek's baseflow predicted under the proposed action during the operational life of the mine, groundwater pumping for the proposed action could be a greater contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat than both the no-action alternative and alternative 1. Surface disturbance and clearing of vegetation would be an unavoidable adverse effect where facilities are expanded. The proposed action would result in the greatest reduction in long-term productivity of vegetation communities due to the larger acreage of vegetation clearing, followed by alternative 1, then the no-action alternative. Mining operations would also have unavoidable adverse effects on wildlife and special status species from dust creation, use of artificial lighting, and increased traffic levels, all of which present threats to vegetation and wildlife populations or habitat. Vegetation clearing to allow for mine-related activities would be an irretrievable commitment of vegetation, as the clearing would result in loss of existing vegetation until reclamation standards are met, which can take a substantial amount of time in semiarid ecosystems, as described in section 3.18.4. The proposed action would result in the greatest irretrievable commitment of vegetation communities due to the larger acreage of vegetation clearing, followed by alternative 1, then the no-action alternative. Most wildlife and special status species are likely to avoid Pinto Valley Mine during active mining operations due to habitat removal and human activity.
Greenhouse Gas Emissions and Climate Change	No	Yes	No	Ongoing mining operations would create greenhouse gas emissions from energy combusted on site and electricity generated off site that is used for Pinto Valley Mine activities. Greenhouse gas emissions contribute to global climate change and are an unavoidable adverse effect. The proposed action would contribute an estimated 3.7 million metric tons of carbon dioxide emissions throughout active mining operations and the post-closure period which would result in a greater cumulative contribution of greenhouse gases than either alternative 1 or the no-action alternative, primarily due to the longer operational life of the mine. Global climate change would also present unavoidable adverse effects on resources, as the change in climate conditions could increase the likelihood of water shortages and aquifer drawdown, surface water and groundwater contamination, and wildfire.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Cultural Resources	Yes	Yes	Yes	Short-term use of lands for operation of Pinto Valley Mine would have direct and indirect adverse effects on historic properties. The proposed action would result in adverse effects on long-term preservation of historic properties and result in unavoidable effects because the area of new surface disturbance could have an adverse effect on some or all of the 27 known historic properties. These 27 properties include the three historic properties that could be directly adversely affected by alternative 1, the 13 historic properties that are vulnerable to indirect effects under all alternatives due to their proximity to existing roads, and 11 additional sites that could be affected under the proposed action that would not be affected under alternative 1. The no-action alternative would not affect known historic properties. Under the proposed action, 18 historic properties will be protected from direct physical effects by their natural topographic setting. The historic properties treatment plan provides measures to protect an additional 14 historic properties and requires data recovery be completed at 14 historic properties prior to project activities that could affect these sites. Under alternative 1 and the proposed action, the section 106 process would apply and mitigate long-term impacts on historic properties on National Forest System lands. No adverse effects on historic properties are anticipated under the no-action alternative. Surface disturbance associated with mine-related activities and the potential to bury, disturb, or destroy known and unknown historic properties would be an irreversible commitment of cultural resources. Data recovery conducted in accordance with the historic properties treatment plan would record and preserve some of the materials from affected sites but would not avoid adverse effects on the integrity of setting, association, workmanship, feeling, location, and design.
Resources of Tribal Interest	Yes	Yes	Yes	Although none of the tribes specifically identified historic properties as being of particular tribal interest, it is a reasonable assumption that disturbing any of these properties would be perceived as an adverse effect on tribes. As described in section 3.5, “Cultural Resources,” short-term uses of lands for mining operations under the proposed action would adversely affect a greater number of historic properties than the no-action alternative and alternative 1, precluding their long-term preservation. Short-term uses of lands for mining operations and long-terms impacts on the Pinto Creek watershed, springs, and gathering areas could result in impacts on potential resources of tribal concern. Long-term impacts on potential resources of tribal concern such as the Pinto Creek watershed, springs, and gathering areas would be greatest under the proposed action because active mining operations would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative. These impacts would also be perceived as irreversible and irretrievable commitments of resources of tribal interest within the analysis area.
Environmental Justice	No	No	No	There would be no environmental justice impacts for which maintenance of long-term productivity is a concern. There would be no unavoidable, irreversible, or irretrievable environmental justice impacts.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Fire and Fuels Management	Yes	Yes	No	Continued vegetation management and other fire-suppression activities would occur under all alternatives during mine operations and for certain facilities maintained during the post-closure period. Fire suppression activities would limit the Forest Service's ability to use prescribed fire and wildfire as a tool to manage fuel loading, which could enhance the long-term productivity of the landscape. Based on the duration of active mining activities under each alternative, the proposed action would require fire suppression over the longest period of time, followed by alternative 1, then the no-action alternative. Unavoidable adverse impacts from continued fire suppression could increase the age and density of vegetation in the vicinity of Pinto Valley Mine, resulting in a further departure from the natural fire regime. The Forest Service could consider the use of prescribed wildland fire as a management tool in the vicinity of Pinto Valley Mine after mine closure, provided its use would be consistent with public safety and resource considerations.
Geology, Minerals, Geotechnical Stability	Yes	Yes	Yes	Short-term uses and long-term productivity impacts would occur through the permanent removal of proven and probable ore reserves at Pinto Valley Mine. Mining and processing of the ore would make copper and molybdenum available for short- and long-term use in a variety of applications. The proposed action would process approximately 402,230,000 tons of ore over the estimated 19-year operational life of the mine to produce approximately 2,430,100,000 pounds of copper and 23,750,000 pounds of molybdenum. This is approximately 254,040,000 more tons of ore, 1,534,800,000 more pounds of copper, and 15,000,000 more tons of molybdenum than under alternative 1, and 398,750,000 more tons of ore, 2,409,075,000 more pounds of copper, and 23,545,000 more pounds of molybdenum than under the no-action alternative. Mining operations would permanently alter natural topographic and geomorphic features within the Pinto Valley Mine boundary, primarily through excavation of the Open Pit, deposition of tailings in storage areas, and stockpiling of waste rock. These unavoidable adverse effects on natural topographic and geomorphic features under the proposed action would result from the extraction, deposition, and stockpiling of more materials over the longer operational life of the mine and approximately 1,317 acres of new surface disturbance, which would be 408 more acres than under alternative 1 and 950 acres more than under the no-action alternative. Reclamation activities by Pinto Valley Mining Corp. would return some areas within the mine site to approximate pre-mining topography, whereas other facilities would result in permanent changes to topography and geomorphic features. Removal of proven and probable ore reserves at Pinto Valley Mine and the subsequent generation of waste rock and tailings material would be an irreversible commitment, as the geologic and mineral resources in the area are nonrenewable. Mining operations that would permanently alter natural topographic and geomorphic features, including excavation of the Open Pit, deposition of tailings in storage areas, and stockpiling of waste rock within the Pinto Valley Mine boundary would be irreversible.
Paleontology	No	No	No	There would be no impacts for which maintenance of long-term productivity is a concern for paleontological resources. There would be no unavoidable, irreversible, or irretrievable paleontology impacts.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Hazardous and Nonhazardous Materials	No	No	No	There would be no impacts for which maintenance of long-term productivity is a concern for hazardous and nonhazardous materials. There would be no unavoidable, irreversible, or irretrievable impacts from the use or storage of hazardous and nonhazardous materials.
Land Ownership	No	No	No	There would be no impacts for which maintenance of long-term productivity is a concern for land ownership. Eventual reclamation of encroachment areas could enhance the long-term productivity of lands for wildlife habitat, livestock grazing, and other post-mining uses. There would be no unavoidable, irreversible, or irretrievable land ownership impacts.
Livestock Grazing	Yes	Yes	Yes	Ongoing mining operations and mine-related activities at Pinto Valley Mine would result in the short-term loss of lands available for livestock grazing. The proposed action would result in additional surface disturbance on private land and National Forest System lands compared to the no-action alternative and alternative 1 and would have a longer operational life. The size of potential livestock foraging areas disturbed and the duration that these areas that would be inaccessible or incapable of providing forage would be greatest under the proposed action. Neither the no-action alternative nor alternative 1 would result in new surface disturbance or direct forage loss within the analysis area. Surface disturbances associated with mining operations would also result in unavoidable adverse impacts by removing forage from lands that otherwise may be available for livestock grazing. The proposed action could result in an estimated loss of 47 animal units months, which is approximately 0.5 percent of the total 10,038 existing animal unit months in the analysis area. However, the estimated loss of animal unit months under the proposed action is not expected to result in a reduction in authorized livestock grazing numbers because the allotments are capable of supporting more animal unit months than currently permitted. As Pinto Valley Mining Corp. implements reclamation activities following mine closure, vegetation would gradually reestablish in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands. Once vegetation has reestablished in previously disturbed areas capable of supporting vegetation and accessible to livestock, these lands may produce forage capable of supporting long-term use for livestock grazing. As such, this would be an irretrievable commitment of resources.
Noise	No	No	No	There would be no noise impacts for which maintenance of long-term productivity is a concern. There would be no unavoidable, irreversible, or irretrievable noise impacts.
Public Health and Safety	No	No	No	There would be no public health and safety impacts for which maintenance of long-term productivity is a concern. There would be no unavoidable, irreversible, or irretrievable public health and safety impacts.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Recreation and Wilderness	Yes	Yes	Yes	Recreation has been identified as a potential post-closure use of National Forest System lands occupied by previously authorized or encroaching facilities associated with Pinto Valley Mine, so long as use of these lands would not present health or safety hazards to the public. The opening of these lands for recreation would provide a long-term benefit to recreation opportunities by increasing the acreage of lands within the Tonto National Forest available for dispersed public recreation. However, lands within the Open Pit would remain permanently closed to public access. The proposed action would have the greatest adverse effect on the capacity of the landscape to support public recreation opportunities over the long term because more National Forest System lands would be subject to short-term disturbance during active mining operations or consumed by the Open Pit and permanently unavailable for public recreation. Additionally, National Forest System lands would be occupied by active mining operations for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative, delaying the availability of the lands for post-closure recreational uses. Unavoidable adverse effects would occur on the capacity of the landscape to support public recreation opportunities over the long term because more National Forest System lands would be subject to short-term disturbance during active mining operations or consumed by the Open Pit and permanently unavailable for public recreation. Effects on the Forest Service's ability to manage lands to meet their recreation opportunity spectrum classifications are anticipated to be relatively minor under all alternatives compared to existing conditions based on the occurrence of mining operations in the area since the 1940s, the limited use of National Forest System lands near Pinto Valley Mine for recreation, and mitigating factors such as topographic screening. During active mining operations, National Forest System lands within the Pinto Valley Mine boundary would be unavailable for public recreation. This would be an irretrievable commitment of recreation resources. Making these lands available for dispersed recreation after closure would restore recreation opportunities foregone during the operational life of the mine. However, lands within the Open Pit would remain permanently closed to public access, constituting an irreversible commitment of resources.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Socioeconomic Conditions	Yes	No	Yes	The Pinto Valley Mine provides a source of labor and economic output in the region and the production of minerals and associated expenditures and taxes associated with the Pinto Valley Mine provide long-term economic contributions to the region. Operation of Pinto Valley Mine for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 would result in more sustained economic output and labor income than the no-action alternative. However, as disturbance from mine-related activities cease, long-term nonmarket values in the Pinto Valley Mine boundary would increase. There would be irretrievable socioeconomic effects because nonmarket values in the Pinto Valley Mine boundary would be reduced (relative to similar, undisturbed or successfully reclaimed lands in the area) during the time that lands are being used for mining operations and are subject to surface disturbance and human activity. The permanent closure of mining facilities would remove most of the mine's economic effects and future economic potential due to the permanent removal of proven and probable ore reserves and the limited post-closure workforce and expenditures. After mine closure and Pinto Valley Mining Corp.'s reclamation activities, long-term nonmarket values in the Pinto Valley Mine boundary would increase.
Soils	Yes	Yes	Yes	Disturbance, removal, or burial of soils, where present, due to mine-related activities would result in permanent soil loss and a long-term reduction in the productive capacity of the land to support native vegetation communities under both alternatives. The long-term loss of productivity would affect a larger area under the proposed action, which would remove soils, where present, resulting in approximately 1,317 acres of new surface disturbance, approximately 408 more acres than under alternative 1 and 950 acres more than under the no-action alternative. The disturbance, removal, or burial of existing soils would be an unavoidable adverse effect and an irreversible commitment of soil resources. Additionally, past and potentially ongoing mining operations have contaminated an unknown volume of soils within the Pinto Valley Mine Boundary, likely confined to several small areas. This constitutes an irreversible commitment because contaminated soils will either have to be removed from the site or covered in-place in accordance with Arizona solid waste rules. Pinto Valley Mining Corp.'s active Mined Land Reclamation Plan and reclamation plan for National Forest System lands identify conceptual reclamation measures necessary to achieve the proposed post-mining land uses at Pinto Valley Mine, including wildlife habitat, livestock grazing, recreational land, commercial or industrial use, and mineral exploration and mining (SRK Consulting, Inc. 2016a).
Traffic and Transportation	No	No	No	There would be no traffic and transportation impacts for which maintenance of long-term productivity is a concern. There would be no unavoidable, irreversible, or irretrievable traffic and transportation impacts.

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
Visual Resources	Yes	Yes	No	The existence of mining facilities would present both short- and long-term impacts, particularly when these facilities overlap with recreation areas or areas of visual sensitivity. While many facilities would be completely removed and reclaimed upon Pinto Valley Mine closure, other facilities (such as the Open Pit) would remain as permanent alterations to the pre-disturbance landforms, which would affect the scenic quality of the area in perpetuity. Due to the estimated area of surface disturbance and expansion onto National Forest System lands, vertical expansion of mining facilities (tailings storage facilities), and extension of the mine life for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, the proposed action would have greater long-term visual resource impacts compared to the no-action alternative and alternative 1. Expansion of mining facilities would have an unavoidable adverse effect on visual resources under all alternatives by creating weak to minor form, line, color, or texture visual contrast with landforms, vegetation, and structures that deviate from a natural-appearing landscape. However, visual resource impacts are anticipated to be minor relative to existing conditions in the analysis area, which have been dominated by mining activities that began in the 1940s and intensified with development of the Pinto Valley Mine Open Pit in the early 1970s.
Water Resources and Hydro-geochemistry	Yes	Yes	Yes	Short-term use of groundwater to support operation of Pinto Valley Mine would result in drawdown of groundwater resources. This use would have long-term effects on groundwater and surface water quality and quantity and on the condition of vegetation communities and wildlife habitat (see section 3.3, “Biological Resources”). In addition, groundwater drawdown from dewatering of the Open Pit would be perpetuated by the hydraulic sink created by the pit lake and would constitute a permanent change in hydrology. The predicted changes in groundwater levels 100 years post-mining under the proposed action indicate the drawdown area would be 6 percent larger than under the no-action alternative and 1 percent larger than under alternative 1. After 100 years post-mining, baseflow in Pinto Creek under the proposed action scenario is predicted to eventually reach a steady-state condition of approximately 407 gallons per minute, which represents a 62-percent reduction in flow compared to conditions at the start of 2013. The predicted long-term reduction of baseflow in Pinto Creek during the post-mining period would be similar for the no-action alternative and alternative 1. Mitigation measures and water monitoring may reduce the scale and extent of these impacts; however, continued use of groundwater from the Peak Well field would result in unavoidable adverse impacts on water quality and quantity such as: • Long-term expansion of the groundwater drawdown area • Reduced baseflow in segments of Pinto Creek with associated adverse effects on surface water quality • Potential impairment of surface water rights, including Forest Service in-stream flow right in Pinto Creek, depending on site-specific conditions • Formation of a pit lake with a low pH, high sulfate concentrations, and high metal concentrations

Resource/ Resource Element	Short-Term Uses and Long-Term Productivity	Unavoidable Adverse Effects	Irreversible and Irretrievable Impacts	Explanation
				The magnitude and duration of these effects would generally be greater under the proposed action compared to the no-action alternative and alternative 1 due to the longer operational life of the mine during which groundwater pumping would continue. The predicted changes in groundwater levels 100 years post-mining under the proposed action indicate the drawdown area would be 6 percent larger than under the no-action alternative and 1 percent larger than under alternative 1. After 100 years post-mining, baseflow in Pinto Creek under the proposed action scenario is predicted to eventually reach a steady-state condition of approximately 407 gallons per minute, which represents a 62-percent reduction in flow compared to conditions at the start of 2013. The predicted long-term reduction of baseflow in Pinto Creek during the post-mining period would be similar for the no-action alternative and alternative 1. The loss of groundwater quantity affecting stream baseflow, springs, and surface water rights would constitute an irreversible, but not irretrievable, commitment of water resources during mine operation and the post-closure period. After closure of the mine, a permanent mine pit lake would form in the Open Pit. The pit lake is expected to behave as a strong hydraulic sink (hydrologic capture zone where there is groundwater inflow that is lost to evaporation but no outflow to the groundwater system). At full recovery, the pit lake is predicted to have a groundwater inflow rate of 99 gallons per minute and evaporation rate of 310 gallons per minute. As a result, evaporation of water from formation of the pit lake would constitute an irreversible commitment of resources.

3.23 Summary Comparison of Environmental Consequences

Table 3-135 provides a summary and comparison of the potential environmental consequences that could result from implementing the alternatives.

Table 3-135. Comparison of environmental consequences of the alternatives

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Air Quality			
Air quality – emissions	Emissions from stationary sources at Pinto Valley Mine are expected to remain relatively constant during the 6-month transition period. Emissions from mobile sources at Pinto Valley Mine are expected to decrease rapidly as the mine transitions from active mining operations to reclamation and closure within 6 months of the record of decision.	Emissions during the maximum emissions year would increase compared to the no-action alternative. The increase in emissions is mostly due to the extension of the operational life of the mine by approximately 7 years and associated increases in haul truck activity under alternative 1. In addition, emissions-generating activities would continue for approximately 7 more years than under the no-action alternative.	All pollutant emissions during the maximum emissions year would increase compared to the no-action alternative and emissions of PM_{10}, $PM_{2.5}$, nitrogen oxides, and carbon monoxide would increase compared to alternative 1. Stationary source emissions would generally be the same as under alternative 1 and the spatial pattern of these emissions would change due to the increased expansion of the Open Pit, tailings storage facilities, and other project facilities onto National Forest System lands under the proposed action. Emissions from mobile sources would increase, mostly due to increases in haul truck activity under the proposed action. Emissions-generating activities would continue for approximately 19 more years than under the no-action alternative and approximately more 12 years than under alternative 1.
Air quality – ambient pollutant concentrations	Ambient concentrations in the immediate vicinity of Pinto Valley Mine are expected to remain constant or decrease slightly over time, reflecting the expected emissions changes. Air quality modeling was not performed for the no-action alternative as the emissions would be substantially lower than emissions for alternative 1 and the proposed action. Ambient pollutant concentrations under the no-action alternative would also be less than under the proposed action and alternative 1, and would be unlikely to cause or contribute to an exceedance of the National Ambient Air Quality Standards, if modeled.	Air quality modeling indicates that there would be no exceedances of National Ambient Air Quality Standards.	The proposed action would increase the maximum ambient pollutant concentrations for all pollutants except for 8-hour carbon monoxide and 1-hour sulfur dioxide, which remain the same, and 3-hour sulfur dioxide, which decreases under the proposed action. However, there would be no exceedances of National Ambient Air Quality Standards that are attributable to the mine.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Air quality–related values – visibility	Under the no-action alternative, Pinto Valley Mine emissions that could affect air quality-related values at nearby Class I and Class II areas would substantially decrease following the 6-month transition period as the mine transitions from active mining operations to reclamation/closure. In addition, under the no-action alternative Pinto Valley Mining Corp. does not anticipate regular blasting events that could affect visibility. As a result, the no-action alternative is not anticipated to result in visibility impacts at the Superstition Wilderness, Sierra Ancha Wilderness, or Tonto National Monument.	Under alternative 1, Pinto Valley Mine emissions of nitrogen oxides, sulfur dioxide, and particulate matter that could affect visibility at nearby Class I and Class II areas would increase compared to the no-action alternative due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increases in emissions under alternative 1. In addition, under alternative 1 Pinto Valley Mining Corp. would conduct daily blasting operations to excavate the ore and waste rock in the Open Pit. As indicated in appendix B, "Air Quality Technical Support Document," daily blasting could result in a visible plume at Superstition Wilderness. However, a perceptible plume would only occur when the plume is viewed against a black background, the wind direction is between 70 and 100 degrees, and the time is between the hours of 11 a.m. and 1 p.m., that is, conditions at midday with the wind from the east. However, the probability of these conditions occurring is approximately 15 percent based on the meteorological measurements, and an observer in the Superstition Wilderness would not necessarily be viewing the plume against a black background. As a result, alternative 1 would increase potential impacts on visibility at nearby Class I and Class II areas compared to the no-action alternative. However, the probability of visibility impairment in the Class I and Class II areas would still be low.	Under the proposed action, Pinto Valley Mine emissions of nitrogen oxides, sulfur dioxide, and particulate matter that could affect visibility at nearby Class I and Class II areas would increase compared to alternative 1 due to the extension of active mining operations, increased haul truck activity during the maximum emissions year, and associated increase in emissions under the proposed action. As a result, visibility impacts from active mining operations and visible plumes could occur within the nearby Superstition Wilderness into the direction of the sun against a dark terrain background. However, a more refined level-3 analysis for active operations would likely show that this impact is less than perceptible. Potential impacts on visibility in Superstition Wilderness from daily blasting operations would be the same as alternative 1, except that daily blasting operations and resulting potential impacts on visibility would persist for 12 more years than alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Air quality–related values – acidic deposition	Under the no-action alternative, Pinto Valley Mine emissions that could affect acidic deposition at nearby Class I and Class II areas would substantially decrease following the 6-month transition period as the mine transitions from active mining operations to reclamation/closure. As a result, the no-action alternative is not anticipated to result in acidic deposition impacts at the Superstition Wilderness, Sierra Ancha Wilderness, or Tonto National Monument.	Under alternative 1, Pinto Valley Mine emissions of nitrogen oxides and sulfur dioxide that could affect acidic deposition at nearby Class I and Class II areas would increase compared to the no-action alternative due to the extension of active mining operations and associated increase in emissions under alternative 1. As a result, alternative 1 would increase potential impacts on acidic deposition at nearby Class I and Class II areas compared to the no-action alternative.	Under the proposed action modeling scenario, acidic deposition rates at Superstition Wilderness and other Class I areas would increase compared to alternative 1. The largest modeled increase in sulfur deposition in any Class I area was 0.00013 kilogram per hectare per year, well below the data analysis threshold of 0.005 kilogram per hectare per year. The largest modeled increase in nitrogen deposition in any Class I area occurred in the Superstition Wilderness area and was 0.11 kilogram per hectare per year, which exceeds the data analysis threshold of 0.005 kilogram per hectare per year. Only the Superstition Wilderness area had deposition values that would exceed the data analysis threshold. A variety of analysis techniques exist that more accurately account for the atmospheric conversion of nitrogen oxides emissions to various nitrogen species that may be deposited (Forest Service et al. 2014).
Biological Resources – Vegetation			
Upland vegetation communities	New surface disturbance and associated impacts would occur on 367 additional acres of private lands owned by Pinto Valley Mining Corp. primarily due to closure activities.	The proposed action would result in 542 more acres of new surface disturbance on private land than the no-action alternative. The longer operating life of the mine under alternative 1 would delay the start of reclamation for most facilities by approximately 7 years compared to the no-action alternative.	The proposed action would result in a 1,317-acres of surface disturbance, including 1,087 acres on private land, including 229 acres on National Forest System land. The longer operating life of the mine under the proposed action would delay the start of reclamation for most facilities for approximately 19 years beyond the no-action alternative and approximately 12 years beyond alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Riparian and wetland vegetation communities	No direct impacts on riparian or wetland vegetation communities are anticipated from the no-action alternative.	An estimated 11 acres of Sycamore - Fremont Cottonwood riparian vegetation in Gold Gulch on private lands would be cleared or buried during construction of the West Dump.	The proposed action would remove an estimated 39 acres of riparian vegetation (14 acres on private lands owned by Pinto Valley Mining Corp. and 24 acres on National Forest System lands). Expansion of Tailings Storage Facility No. 4 and associated relocation of access roads and water pipelines would result in additional clearing or removal of 27 acres of Sycamore - Fremont Cottonwood riparian vegetation and 1 acre of Fremont Cottonwood/Shrub riparian vegetation.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Plant health	Continued groundwater pumping from the Peak Well field is predicted to reduce groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 to 97 gallons per minute at the end of mining in 2021. Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, and may be a contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat. The Leach Piles are predicted to discharge low pH, high total dissolved solids, and metal-laden water for hundreds of years; however, most of this discharge would be captured, while some would continue to infiltrate to groundwater. This would result in impacts on riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine due to accumulation of heavy metals in the soils, uptake by vegetation, and bioaccumulation in food chains. Particulate matter and dust generated from project activity can accumulate on vegetation and result in adverse effects.	Continued pumping from the Peak Well field under alternative 1 is predicted to result in a reduction in groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 73 gallons per minute (a 93-percent reduction from 2013 versus 91 percent under the no-action alternative).Continued groundwater pumping from the Peak Well field is predicted to result in a 10-percent reduction in baseflow from 2018 through the end of mining, for a total of 5.68 miles of perennial stream length. Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a slightly greater reduction in baseflow in Pinto Creek than the no-action alternative that would persist for approximately 7 more years. Alternative 1 could be a greater contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat than the no-action alternative. Discharge from the Leach Piles and potential adverse effects on riparian areas along segments of Pinto Creek downstream of Pinto Valley Mine would be the same as described for the no-action alternative. The duration of time during which mining activities and road use would generate and deposit dust on nearby plants, which could adversely affect plant health, would be approximately 7 years longer than under the no-action alternative.	Continued pumping from the Peak Well field under the proposed action is predicted to result in a reduction in groundwater discharge to Pinto Creek at the Magma Weir from 1,070 gallons per minute at the beginning of 2013 (and 188 gallons per minute in 2018) to 162 gallons per minute at the end of active mining operations (an 85-percent reduction from 2013 versus 90 percent under the no-action alternative and 93 percent under alternative 1). Riparian areas along these perennial reaches are anticipated to be indirectly affected by the continued pumping of the Peak Well field, which would result in a reduction in baseflow in Pinto Creek greater in magnitude than the no-action alternative and similar in magnitude to alternative 1 but persisting for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. Reduction in baseflow during the operational life of the mine could be a greater contributing factor to mortality of riparian vegetation and loss of functioning riparian habitat than both the no-action alternative and alternative 1. The potential for accumulation of heavy metals in the soils, uptake by vegetation, and bioaccumulation in food chains in riparian areas along Pinto Creek downstream of Pinto Valley Mine would be essentially the same as under the no-action alternative and alternative 1. Dust generation and deposition on nearby vegetation would continue for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Invasive plants	Expansion of mining facilities onto an additional 367 acres of previously undisturbed private lands would increase the potential for spread and establishment of invasive plant species. Best management practices would help minimize the potential for introduction of noxious weed species.	Expansion of mining facilities onto an additional 542 acres compared to the no-action alternative would increase the potential for spread and establishment of invasive plant species. Continued road use and maintenance and other activities may contribute to dispersal for approximately 7 more years than under the no-action alternative.	Expansion of mining facilities onto an additional 950 acres compared to the no-action alternative and 408 more total acres compared to alternative 1 would increase the potential for spread and establishment of invasive plant species. Continued road use and maintenance and other activities may contribute to dispersal for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.
Biological Resources - Fish and Wildlife			
Surface disturbance	Expansion of mining facilities would result in an additional 367 acres of new surface disturbance within Interior Chaparral biotic communities. The resulting loss of shelter, breeding sites, and food resources would adversely affect wildlife until the areas are reclaimed or revegetate naturally. There would be minimal impacts on habitat connectivity, as new surface disturbance would occur adjacent to areas disturbed by the Pinto Valley Mine's existing facilities.	Impacts on wildlife that would occur as a result of surface disturbance would be similar to those under the no-action alternative, except the size of the affected area would be greater (542 more acres of new surface disturbance) and the timeframe associated with this disturbance would extend for approximately 7 more years.	Impacts on wildlife that would occur as a result of surface disturbance would be similar to those under the no-action alternative and alternative 1, except the size of the affected area would be greater by 950 additional acres and 408 additional acres, respectively. The timeframe associated with this disturbance would be approximately 19 years longer than under the no-action alternative or 12 years longer than under alternative 1.
Traffic	Wildlife may be killed or injured due to impacts with or crushing by vehicles by traffic both within the mine site and along National Forest System Road 287. Mine-related traffic would continue at approximately the same volume as during existing mine operations during the first 2 months of the 6-month transition period. Traffic-related impacts along National Forest System Road 287 would decrease following the 2 months of active operations due to reduced employment at the Pinto Valley Mine and substantial reductions in overall activity at the Pinto Valley Mine.	Impacts on fish and wildlife that would occur as a result of mine-related traffic would be similar to those under the no-action alternative, except that impacts experienced during active mining operations would extend for approximately 7 more years.	Impacts on fish and wildlife that would occur as a result of mine-related traffic would be similar to those under the no-action alternative and alternative 1, except that impacts experienced during active mining operations would continue for approximately 19 more years or 12 more years, respectively.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Artificial nighttime lighting	Existing impacts of nighttime lighting on wildlife would continue for 2 months until the end of active mining operations. During this time, wildlife using areas close to new or expanded facilities would be exposed to nighttime lighting above existing levels, which have differential effects on an organism's behavioral patterns and physiology depending on the species. Impacts of nighttime lighting would cease at mine closure when the use of nighttime lighting is discontinued.	Impacts on fish and wildlife from artificial nighttime lighting would be similar to those under the no-action alternative, except that impacts would continue for approximately 7 more years and additional lighting required for expanded facilities would expose wildlife using adjacent habitats to light levels above those experienced under the no-action alternative.	Impacts on fish and wildlife from artificial nighttime lighting would be similar to those under the no-action alternative and alternative 1, except that impacts would continue for approximately 19 more years or 12 more years, respectively. Additional lighting required for expanded facilities would expose wildlife using adjacent habitats to light levels above those experienced under the no-action alternative or alternative 1.
Dust	Changes in vegetation that result from dust deposition may affect wildlife communities by altering the competitive relationships between species and cycles of decomposition, as well as by altering characteristics of habitat components such as the availability of food and shelter. Impacts on wildlife communities resulting from dust would be greatest in the areas of highest deposition, primarily within the Open Pit, dumps, mill, and borrow sources.	Impacts on fish and wildlife from dust would be similar to those under the no-action alternative, except the impacts from dust deposition would affect individuals within a broader area and would continue for approximately 7 more years.	Impacts on fish and wildlife from dust would be similar to those under the no-action alternative and alternative 1, except the impacts from dust deposition would affect individuals within a broader area and would continue for approximately 19 more years or 12 more years, respectively.
Noise	The effects of noise produced by mines are not well studied, but traffic noise may contribute to decreased bird breeding activity and abundance in proximity to roadways. Mine-related traffic would occur primarily during the 2-month operational period and during the first and last 3 years of reclamation activities.	Impacts on fish and wildlife as a result of mine-related noise would affect individuals within a broader area and would continue for approximately 7 more years than under the no-action alternative.	Impacts on fish and wildlife from project-related noise would generally be similar to those described for alternative 1 and the no-action alternative. However, during active mine operations, impacts on fish and wildlife as a result of mine-related noise would affect individuals within a broader area and would continue for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Water withdrawals	Impacts on fish and wildlife species from the drawdown of the groundwater table may occur through the reduction of available surface water in areas where the groundwater is lowered enough to eliminate surface flow in streams and springs; the loss of riparian vegetation when the water table is lowered enough to kill or reduce vegetation; or the contamination of groundwater due to outflow from the tailings and Leach Piles is possible.	The nature of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for the no-action alternative. However, potential impacts would occur along an additional 0.18 mile of perennial streams under alternative 1 and may be more pronounced because baseflow would be lower at the end of active mining than under the no-action alternative. Direct impacts from low baseflow during active mining would continue for approximately 7 more years, during which time vegetation would continue to deteriorate. Vegetation would not begin to recover until approximately 7 years later under alternative 1 compared to the no-action alternative.	The nature of impacts on fish and wildlife resulting from water withdrawals would generally be the same as described for alternative 1 and the no-action alternative. Impacts would be experienced along an additional 0.18 mile of perennial streams than under alternative 1 and an additional 0.37 mile of perennial streams than under the no-action alternative. Impacts would be the most pronounced under the proposed action because reduced baseflow occurs over the longest timeframe under this alternative. Direct impacts from low baseflow during active mining would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative, during which time vegetation would continue to deteriorate. Vegetation would not begin to recover until approximately 12 years later than under alternative 1 and approximately 19 years later than under the no-action alternative.
Water contamination	Fish and wildlife may be exposed to water contaminated from the Pinto Valley Mine through the following pathways under the no-action alternative. Although the risk of harmful effects from exposure to pH, total dissolved solids, and sulfate in the pit lake were not quantitatively analyzed, mammals and birds that consume water from the pit lake may also be negatively affected by these constituents. Aquatic macroinvertebrates and fish within Pinto Creek would be exposed to high levels of total dissolved solids and sulfates originating from seepage from the tailings storage facilities, and, to a lesser extent, from the Leach Piles. However, this seepage would likely be diluted by groundwater and by surface flow in Pinto Creek.	The nature of impacts on fish and wildlife resulting from water contamination would generally be the same as described for the no-action alternative, but exposure from some pathways would differ in length, start date, and magnitude of exposure. Impacts due to exposure to selenium within storm water facilities would continue for approximately 7 more years under alternative 1.	The nature of impacts on fish and wildlife resulting from water contamination would generally be the same as described for the no-action alternative and alternative 1, but exposure from some pathways would differ in length, start date, and magnitude. Impacts due to exposure to selenium within storm water facilities would continue for approximately 12 more years than under alternative 1 and 19 more years than under the no-action alternative.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Biological Resources – Special Status Species			
Threatened and endangered species	No surface disturbance would occur in critical habitat for western yellow-billed cuckoo. Approximately, 244 acres and 32 acres of proposed critical habitat within units 26 and 29, respectively, would be affected by groundwater drawdown along Pinto Creek under the no-action alternative. Adverse effects on other threatened and endangered species are unlikely.	The nature of the impacts on proposed critical habitat for western yellow-billed cuckoo would be as described under the no-action alternative, except 250 acres within unit 26 and 49 acres within unit 29 would be affected by groundwater drawdown. The acreage affected within unit 26 and unit 29 would be, respectively, 6 acres and 18 acres greater than under the no-action alternative. Full capacity operation of the Peak Well field would continue for approximately 7 more years under alternative 1, resulting in approximately 7 more years of additional impacts on proposed critical habitat and thus delaying recovery of affected physical and biological features.	The nature of the impacts on proposed critical habitat for western yellow-billed cuckoo would be as described under the no-action alternative and alternative 1, except 254 acres within unit 26 and 51 acres within unit 29 would be affected by groundwater drawdown under the proposed action. The acreage affected within unit 26 and unit 29 would be, respectively, 4 acres and 5 acres greater than under alternative 1 and 10 and 19 acres greater than under the no-action alternative. Full capacity operation of the Peak Well field would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, resulting in additional impacts on proposed critical habitat and thus delaying recovery of affected physical and biological features. Despite the potential adverse effects on proposed critical habitat for western yellow-billed cuckoo along Pinto Creek, the proposed action is not anticipated to prevent the species' recovery within the Tonto Basin or throughout its range due to the presence suitable alternative breeding sites.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Bald and golden eagles	new surface disturbance would directly affect up to 367 acres of potential foraging habitat for golden eagles on private land. Golden eagles may also be adversely affected by existing mine-related noise and traffic, which could cause them to avoid affected areas. Golden eagle nesting sites would not be affected, as none occur within portions of the analysis area. Impacts on golden eagles from light, noise, and traffic would be generally be short term, occurring primarily during the first 2 months of the 6-month transition period, and, in the case of noise and traffic, during the active phases of reclamation. During reclamation, most portions of the Pinto Valley Mine affected by surface disturbance would be recontoured and reseeded. As vegetation becomes established, golden eagles and their prey may begin to use the disturbed areas.	Alternative 1 would result in 909 acres of new surface disturbance to potential golden eagle foraging and nesting habitat on private land, an increase of 542 acres compared to the no-action alternative. Because the footprint of the mine would be larger under alternative 1, some areas that would not be exposed to noise and light under the no-action alternative would be exposed to these disturbances under alternative 1. In general, effects associated with active mining would continue for approximately 7 more years, and reclamation would occur 7 years later.	The proposed action would result in 1,317 acres of new surface disturbance to golden eagle foraging habitat including 1,087 acres on private land and 229 acres on National Forest System lands. This represents an increase of 950 acres compared to the no-action alternative and an increase of 408 acres compared to alternative 1. Effects on golden eagles resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively.
Forest Service sensitive species	The no-action alternative would result in up to 367 acres of new surface disturbance on private land with potential habitat for: Allen's big-eared bat, pale Townsend's big-eared bat, western red bat, American peregrine falcon, and Bezy's night lizard. These species would also be exposed to vehicle traffic and artificial nighttime lighting during the first 2 months of the 6-month transition period. Due to the short-term duration of continued pumping, impacts of the no-action alternative on the lowland leopard frog and desert sucker are anticipated to be minimal. The no-action alternative may affect individual Mogollon fleabanes and Arizona alum roots but is not likely to result in a downward trend toward Federal listing or loss of viability.	Effects would be similar to those under the no-action alternative, except alternative 1 would result in an increase of 542 acres of surface disturbance on private land compared to the no-action alternative and effects associated with active mining would continue for approximately 7 more years.	Effects on Forest Service sensitive species resulting from the proposed action would be similar in nature to those described under the no-action alternative and alternative 1, except the proposed action would result in an increase of 950 acres of surface disturbance compared to the no-action alternative and an increase of 408 acres compared to alternative 1. In general, effects associated with active mining operations would continue for approximately 12 more years compared to alternative 1 and 19 more years compared to the no-action alternative. Similarly, reclamation would occur approximately 12 years and 19 years later, respectively.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Management indicator species	Under the no-action alternative, two of the seven vegetation types that occur within the analysis area (pinyon-juniper grassland and desert communities) would not be affected by surface-disturbing activities. Therefore, the no-action alternative is not anticipated to cause or contribute to declines in the four management indicator species associated with these vegetation types (savannah sparrow, horned lark, black-throated sparrow, and canyon towhee). Two of the vegetation types within the analysis area, pinyon-juniper chaparral and interior chaparral, and their seven associated management indicator species (ash-throated fly catcher, gray vireo, Townsend's solitaire, northern flicker, spotted towhee, and black-chinned sparrow) would be directly affected by surface disturbance under the no-action alternative. The remaining three vegetation types within the analysis area (cottonwood willow riparian forest, mixed broadleaf deciduous riparian forest, and aquatic) and their 10 associated management indicator species may be indirectly affected under the no-action alternative if continued operation of the Peak Well field exacerbates deteriorating conditions along Pinto Creek.	Effects would be similar to those under the no-action alternative, except additional surface disturbance would occur beyond that which would occur under the no-action alternative and indirect impacts caused by pumping would last approximately 7 more years, after which time affected vegetation is anticipated to begin to regenerate.	Effects would be similar to those under the no-action alternative and alternative 1, except additional surface disturbance would occur for approximately 19 more years or 12 more years, respectively. Indirect impacts caused by pumping would last approximately 12 more years than under alternative 1 and approximately 19 more years than under the no-action alternative, after which time affected vegetation is anticipated to begin to regenerate.
Migratory birds	The no-action alternative is anticipated to adversely affect seven migratory birds of concern due to loss of vegetation communities that provide habitat for these bird species.	Same as the no-action alternative, except additional surface disturbance would occur beyond that which would occur under the no-action alternative and indirect impacts caused by pumping would last approximately 7 more years, after which time the vegetation is anticipated to regenerate.	Same as the no-action alternative and alternative 1, except direct impacts from additional surface disturbance and indirect impacts caused by pumping would last approximately 19 more years or 12 more years, respectively.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Greenhouse Gas and Climate Change			
Greenhouse gas emissions	Under the no-action alternative, cumulative greenhouse gas emissions through the end of the mine life (through 2021) are estimated to be 1.04 million metric tons of carbon dioxide equivalent. Carbon dioxide equivalent throughout reclamation activities (2022 through 2034) would be 0.9 million metric ton. Reclamation, closure, and post-closure activities are not anticipated to result in notable emissions (2035 through 2065).	Under alternative 1, cumulative greenhouse gas emissions through the end of the mine life (until 2027) would be 2.6 million metric tons of carbon dioxide equivalent. Carbon dioxide equivalent throughout reclamation activities would be the same as under the no-action alternative but would occur approximately 7 years later (2028–2040). Reclamation, closure, and post-closure activities are not anticipated to result in notable emissions (2041–2070).	Under the proposed action, cumulative greenhouse gas emissions through the end of the mine life would be 6.3 million metric tons of carbon dioxide equivalent (5.26 and 3.7 million metric tons more than under the no-action alternative and alternative 1, respectively). Carbon dioxide equivalent throughout reclamation activities would be the same as under the no-action alternative and alternative 1, but would occur approximately 19 years or 12 years later, respectively (2040–2052). The only emissions during post-closure of the mine (2053–2082) would be due to lost carbon sequestration from forest lands.
Climate change	Continued mining operations for 2 months following the record of decision and subsequent closure, reclamation, and post-closure would reflect trends of warming and more frequent heat waves, increasing frequency and severity of extreme precipitation events, as well as a slight overall decrease in precipitation. Greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine are not expected to notably affect the frequency or severity of wildfires.	Continued mining operations for 12 additional years under alternative 1 would coincide with general air temperature warming described above under the no-action alternative. Similar to the no-action alternative, extreme precipitation events may become more frequent and severe, even while overall precipitation decreases. Greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine are not expected to notably affect the frequency or severity of wildfires.	Continued mining operations for 19 additional years would increase energy demands under extreme heat compared to the no-action alternative and alternative 1. Similar to the no-action alternative and alternative 1, changing precipitation and drought patterns will likely affect the analysis area under the proposed action. Greenhouse gas emissions and contributions to climate change solely attributable to the Pinto Valley Mine are not expected to notably affect the frequency or severity of wildfires.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Cultural Resources			
Historic properties	There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. Direct impacts from surface and subsurface disturbance on private land could potentially affect undiscovered historic properties; however, previous cultural resource surveys in areas of proposed disturbance make the discovery of undiscovered properties unlikely. Any new sites that may be discovered during the course of mining activities would not necessarily need to be reported if they occur on private land. Indirect effects from public access and associated risk of theft or vandalism would be the same as under existing conditions, with 14 historic properties within or near existing roads vulnerable to indirect or inadvertent adverse effects resulting from use of the roads.	New surface disturbance on an additional 909 acres of private lands owned by Pinto Valley Mining Corp. has the potential to directly affect one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. Under alternative 1, undertakings in the area of potential effect would generally be subject to the National Historic Preservation Act section 106 process because alternative 1 includes authorization of activities on National Forest System lands. Potential direct impacts on undiscovered properties and indirect effects from public access would be the same as described under the no-action alternative except the risk would persist for approximately 7 more years under alternative 1.	New surface disturbance from expansion of mining facilities onto an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. would affect 27 historic properties, including the three historic properties that could be adversely affected by alternative 1. Under the proposed action, 18 of these historic properties will be protected from direct physical effects by their natural topographic setting. The historic properties treatment plan directs protective measures to protect an additional 14 historic properties and requires data recovery be completed at 14 historic properties prior to project activities that could affect these sites. Similar to alternative 1, all historic properties are subject to the section 106 process. New sites discovered under the proposed action would reported whether they occur on private or Federal lands, pursuant to agreed-upon measures for new cultural resource discovery reporting, assessment, and mitigation specified in the historic properties treatment plan and memorandum of agreement (WestLand Resources, Inc. 2019a; Forest Service 2020d) Potential direct impacts on undiscovered properties and indirect effects from public access would persist for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1 and would increase the duration of visual and noise effects at 14 historic properties located near existing roads.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Resources of Tribal Interest			
Resources of tribal interest	There are no anticipated direct adverse impacts on known historic properties associated with the 367 acres of new surface disturbance on private land under the no-action alternative. As a result, there are no anticipated adverse impacts on historic properties of tribal interest. However, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area. Tribes have expressed general concern with potential impacts on sacred sites and other resources of tribal interest associated with the historic and continued operation of the Pinto Valley Mine, including impacts on the Pinto Creek watershed and springs in the area, direct loss of gathering areas and access to gathering areas, and overall impacts on the landscape. These potential impacts on resources of tribal interest could generally continue during the first 2 months of the 6-month transition period as active mining operations continue and would generally persist until mining activities cease and successful reclamation is completed.	New surface disturbance on an additional 909 acres of private lands under alternative 1 has the potential to have direct physical effects on one historic property located on private lands and two historic properties located partially on private lands and partially on National Forest System lands. Adverse impacts on these historic properties could result in impacts on resources of tribal interest. Efforts by Pinto Valley Mining Corp. to avoid or mitigate effects on cultural resources and resources of tribal interest under alternative 1 would be on a voluntary basis because all additional surface disturbance and most ongoing activities at Pinto Valley Mine would be confined to private lands. Similar to the no-action alternative, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area. Similar to the no-action alternative but increased potential impacts on other resources of tribal concern because active mining operations would continue for approximately 7 more years under alternative 1.	New surface disturbance on an additional 229 acres of National Forest System lands and 1,087 acres of private lands owned by Pinto Valley Mining Corp. under the proposed action could have an adverse effect on some or all of the 45 known historic properties. Adverse impacts on these historic properties could result in impacts on resources of tribal interest. However, potential impacts on historic properties under the proposed action would be avoided and mitigated by applying the historic properties treatment plan (WestLand Resources, Inc. 2019a). As a result, potential impacts on historic properties that have resources of tribal interest would be reduced compared to the no-action alternative and alternative 1. Similar to the no-action alternative and alternative 1, tribes have not identified any specific traditional cultural sites, sacred sites, or other specific resources of tribal interest within the analysis area. Similar to the no-action alternative but increased potential impacts on other resources of tribal concern because active mining operations would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Environmental Justice			
Minority and low-income communities	Nearby communities may experience out-migration, increased vacancy rates, and decreased housing values as staffing levels are substantially reduced within 3 months of the record of decision. Identified minority and low-income communities where many mine employees reside and that experience economic activity resulting from active mining operations could experience disproportionately adverse effects from mine closure within 3 months after the record of decision is issued.	Continuation of active mining operations for approximately 7 more years than under the no-action alternative and expansion of mining facilities on private land would alleviate the socioeconomic effects described under the no-action alternative but could result in adverse effects on identified minority and low-income communities (for example, continued air pollutant emissions, vehicle traffic, and visual effects); however, these communities would not be disproportionately affected.	Continuation of active mining operations for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1 and expansion of mining facilities onto private and National Forest System lands would alleviate the socioeconomic effects described under the no-action alternative but could result in adverse effects on identified minority and low-income communities (for example, continued air pollutant emissions, vehicle traffic, and visual effects); however, these communities would not be disproportionately affected.
Environmental risk exposure	Gila County's average environmental indicators are better than or are similar with national averages in all categories except for ozone, traffic proximity and volume, and wastewater discharge.	No anticipated increase in environmental risk exposure due to increases in ozone or traffic volume. Alternative 1 would increase the operational life of the mine by 7 years compared to the no-action alternative, resulting in an extended period during which wastewater discharge and other operational activities could affect water quality and increase environmental risk exposure. However, these impacts are not expected to disproportionately affect minority or low-income communities.	No anticipated increase in environmental risk exposure due to increases in ozone or traffic volume. The proposed action would increase the operational life of the mine by 19 years compared to the no-action alternative and by 12 years compared to alternative 1, resulting in an extended period during which wastewater discharge and other operational activities could affect water quality and increase environmental risk exposure. However, these impacts are not expected to disproportionately affect minority or low-income communities.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Fire and Fuels Management			
Fuel loading	Continuation of mining operations during the first 2 months of the 6-month transition period and expansion of mining facilities onto an additional 367 acres of private lands under the no-action alternative would decrease the total amount of vegetative fuels in the analysis area as areas are cleared around existing facilities. After clearing, bare ground would be susceptible to invasive weed infestation, which would increase fuel loading and fire hazard. During reclamation and closure, vegetation would reestablish across much of the mine site (except within the Open Pit). After several decades of reclamation and revegetation, total fuel loading in the analysis area may be greater than under existing conditions at the mine.	Continuation of mining operations and expansion of mining facilities onto an additional 909 acres of private lands (an increase of 542 acres) would decrease the total amount of vegetative fuels in the analysis area as areas are cleared around existing facilities. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 7 years later than under the no-action alternative.	Expansion and reclamation of mining facilities under the proposed action would have the same types of impacts on fuel loading described for the no-action alternative, except to a greater degree because the proposed action would disturb 720 more acres of on private land compared to the no-action alternative and 178 more acres of private land compared to alternative 1. The proposed action would also disturb 229 more acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. Vegetation reestablishment and the potential for increase of fuel loads within reclaimed mining disturbances would occur approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Fuel breaks and barriers	Limited future use of approximately 29.8 miles of existing National Forest System roads, 15.2 miles of access roads on National Forest System lands, 26.8 miles of electric power line corridors, and 35.6 miles of water pipeline corridors (outside of road alignments) would not change the potential for mine-related linear facilities to serve as fuel breaks for wildland fire in the short term.	The potential for mine-related facilities and roads to serve as fuel breaks for wildland fire would be the same as under the no-action alternative but would exist for approximately 7 more years.	The increased surface disturbance under the proposed action would generally increase the potential for disturbed areas to serve as fuel breaks for wildland fire in the short term, but could alter the distribution of fuel breaks or potential for wildfire spread in the long term to a greater extent than the no-action alternative or alternative 1. New and realigned access roads around the perimeters of the Open Pit and Tailings Storage Facility No. 4 would create fuel breaks around these facilities, limiting the potential for fire to enter or escape these facilities. Construction of a new electric power line on National Forest System lands to support the operation of Tailings Storage Facility No. 4 would create an additional fuel break compared to the no-action alternative and alternative 1. Final reclamation would begin approximately 19 years later than under the no-action alternative and approximately 12 years later than under alternative 1.
Wildfire response	Fire suppression requirements would limit the Forest Service's ability to allow fire to resume its natural role in the fire-dependent ecosystem within which Pinto Valley Mine is located, resulting in further departure from the natural fire regime. Limited future use of approximately 29.8 miles of existing National Forest System roads and 15.2 miles of access roads on National Forest System lands would not change the potential for these linear facilities to provide access for fire management and response activities.	Fire suppression on surrounding National Forest System lands to protect public safety and capital investments associated with Pinto Valley Mine and nearby communities would be the same as under the no-action alternative. The continued use of existing National Forest System roads and access roads would not change the potential for linear facilities to provide access for fire management and response activities under alternative 1. Final reclamation activities would start approximately 7 years later than under the no-action alternative and the Forest Service would consider the use of wildland fire as a management tool on National Forest System lands approximately 7 years later than under the no-action alternative.	Fuel loads would continue to increase for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1, further limiting the Forest Service's ability to manage fire in proximity to the Pinto Valley Mine. Continued use of existing roads would provide similar access for fire management and response activities as described under the no-action alternative and alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Unplanned ignitions	Blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, electrical power lines, and other activities would continue the risk of unplanned ignitions associated with mine operation, which would decrease at the end of active mine operation and through the 6-month transition period.	Blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, and other activities would continue the risk of unplanned ignitions associated with mine operation for approximately 7 more years and would decrease following cessation of active mining operations.	Blasting, equipment use and failures, vehicle traffic, storage and transportation of flammable materials, and other activities would extend the risk of unplanned ignitions associated with mine operation for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. The risk of unplanned ignitions would decrease following the cessation of active mining operations
Geology, Minerals, and Geotechnical Stability			
Geology	Under the no-action alternative, active mining operations would continue for the first 2 months of the 6-month transition period. Compared to the existing conditions, 357 acres of new surface disturbance on private land for borrow and riprap sources and 10 acres of lateral expansion of Tailings Storage Facility No. 4 and would result in a total net increase of approximately 367 acres where the natural topographic and geomorphic features would be permanently altered (even with reclamation) within the analysis area.	Mining activities under alternative 1 would result in an additional 909 acres of new surface disturbance on private land due to expansion of the Open Pit, waste rock dumps, excavation borrow and riprap sources, and expansion of tailings storage facilities compared to the no-action alternative. Alternative 1 would increase the area where the natural topographic and geomorphic features would be permanently altered within the analysis area due to the increased expansion of facilities and associated new surface disturbance on private land compared to the no-action alternative. Alternative 1 would extend the operational life of the mine by approximately 7 years compared to the no-action alternative and the start of reclamation and closure would generally occur 7 years later. As a result, potential impacts on natural topography and geomorphology prior to reclamation would persist for approximately 7 years longer than under the no-action alternative. The Open Pit would be mined to a depth of 90 feet deeper than the no-action alternative. The elevation of Tailings Storage Facility No. 3 would increase by 132 feet compared to the no-action alternative. The elevation of the Main Dump would increase by 230 feet compared to the no-action alternative.	The proposed action would increase new surface disturbance on private land by approximately 720 acres compared to the no-action alternative and by approximately 178 acres compared to alternative 1. In addition, the proposed action would result in approximately 229 acres of new surface disturbance on National Forest System lands that would not occur under the other alternatives. Due to the increased amount of new surface disturbance and increased generation of waste rock and tailings materials, the proposed action would result in increased potential for impacts on topography compared to the other alternatives, including on 229 acres of National Forest System lands that would not occur under the other alternatives. The expansion of the Open Pit toward the east would remove adjacent mountainous topography within the expansion area. Potential impacts on natural topography and geomorphology prior to reclamation would persist for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1. The Open Pit would be mined to a depth of 360 feet deeper than the no-action alternative 1. The elevation of Tailings Storage Facility No. 3 would increase by 75 feet compared to the no-action alternative and

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
			alternative 1. The elevation of Tailings Storage Facility No. 4 would increase by 292 feet compared to the no-action alternative and 160 feet compared to alternative 1. The final elevation of the Main Dump would increase by 410 feet compared to the no-action alternative and by 180 feet compared to alternative 1.
Mineral resources	Approximately 3.48 million tons of ore would be mined during 2 months of active mining operations that would result in the generation and disposal of approximately 4.92 million tons of waste rock and approximately 75 million tons of tailings material. Ceasing active mining operations two months after the record of decision would leave known mineral resources in the ground on both private and National Forest System land. The known mineral resources that are left in the ground could be targeted by future mining operations.	Approximately 148.3 million tons of ore would be mined that would result in the generation and disposal of approximately 209.7 million tons of waste rock and approximately 232 million tons of tailings material. Ceasing active mining operations seven years after the record of decision would leave known mineral resources in the ground on both private and National Forest System land. The known mineral resources that are left in the ground could be targeted by future mining operations.	Approximately 402.2 million tons of ore would be mined that would result in the generation and disposal of approximately 568.7 million tons of waste rock and approximately 440 million tons of tailings material.
Geotechnical stability	Under the no-action alternative, the Open Pit would not be backfilled at mine closure and water management operations designed to dewater the Open Pit during mining would cease. As a result, the groundwater levels in the pit and pit walls would partially recover and be controlled by the final pit lake elevation. Under the no-action alternative, there would be no further lateral expansion of the Open Pit through active mining. However, sections of the open pit where the Pinal Schist are exposed may continue to fail until equilibrium for the rock mass is reached. The lowest calculated factors of safety for both static and pseudo-static loading for the no-action alternative are found at Tailings Storage Facility No. 3. The lowest result for static loading was a factor of safety of 1.44 computed for an undrained response assumption, which is above the minimum 1.3 based on the best available	Backfilling of the Open Pit and water management during closure and post-closure would generally be the same as described for the no-action alternative except that these activities would cover the larger footprint of the Open Pit on private land under alternative 1 and these closure and post-closure activities would occur approximately 7 years later than under the no-action alternative. In general, the types of potential impacts associated with pit slope stability would be the same as the no-action alternative. However, alternative 1 would increase the depth of the Open Pit by 90 feet compared to the no-action alternative. The lowest result for static loading was a factor of safety of 1.34 computed for an undrained response assumption, which meets the minimum required factor of safety of 1.30 under the Best Available Demonstrated Control	Potential impacts associated with pit slope stability would be the same as those of alternative 1 except that impacts associated with potential instability of the pit walls that could occur during operation would persist for 12 more years than under alternative 1 and potential impacts during the closure and post-closure periods would occur 12 years later than under alternative 1. Because the Open Pit would be expanded onto National Forest System lands under the proposed action, potential impacts on National Forest System lands associated with pit stability would be increased compared to the other alternatives. However, the post-closure pit wall stability model for the proposed action (SRK Consulting, Inc. 2020c) indicates that the probability of a deep-seated pit wall failure extending to the pit bottom occurring during the life of mine and the post-closure periods

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
	demonstrated control technology. The lowest result for pseudo-static loading was also found on Tailings Storage Facility No. 3, with a computed factor of safety of 1.08, above the minimum required factors.	Technology. The lowest result for pseudo-static loading was also found on that same section, with a computed factor of safety of 1.01, which meets the minimum factor of safety of 1.0. These results warrant diligent monitoring of both facilities to ensure that the pore pressure response and shear strength assumptions used in the geotechnical analyses are valid.	such that it would cause unplanned disturbance to National Forest System land is very low. However, creep and continued movement of Pinal Schist within the Schist Hill Creep Monitoring Zone is considered likely. The creep would occur in previously mined areas and on the native slopes south of the Open Pit extending onto National Forest System land (SRK Consulting, Inc. 2020c). The lowest calculated factors of safety for both static and pseudo-static loading for the proposed action were found on section B at Tailings Storage Facility No. 3. The lowest result for static loading was a factor of safety of 1.30 for static loading and 1.0 for pseudo-static loading, which are equal to the minimum required factors under the Best Available Demonstrated Control Technology. The lowest result for Tailings Storage Facility No. 4 was 1.34 for static loading and 1.08 for pseudo-static loading. The results under the proposed action warrant diligent monitoring of both facilities to ensure that the pore pressure response and shear strength assumptions used in the geotechnical analyses are valid. The Forest Service has included specific monitoring measures for dam safety monitoring to address these concerns.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Paleontology			
Potential loss of unknown paleontological resources	Impacts on significant fossils could result from project-related surface-disturbing activities; however, it is unlikely that fossils would be encountered due to the infrequent occurrence of fossils in these geologic units, the lack of identified significant fossils in the analysis area, and the lack of significant fossil encounters from previous mining activity in the analysis area.	Continuation of mining operations and net expansion onto an additional 909 acres of private lands under the no-action alternative would result in additional ground disturbance on approximately 143 acres of land underlain by geologic units that have a moderate probability of containing paleontological resources. Based on the characteristics of the geologic units and absence of prior fossil discoveries at Pinto Valley Mine, it is unlikely that fossils would be encountered.	Expansion of mining facilities would disturb approximately 142 acres of National Forest System lands and 646 acres of private land underlain by geologic units that have a moderate probability of containing paleontological resources, resulting in a slightly greater impact than under the no-action alternative. Based on the characteristics of the geologic units and absence of prior fossil discoveries at Pinto Valley Mine, it is unlikely that fossils would be encountered.
Potential loss of known paleontological resources	Continuation of mining activities at the Pinto Valley Mine onto an additional 367 acres of private lands under the no-action alternative would not result in the potential loss of known paleontological resources because no known fossil localities have been recorded within the Pinto Valley Mine project boundary.	Expansion of mining activities onto an additional 909 acres of private lands under the no-action alternative would not result in the potential loss of known paleontological resources because no known fossil localities have been recorded within the Pinto Valley Mine project boundary.	Impacts of the proposed action are the same as those described under the no-action alternative because no known fossil localities have been recorded within the Pinto Valley Mine project boundary.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Hazardous and Nonhazardous Materials			
Materials storage and use	The types and amounts of hazardous and nonhazardous materials used and stored on site at Pinto Valley Mine would remain generally consistent with those listed in appendix G, "Hazardous and Nonhazardous Materials Inventory," during the 6-month transition period from active operations to the start of mine closure. Pinto Valley Mining Corp. would continue to minimize risks of materials release through proper material management and implementation of precautionary measures through post-closure in accordance with current practices.	Under alternative 1, Pinto Valley Mining Corp. would continue mining operations approximately 7 years longer than under the no-action alternative, increasing the volume of materials stored onsite and the amount of time hazardous and nonhazardous materials would be used and stored on site during active mining operations. Risks associated with materials storage and use would continue for approximately 7 more years than under the no-action alternative. Aside from changes in the location of petroleum products for powering, lubricating, or cooling motor vehicles or transformers within Pinto Valley Mining Corp.'s private lands, storage and use locations for most hazardous and nonhazardous materials are not anticipated to change from existing locations and volumes. Pinto Valley Mining Corp. would minimize the risk of materials release in the same manner as under the no-action alternative.	Under the proposed action, Pinto Valley Mining Corp. would continue mining operations approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1, increasing the volume of materials stored on site and the amount of time hazardous and nonhazardous materials would be used and stored on site during active mining operations. Risks associated with materials storage and use would continue for a longer period of time than under either the no-action alternative or alternative 1. Use of certain mobile and fixed equipment on National Forest System lands that contain regulated materials, such as petroleum-based fuels and lubricants, would increase the potential for inadvertent release of these materials on National Forest System lands. Pinto Valley Mining Corp. would minimize the risk of materials release in the same manner as under the no-action alternative and alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Materials transportation	Limited authorization to use approximately 29.8 miles of existing National Forest System roads during the 6-month transition period under the no-action alternative would not result in changes to delivery routes, material use, or shipment rates.	Material use and shipment rates would generally be the same as under the no-action alternative but would persist for approximately 7 years longer during the extended operational life of the mine under alternative 1. Potential realignments of National Forest System Road 287 and other roads could change the transportation routes for materials to the Pinto Valley Mine, but impacts of these route changes would be negligible as materials are generally stored within or nearby their location of use.	Transportation routes for materials within Pinto Valley Mine could change relative to current conditions and the no-action alternative as the Open Pit and Tailings Storage Facility No. 4 are constructed or realigned, but the same requirements and procedures would be followed. The proposed action would not alter the frequency of shipments, but material transportation would continue for approximately 19 more years than under the no-action alternative, or 12 more years than under alternative 1, because the duration of active mining operations would be longer under the proposed action. Transportation routes to landfills and processing locations outside of Pinto Valley Mine could change over the life of the mine; however, alternative disposal locations are likely to be available within similar distances to those currently traveled.
Materials release	Pinto Valley Mining Corp. would continue to minimize risks of materials release through proper material management and implementation of precautionary measures during the 6-month transition period in accordance with current practices. Risks associated with an accidental materials release would decrease during reclamation and closure phases due to the cessation of active mining activities and removal of hazardous and nonhazardous materials from the analysis area.	Extension of the mine life for 12 additional years and expansion of mining activities would extend the duration and geographic extent of the use of hazardous and nonhazardous materials and extend and expand the opportunities for an accidental material spill compared to the no-action alternative. Alternative 1 would result in continuation of risks to the surrounding environment for approximately 7 more years, decreasing during final reclamation and post-closure phases as they would under the no-action alternative.	Extension of the mine life for 19 additional years and expansion onto National Forest System lands would extend the duration and geographic extent of the use of hazardous and nonhazardous materials and extend and expand the opportunities for an accidental material spill compared to the no-action alternative and alternative 1. The proposed action would result in continuation of risks to the surrounding environment for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1, before decreasing during final reclamation and post-closure phases.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Land Ownership			
Land ownership	There would be no change in land ownership under the no-action alternative.	Under alternative 1, existing uses of National Forest System lands would be authorized. Expansion of the Open Pit, stockpiles, dumps, and tailings storage facilities would not result in a change of land ownership.	Expansion of mining facilities under the proposed action would result in an extended footprint on National Forest System lands when compared to the no-action alternative and alternative 1 to access unpatented claims; however, as under the no-action alternative and alternative 1, there would be no change in land ownership under the proposed action.
Land uses	Under the no-action alternative, no new disturbance would occur on National Forest System lands from continued operation of the Pinto Valley Mine. Previously authorized, ongoing activities would continue for 2 months with minimal changes to land use. Temporary public road user conflicts with mining operation traffic could continue along the segment of National Forest System Road 287 that passes through Pinto Valley Mine property.	Similar to the no-action alternative, no new disturbance would occur on National Forest System lands from continued operation of the Pinto Valley Mine. Previously authorized, ongoing activities would continue on private land with minimal changes to land use. Temporary public road user conflicts with mining operation traffic could continue along the segment of National Forest System Road 287 for approximately 7 more years than under the no-action alternative.	The proposed action would increase surface disturbance on private land by 720 acres compared to the no-action alternative and 178 acres compared to alternative 1. The proposed action would also increase surface disturbance and changes in land uses on National Forest System lands by 229 acres, resulting In minor changes to land uses compared to the no-action alternative and alternative 1. No closures of existing roads are anticipated under the proposed action, and National Forest System roads would remain open to the public with the potential for user conflicts for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1. Expansion of mining facilities onto National Forest System lands would result in greater impacts on the public using this land for livestock grazing from the loss of an estimated 47 animal unit months, which would not occur under either the no-action alternative and alternative 1. Reclamation would be delayed for 19 years and the timeframes where National Forest System lands would be unavailable for livestock grazing in the analysis area also would be increased by approximately 19 years compared to the no-action alternative or approximately 12 years compared to alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Land use authorizations	Previously authorized rights-of-way and special use permits for mining and ancillary facilities on National Forest System lands would not be authorized and remaining reclamation under existing plans of operations would be required. At the date of the record of decision, use of National Forest System lands would be limited to those activities that are required to initiate shutdown of the mine and to transition the mine from production to closure and reclamation as well as those activities associated with closure, reclamation, and post-closure care. Mine-related facilities within existing encroachments on National Forest System lands would be decommissioned and removed after the 6-month transition period. Use of the Burch creek pipeline system would be discontinued as soon as possible after the 6-month transitional period from active operations to the start of mine closure.	Under alternative 1, existing encroachments and previous authorizations for uses of National Forest System lands would be authorized on approximately 566 acres of National Forest System lands. Pinto Valley Mining Corp. would further expand the footprints of certain mining facilities within Pinto Valley Mining Corp.'s private lands. No new surface disturbance would occur on National Forest System lands. There would be no new surface disturbance on National Forest System lands. Existing land use authorizations and rights-of-way on National Forest System lands would continue for approximately 7 more years than under the no-action alternative. Use and maintenance of the Burch pipeline during active mining operations would continue for approximately 7 more years under alternative 1.	Under the proposed action, the Forest Service would authorize the use of approximately 795 total acres of National Forest System lands for mining-related use by Pinto Valley Mining Corp. including the 566 acres of existing encroachments and areas of previous authorizations and the 229 acres of additional disturbance due to expansion of the Open Pit, tailings storage facilities, and construction or relocation of linear features under the proposed action (roads and pipelines). Existing land use authorizations and rights-of-way on National Forest System lands would continue for approximately 19 more years than the no-action alternative and 12 more years than alternative 1. Use of the Burch pipeline system on National Forest System lands would be extended under the approved mining plan of operations. In addition, the tee connection from the Burch pipeline running north to the mine reservoir and beyond to the water fill stations on Pinto Valley Mining Corp. private property and the mine reservoir itself would be authorized under the mining plan of operations.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Livestock Grazing			
Grazing activity, allotment acreages, and animal unit months	All new surface disturbance under the no-action alternative would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, the no-action alternative would not result in a loss of forage, as measured by animal unit months, and would not reduce the amount of grazing in the allotments. Following the 6-month transition period, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands.	Similar to the no-action alternative, all new surface disturbance under alternative 1 would occur on private lands owned by Pinto Valley Mining Corp. and would not affect portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service. Therefore, alternative 1 would not result in a loss of forage (as measured by animal unit months) or reduce the amount of grazing in the allotments. As the mine transitions to reclamation and closure, which would occur approximately 7 years later than under the no-action alternative, vegetation would be gradually reestablished in areas of existing surface disturbance on National Forest System lands in accordance with Pinto Valley Mining Corp.'s reclamation plan for National Forest System lands.	The proposed action would result in an estimated 117 acres of new disturbance of National Forest System lands in the Pinto Creek allotment and 112 acres of surface disturbance on National Forest System lands in the Sleeping Beauty Complex allotment. could result in an estimated loss of up to 47 animal unit months (27 in the Pinto Creek allotment and 20 in the Sleeping Beauty Complex allotment). The longer duration of mine operations under the proposed action would expand the area unavailable for forage and extend the length of time during which forage on National Forest System lands occupied by mining activities would be unavailable to livestock grazing by approximately 229 acres and 19 years compared to the no-action alternative and 229 acres and 12 years compared to alternative 1. However, the estimated loss of animal unit months under the proposed action is not expected to result in a reduction in authorized livestock grazing numbers because the allotments are capable of supporting more animal unit months than currently permitted.
Range improvements	The no-action alternative would have no effect on range improvements within portions of the Pinto Creek or Sleeping Beauty Complex allotments administered by the Forest Service because there would be no new surface disturbance in these areas.	Same as the no-action alternative.	No existing range improvements were identified within grazing allotments on National Forest System lands within areas of new disturbance under the proposed action. If range improvements are inadvertently damaged or destroyed in the course of conducting proposed activities on National Forest System lands, Pinto Valley Mining Corp. would work with the permittee to repair and replace range improvements as needed; therefore, no range improvements are anticipated to be damaged or destroyed.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Noise			
Mining operations and reclamation	Users of adjacent dispersed recreation areas or travel routes to those areas may experience mine-related noise, depending on their proximity to mine-associated noise sources. Reclamation would generally occur during a 12-year period in three phases, each of which would employ different equipment and noise sources. The closest residences are 2.8 miles away and modeling found no discernable effects on those residences. Existing human-made noise from operations would cease following the record of decision and the 6-month transition period.	Alternative 1 would have the same operational noise impacts as the no-action alternative but continuing for approximately 7 more years. In addition, increases in existing human-made noise from operations at the Pinto Valley and Carlota Mines related to reclamation activities would occur approximately 7 years later than under the no-action alternative.	The proposed action would have the same noise impacts as the no-action alternative and alternative 1 but for approximately 19 more years or 12 more years, respectively. In addition, increases in existing human-made noise from operations at the Pinto Valley and Carlota Mines related to reclamation activities would occur approximately 19 years later than under the no-action alternative or approximately 12 years later than under alternative 1.
Traffic noise	Traffic is anticipated continue at approximately current levels during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure. Corresponding noise-related impacts on recreationists (especially along National Forest System Road 287) are expected to decrease after 6-month transition period.	Traffic is anticipated to continue at current levels with corresponding noise-related impacts as described for the no-action alternative but would occur for approximately 7 more years under alternative 1.	Same as the no-action alternative and alternative 1, but the traffic noise-related impacts would continue for approximately 19 more years or 12 more years, respectively.
Blasting noise and vibrations	Users of adjacent dispersed recreation areas or travel routes to those areas may experience infrequent blasting noise during daylight hours, with no effects on nearby wilderness areas. No vibration effects from infrequent blasting that exceed Office of Surface Mining Reclamation and Enforcement regulatory standards are anticipated under the no-action alternative. Vibration effects on residences are not expected to occur.	Similar noise impacts from blasting as described for the no-action alternative but a substantial increase in frequency and duration under alternative 1. Blasting operations would generally continue to be conducted once daily during daylight hours for approximately 7 more years than under the no-action alternative. No vibration effects from once-daily blasting that exceed Office of Surface Mining Reclamation and Enforcement regulatory standards are anticipated under alternative 1. Vibration effects on residences are not expected to occur.	Same as alternative 1, but for approximately 12 more years (19 years longer than under the no-action alternative).

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Public Health and Safety			
Physical hazards	Existing mine identification and security features would remain in place at Pinto Valley Mine under the no-action alternative. An additional security fence and access road would be installed on Pinto Valley Mining Corp. private property around the Open Pit to deter public access during final reclamation and would be monitored regularly throughout the post-closure period.	Physical hazards would be essentially the same as under the no-action alternative, except that any hazards associated with active mining operations would extend for approximately 7 more years than under the no-action alternative. The additional perimeter fence around the Open Pit would be installed and monitored approximately 7 years later than under the no-action alternative. Pinto Valley Mining Corp. would continue to manage public access to mine facilities and no increased risk to public health or safety is anticipated.	Physical hazards would be essentially the same as under the no-action alternative and alternative 1, except that any hazards associated with active mining operations would be expanded on an additional 229 acres of National Forest System lands and continue for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1. The additional perimeter fence around the Open Pit would be installed approximately 12 years later than under the no-action alternative and approximately 19 years later than under the proposed action. Pinto Valley Mining Corp. would continue to manage public access to mine facilities and no increased risk to public health or safety is anticipated.
Blasting	Pinto Valley Mining Corp. does not anticipate the need for blasting under the no-action alternative. If blasting of active mining faces is needed to stabilize the mine, impacts on public health and safety are expected to be negligible, due to the personnel exclusion zones near blasting sites, the Forest Service blasting closure order located immediately to the east of the mine, and other standard operating procedures (such as signage) to prevent impacts on public safety.	Impacts from blasting on public health and safety under alternative 1 are expected to increase compared to the no-action alternative due to the increased frequency and duration (approximately 7 more years) of blasting. However, potential impacts on public safety from blasting would still be negligible due to the preventative safety measures employed by the mine and Forest Service.	Blasting activities would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1. As a result, the time period over which mine workers and the public could be exposed to risks from blasting would be increased under the proposed action. However, potential impacts on public safety from blasting would still be negligible due to the preventative safety measures employed by the mine and Forest Service.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Hazardous and nonhazardous materials	No changes to the types or quantities of hazardous and nonhazardous materials used and stored at Pinto Valley Mine are anticipated under the no-action alternative and no change to the existing risk to Pinto Valley Mine employee or public health from potential exposure to these materials would occur. The types and amounts of hazardous and nonhazardous materials stored at Pinto Valley Mine during the 6-month transition period from active operations to the start of mine closure would be essentially the same as under existing conditions.	Risks from the types and quantities of materials used on site are the same as those under the no-action alternative. Extension of the mine life under alternative 1 would extend the duration of use of hazardous materials on the Pinto Valley Mine site by approximately 7 years and, therefore, would provide more opportunities affecting public health by mismanagement of materials or accidental release into the environment.	Risks from the types and quantities of materials used on site are the same as those under the no-action alternative. Extension of the mine life under the proposed action would extend the duration of use of hazardous materials on the Pinto Valley Mine site by approximately 19 more years than under the no-action alternative or approximately 12 more years than under alternative 1 and, therefore, would provide more opportunities affecting public health by mismanagement of materials or accidental release into the environment.
Vehicle traffic	Pinto Valley Mining Corp. would continue to use approximately 29.8 miles of existing National Forest System roads and 15.2 miles of access roads on National Forest System lands under the no-action alternative. Total vehicle trips would decrease during 6-month transition period with the reduction of 400 nonessential personnel expected to be laid off within 3 months after issuance of the record of decision. Total vehicle trips would further decrease at mine closure, reclamation phases, and post-closure phases, potentially decreasing traffic counts and risk of vehicle crash compared to existing conditions.	Similar to the no-action alternative except the operational period of the mine and the associated traffic would extend for approximately 7 more years. As a result, potential degradation of roads associated with use and vehicle trips during active mining operations could increase compared to the proposed action. However, under Mitigation Measure TR-1, Pinto Valley Mining Corp. would operate under a road use permit for commercial use and maintenance of National Forest System roads. The road use permit will outline Pinto Valley Mining Corp.'s expected annual use, the calculated fee, and potential credits for maintenance conducted by Pinto Valley Mining Corp. as approved by the Forest Service.	Similar to the no-action alternative and alternative 1, traffic along the current transportation system under the proposed action is not anticipated to result in impacts on public safety. Extending the mine life would extend the duration of mine-related traffic during active mining operations by approximately 19 years compared to the no-action alternative and approximately 12 years compared to alternative 1. Same as alternative 1, Pinto Valley Mining Corp. would operate under a road use permit for commercial use and maintenance of National Forest System roads. The road use permit will outline Pinto Valley Mining Corp.'s expected annual use, the calculated fee, and potential credits for maintenance conducted by Pinto Valley Mining Corp. as approved by the Forest Service (Mitigation Measure TR-1).

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Noise	Noise levels would remain in the same equivalent range as under existing conditions during the first 2 months of the 6-month transition period. Following the first 2 months of the 6-month transition period, project-related noise would be reduced compared to existing conditions as the mine transitions from active mining operations to reclamation and closure. Therefore, public health is not anticipated to be affected by noise during active mining operations at the Pinto Valley Mine.	Under alternative 1, modeled noise levels and impacts on public health would be similar as those described under the no-action alternative, except that the mine would operate for approximately 7 more years under alternative 1, increasing the amount of time noise levels would be increased from Pinto Valley Mine active operations.	Operation of Pinto Valley Mine under the proposed action (approximately 19 years longer than under the no-action alternative and 12 years longer than under alternative 1) would extend the duration of impacts from mine operational noise. The maximum modeled noise levels for the proposed action were the same as those for the no-action alternative and alternative 1 and resulting primarily from increased use and traffic on U.S. Highway 60 independent of the mine.
Water quality	Active mining operations would continue at the Pinto Valley Mine for approximately 2 months following issuance of the record of decision. Impacts on water quality would be similar to those under existing conditions. Pinto Valley Mining Corp. would continue to sample and monitor water quality throughout mine operations and the post-closure period to minimize the risks of undetected public health threats.	Impacts on water quality under alternative 1 would be the similar to those under the no-action alternative, but would continue for approximately 7 more years due to the extended period of active mining operations under alternative 1.	The proposed action would increase the potential for impacts on water quality as mine facilities would be expanded on National Forest System lands and active mine operations and associated water use would continue for approximately 19 more years than under the no-action alternative and approximately 12 more years than under alternative 1.
Air quality	Pinto Valley Mining Corp.'s air quality permit would require the mine air pollutant emissions to remain constant. Increasingly stringent regulation of emissions sources would likely cause ambient pollutant concentrations in the region to remain constant or decrease slowly over time. As a result, there are no anticipated impacts on public health and safety due to air quality emissions or impacts.	Extending the mine life by approximately 7 years and expanding mining facilities would increase the criteria and hazardous air pollutant emissions compared to the no-action alternative. However, there are no anticipated impacts on public health and safety due to air quality emissions or impacts.	Extending the mine life (19 years longer than under the no-action alternative or 12 years longer than under alternative 1) and expanding the mining facilities would increase the criteria and hazardous air pollutant emissions compared to the no-action alternative. However, there are no anticipated impacts on public health and safety due to air quality emissions or impacts.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Geotechnical stability	Due to the relatively minimal level of expansion of tailings storage facilities, the no-action alternative is not anticipated to affect the stability of the tailings storage facilities. In addition, Pinto Valley Mining Corp. would continue to maintain and apply its tailings operation, maintenance, and surveillance manual that would reduce the potential for instability issues (Capstone Mining Corp. 2020c). During the post-closure period, active measures to control pore pressures in the pit slope, surface water management, and geotechnical monitoring would not continue and the pit slopes would be allowed to fail over time until they reach a long-term stable configuration. During final reclamation, a regularly monitored additional perimeter security fence and warning signs would be installed around the Open Pit to deter public access.	Under alternative 1, proposed modifications to the existing tailings storage facilities are not anticipated to affect the public safety risks associated with tailings storage facilities. The Open Pit footprint would increase by approximately 219 acres onto private property compared to the no-action alternative. Ongoing safety and geotechnical evaluations and continuation of pit slope monitoring would protect against a potential failure. Facility stabilization, including stabilizing the Open Pit high wall, would occur approximately 7 years later than under the no-action alternative. However, risk to public safety from pit slope stability hazards would generally be the same as described for the no-action alternative due to routine monitoring and installation of security fencing around the perimeter of the Open Pit during final reclamation.	Pinto Valley Mining Corp. maintains and applies a tailings operation, maintenance, and surveillance manual that describes the procedures and responsibilities for tailings deposition, water management, environmental protection, operating guidelines, surveillance and monitoring, and maintenance of Tailings Storage Facilities No. 3 and No. 4 (Capstone Mining Corp. 2020c). Continued application of this manual would reduce potential instability issues at the tailings storage facilities. Under the proposed action, the Open Pit would be extended to the north and west onto 219 additional acres of private land, and to the east onto approximately 19 acres of National Forest System lands by the end of the operational life of the mine. Although the size of the Open Pit would be larger, and the mine would operate longer under the proposed action, risk to public safety from pit slope stability hazards would be the same as described for the no-action alternative and alternative 1 due to routine monitoring and installation of security fencing around the perimeter of the Open Pit during final reclamation. The pit wall stability model for the proposed action indicates that the probability of a deep-seated pit wall failure extending to the pit bottom occurring during the life of mine and the post-closure periods such that it would cause unplanned disturbance to National Forest System land is very low. However, creep and continued movement of Pinal Schist within the Schist Hill Creep Monitoring Zone is considered likely.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Recreation and Wilderness			
Recreation opportunity spectrum	Under the no-action alternative, closure and reclamation of most facilities at Pinto Valley Mine are expected to begin after the 6-month transition period following release of the record of decision. Existing disturbances from mining facilities on National Forest System lands would gradually transition toward more primitive recreation opportunity spectrum classes as mining facilities are decommissioned or removed and disturbed areas are recontoured, revegetated, and reclaimed in accordance with the reclamation plan for National Forest System lands.	Existing uses of National Forest System lands for active mining operations at the Pinto Valley Mine are expected to continue for approximately 7 more years than under the no-action alternative. Similar to the no-action alternative, existing disturbances from mining facilities on National Forest System lands would gradually transition toward more primitive recreation opportunity spectrum classes as mining facilities are decommissioned or removed and disturbed areas are recontoured, revegetated, and reclaimed in accordance with the reclamation plan for National Forest System lands.	Expansion of mine facility footprints onto 19 acres of National Forest System lands classified as “urban” would contribute to a highly modified landscape characteristic of the urban class. An additional 210 acres of National Forest System lands that could be disturbed or modified by excavation of potential borrow and riprap sources and construction of the Tailings Storage Facility No. 3 and Tailings Storage Facility No. 4 classified as “roaded natural” on the recreation opportunity spectrum. Recreation opportunities within proposed areas of new disturbance have been previously diminished by decades of mining activities on adjacent lands. Neither existing recreation opportunities nor the overall landscape character would change notably relative to the existing conditions. The reclamation practices and estimated duration of reclamation activities for the proposed action would be generally consistent with the no-action alternative and alternative 1 but would begin approximately 19 years later than under the no-action alternative and 12 years later than under alternative 1.
Recreation access	Public use of National Forest System roads for recreational access and potential conflicts with recreational users would continue under the no-action alternative in the same manner as their present use. Except for the portion of National Forest System Road 287B currently closed to public use due to safety and security concerns, National Forest System roads would generally remain open to the public. Average annual mine-related vehicle trips on National Forest System Road 287 would decrease substantially after cessation of active mine operations, decreasing the potential for conflicts with or impediments to public recreational access.	Same as described under the no-action alternative, except the operational life of the mine would continue for approximately 7 more years, resulting in a longer period during which mine-related traffic has the potential to conflict with or impede recreational access.	Continued public use of National Forest System roads for recreational access would be the same as described under the no-action alternative and alternative 1, except the operational life of the mine would continue for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Recreation settings and wilderness	Based on modeling and distance from mine activities for the Arizona National Scenic Trail and the Superstition Wilderness, respectively, mining-related noise under the no-action alternative is not anticipated to affect recreationists in those areas. Continued mining under the no-action alternative would not change the overall scenic quality of the mine site, which already exhibits a high degree of visual change from decades of mining. With only a 2-month period of operational noise from ongoing operational noise under the no-action alternative, the potential for noise-related effects on recreation would be greatest during periods of active reclamation.	Noise-related impacts on recreationists would be the same as for the no-action alternative except noise impacts during active mining operations would continue for approximately 7 more years compared to the no-action alternative. Potential scenic quality impacts, as viewed by recreationists from the Superstition Wilderness and Arizona National Scenic Trail, would be as described but with an additional 542 acres of new surface disturbance compared to the no-action alternative. Increased surface disturbance under the proposed action and higher maximum elevations of waste rock dumps and tailings storage dams would create more visual change than under the no-action alternative; however, the overall scenic quality of the landscape when viewed by recreationists from a distance of 3–10 miles is unlikely to change.	Noise-related impacts on recreationists would be the same as for the no-action alternative and alternative 1 except active mining operations would be approximately 19 years longer or 12 years longer, respectively. Potential scenic quality impacts, as viewed by recreationists from the Superstition Wilderness and Arizona National Scenic Trail, would be similar to the no-action alternative and alternative 1 but with an increase of 178 acres of surface disturbance on private land compared to alternative 1 and an increase of 229 acres of surface disturbance on National Forest System land compared to the no-action alternative and alternative 1. Increased surface disturbance under the proposed action and higher maximum elevations of waste rock dumps and tailings storage dams would create more visual change than under the no-action alternative and alternative 1; however, the overall scenic quality of the landscape as seen and perceived by recreationists due to screening by topography and vegetation (from observation points north of Pinto Valley Mine) or due to the relatively distant viewing locations (from observation points in the Superstition Wilderness or along the Arizona National Scenic Trail) is not anticipated to change.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Socioeconomic Conditions			
Social conditions	Mine operation and expansion of mining under the no-action alternative are not anticipate to change during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure after issuance of the record of decision. Approximately 400 nonessential personnel are expected to be laid off within 3 months after issuance of the record of decision. Out-migration, increased vacancy rates, and decreased housing values due to staffing level reductions could occur during and after mine closure activities.	Impacts of the proposed action would be the same as those under the no-action alternative but extension of the life of the mine would delay social effects associated with mine closure by approximately 7 years.	Impacts of the proposed action would be the same as those under the no-action alternative and alternative 1 but extension of the life of the mine would delay social effects associated with mine closure by approximately 19 years or 12 years, respectively.
Economic conditions	Employment and labor income in the analysis area reflect the ongoing operation of the mine and both employment and labor income would be substantially reduced by closing the mine within 6 months, compared to existing conditions. Following the 2 months of active mining operations and laying off approximately 400 employees within 3 months, the economic effects associated with operation would be substantially reduced in perpetuity compared to existing conditions.	Operation of Pinto Valley Mine, which would continue for approximately 7 years longer than under the no-action alternative, would support approximately 1,030 total annual jobs in the Gila County region, would generate approximately $66.3 million in labor income, and would contribute approximately $326.4 million in industry activity across the region. Decreases in employment and labor income at the time of mine closure would be similar to the no-action alternative but would occur approximately 7 years later under alternative 1.	Annual jobs, labor income, and economic activity generated by operation of Pinto Valley Mine would be the same as under Alternative 1 but would continue for approximately 12 more years under the proposed action. Decreases in employment and labor income at the time of mine closure under the proposed action would be similar to the no-action alternative and alternative 1 but would occur approximately 19 years later or 12 years later, respectively.
Fiscal conditions	State and local government revenues generated through taxes and fees on Pinto Valley Mine expenditures for ongoing operations would generally cease approximately 2 months after issuance of the record of decision. Following the 2 months of active mining operations under the no-action alternative, State and local revenues generated from mine-related expenditures would be substantially reduced in perpetuity compared to existing conditions.	State and local taxes and fees would continue to be collected and would contribute to government revenue for approximately 7 more years than under the no-action alternative. State and local government revenues generated through taxes and fees on Pinto Valley Mine would be greater than and accrue for approximately 7 more years than under the no-action alternative.	The proposed action would generate State and local government revenues for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1, increasing the county's capacity to provide public services for its residents. Operation of Pinto Valley Mine would contribute approximately $14.8 million annually in State and local taxes. The proposed action would delay the reduction in property taxes, sales and fuels taxes, and income taxes by approximately 19 years or 12 years compared to the no-action alternative or alternative 1, respectively.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Nonmarket value	The no-action alternative would result in 367 acres of additional disturbances on private lands but would have minimal impacts on nonmarket values, as the area is and would likely remain unavailable for recreation or other uses by the public. Following the 2-month period of active mining operations after issuance of the record of decision, impacts from noise, human presence, and visual disturbance would decrease. As disturbed areas are reclaimed, nonmarket values would increase commensurate with the success of vegetation and reclamation efforts. This could limit disturbance of wildlife and recreationists on National Forest System lands surrounding the mine and could increase direct and indirect nonmarket values associated with improved recreational experiences in the area and enhanced habitat for wildlife.	Minimal effects on nonmarket values under alternative 1 compared to the no-action alternative from a 49-percent increase in surface disturbance and conversion to an urban and industrial landscape character. Noise and traffic effects would continue for approximately 7 more years than under the no-action alternative. Impacts on passive use and reduction in the range of available opportunities and use of public lands in the area would continue for approximately 7 more years than under the no-action alternative.	Effects on nonmarket values under the proposed action would be greater than under the no-action alternative and alternative 1 due to the increased amount of surface disturbance on private land, the addition of 229 acres of surface disturbance on National Forest System lands, and the longer operational life of the mine. However, similar to the other alternatives, adverse impacts on nonmarket values would continue to be limited due to the existing landscape that is already highly altered from mine development, the relatively distant viewing locations, and likelihood that only portions of Pinto Valley Mine could be seen from each viewing location. Noise and traffic effects would continue for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1. Impacts on passive use and reduction in the range of available opportunities and use of public lands in the area would continue for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1.
Soils			
Soil disturbance	Expansion of mining facilities under the no-action alternative would result in 367 acres of new ground disturbance on private land. Removal of vegetation and the temporary exposure of the bare soil could increase soil erosion rates until the disturbed areas are successfully reclaimed. Given the slow recovery of natural vegetative communities on disturbed land in arid climates in the desert southwest, soil conditions in disturbed areas may require a substantial amount of time to return to natural conditions.	Expansion of mining facilities onto private lands owned by Pinto Valley Mining Corp. under alternative 1 would result in approximately 909 acres of new surface disturbance on private land with 0 acres of new surface disturbance on National Forest System lands. Potential impacts on soils from surface disturbance would be similar to those described for the no-action alternative, but to a greater extent due to the additional 542 acres of surface disturbance on private land compared to the no-action alternative.	Surface disturbance under the proposed action would result in similar types of effects on soils as described for the no-action alternative and alternative 1. However, the proposed action would result in an increase of 720 acres of surface disturbance on private land compared to the no-action alternative, an increase of 178 acres of surface disturbance on private land compared to alternative 1, and an increase of 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Soil condition and reclamation	Under the no-action alternative, reclamation would generally begin following the 6-month transition period unless facilities and infrastructure are necessary for post-closure operations as specified in Pinto Valley Mining Corp.'s 2016 Mined Land Reclamation Plan.	Soil reclamation activities under alternative 1 would occur as described under the no-action alternative on approximately 542 more acres. Additional borrow material would be required to cover and serve as growth media on reclaimed facilities and reclamation would start approximately 7 years later than under the no-action alternative.	Soil reclamation activities under the proposed action would occur as described under the no-action alternative and alternative 1. However, the proposed action would result in an additional 720 acres of surface disturbance on private land compared to the no-action alternative, an additional 178 acres of surface disturbance on private land compared to alternative 1, and an additional 229 acres of surface disturbance on National Forest System lands compared to the no-action alternative and alternative 1. Additional borrow material would be required to cover and serve as growth media on reclaimed facilities and reclamation would start approximately 19 years later than under the no-action alternative or 12 years later than under alternative 1.
Soil contamination	During final reclamation and in accordance with Arizona solid waste rules, Pinto Valley Mining Corp. would cover in place or remove and haul to an off-site repository for disposal any soils potentially contaminated with petroleum hydrocarbons, concentrates, or reagents.	Impacts on soil conditions under the proposed action would be the same as those under the no-action alternative; however, the additional 7 years of mine operation may result in a larger volume of contaminated soil.	Impacts on soil conditions under the proposed action would be the same as those under the no-action alternative and alternative 1; however, expanded mine operation under the proposed action (approximately 19 years longer than under the no-action alternative or 12 years longer than under alternative 1) may result in a larger volume of contaminated soil.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Traffic and Transportation			
Vehicle traffic	The volume of vehicle traffic entering and exiting Pinto Valley Mine would continue at approximately current levels during the first 2 months of the 6-month transition period as the mine prepares for reclamation and closure and would not result in increases of annual employee and contractor traffic along U.S. Highway 60 and National Forest System Road 287. After mine closure, annual contractor vehicle trips would substantially decrease to approximately 1,806 vehicle roundtrips per year (5 average annual daily roundtrips for 12 years) to approximately 161 annual contractor vehicle trips under the no-action alternative.	Under alternative 1, the volume of employee and contractor vehicles entering and exiting Pinto Valley Mine would continue at approximately current levels for the operational period of the mine, which would be approximately 7 years longer than under the no-action alternative. Annual contractor vehicle trips after mine closure would decrease approximately 7 years later than under the no-action alternative.	Expansion of mining activities onto National Forest System lands and reclamation of mining facilities under the proposed action would have the same types of impacts on vehicle traffic as described for the no-action alternative and alternative 1 but would continue for approximately 19 more years or 12 more years, respectively.
Vehicle crashes	Vehicle traffic to and from Pinto Valley Mine under the no-action alternative would begin to decline leading up to closure of the mine at the end of the 6-month transition period. Total vehicle trips would be further reduced during the mine closure and post-closure phases. The decrease in mine-related traffic along U.S. Highway 60 and National Forest System Road 287 would result in a corresponding decrease in the probability of traffic accidents related to vehicle traffic to and from Pinto Valley Mine.	Continuation of mine operations for approximately 7 more years under alternative 1 would extend the timeframe during which mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287, compared to the no-action alternative.	Expansion of mining activities onto National Forest System lands and reclamation of mining facilities under the proposed action would have the same types of impacts on accident rates as alternative 1, which is not anticipated to increase, except that vehicle trips associated with mine operation would be extended for approximately 12 years more than under alternative 1. As a result, extension of the mine life under the proposed action would extend the timeframe where mine-related vehicle trips could contribute to accident rates along U.S. Highway 60 and National Forest System Road 287.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Public access	Under the no-action alternative, there would be no closures of existing roads and National Forest System roads would remain open to the public. However, the potential for temporary public road user conflicts with mining operation traffic would exist and minor delays or reroutes could be encountered along the segment of National Forest System Road 287 that passes through Pinto Valley Mining Corp. property, resulting in minor and temporary potential impacts on public access.	Impacts on public access under alternative 1 would be similar to those under the no-action alternative except the timeframe where public road users could encounter temporary delays would be increased by approximately 7 years. A potential realignment of National Forest System Road 287 would be considered as needed under alternative 1, but there would be no anticipated closures of existing roads under the proposed action and National Forest System roads would remain open to the public.	Impacts on public access under the proposed action would be similar to those under alternative 1 except the timeframe where public road users could encounter temporary delays would be increased by 12 years.
Road conditions	Pavement and road conditions would continue to be maintained to maintenance level 3 along the segment of National Forest System Road 287 used to access the mine under the no-action alternative. Road conditions on U.S. Highway 60 would remain typical of highways in the region and Arizona Department of Transportation would continue to perform routine maintenance and improve highway infrastructure as needed.	Operation of the Pinto Valley Mine for approximately 7 more years than under the no-action alternative would extend the duration of road use along U.S. Highway 60 and National Forest System Road 287. Similar to the no-action alternative, pavement conditions would be maintained to Forest Service road management objectives for road maintenance level 3. It is anticipated that pavement will continue to deteriorate due to heavy truck traffic related to mine operations. National Forest System Road 287 may possibly be improved to maintenance level 4 if Pinto Valley Mining Corp. desires a higher level of service. Road improvements would be accommodated through establishment of an agreement for maintenance and use.	Similar pavement and road conditions as under no-action alternative and alternative 1 except operation of the Pinto Valley Mine for approximately 19 more years than under the no-action alternative or 12 more years than under alternative 1 would extend the duration of road use along U.S. Highway 60 and National Forest System Road 287. Similar to alternative 1, pavement conditions would be maintained to Forest Service road management objectives for road maintenance level 3 unless modified through establishment of a subsequent road use and maintenance agreement. It is anticipated that pavement will deteriorate to a greater degree than under alternative 1 due to 12 additional years of heavy truck traffic related to mine operations.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Visual Resources			
Forest Service visual quality objective	Under the no-action alternative, there would be no expansion of mining facilities onto additional areas of National Forest System lands. During the 6-month transition period from active operations to start of mine closure, the condition of lands relative to visual quality objectives would not change because all activities would occur on private lands, which are not subject to Forest Service visual resource management. Reclamation of existing Pinto Valley Mine facilities on National Forest System lands could result in the gradual transition of the existing disturbed areas to meet current visual objectives as mine facilities are removed and the disturbed area is revegetated in accordance with the reclamation plan for National Forest System lands.	Similar to the no-action alternative, there would be no expansion of mining facilities onto additional areas of National Forest System lands under alternative 1. The condition of lands relative to visual quality objectives would not change because all activities would occur on private lands, which are not subject to Forest Service visual resource management. Reclamation of existing Pinto Valley Mine facilities would have the same effects as described under the no-action alternative but would occur approximately 7 years later.	Whereas the no-action alternative and alternative 1 would not include any additional expansion of mining facilities onto National Forest System lands, the proposed action would result in new disturbance of approximately 229 acres of National Forest System lands. Most new disturbance areas would occur within maximum modification areas, which allow for a high degree of visual change. Use of a potential new borrow area on National Forest System lands could result in approximately 52 acres of new disturbance; however, these borrow areas are unlikely to be disturbed due to the availability of borrow areas on private lands. In the unlikely scenario that borrow areas on National Forest System lands are utilized for mine reclamation, disturbances would be short-term and reclaimed to maintain consistency with the partial retention visual quality objective. Reclamation of mine features on National Forest System Lands in accordance with the reclamation plan for National Forest System lands as well as natural weathering processes during operations and post mining would, over time, reduce contrasts between mining-related disturbances and adjacent natural-appearing landscapes, resulting in a gradual transition of disturbed areas to meet current visual objectives.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Forest Service visual variety and Bureau of Land Management scenic quality	Due to the dominant presence of existing mining-related facilities and disturbance in the viewshed and classification of the Pinto Valley Mine area as Forest Service visual variety Class C, which signifies lands with the lowest relative visual variety and scenic quality, additional disturbances under the no-action alternative would be similar to surrounding activities and consistent with existing visual variety and scenery designations.	Visual contrasts from mining facilities under alternative 1 would be slightly greater than under the no-action alternative due to 542 acres of surface disturbance on private lands, the increased top elevations of tailings dams and waste rock dumps, and extension of active mining operations by approximately 7 years. Due to the dominant presence of existing mining-related facilities, existing disturbance in the mine viewshed, and classification of the Pinto Valley Mine area as Forest Service visual variety class C, additional disturbances under alternative 1 would be similar to surrounding activities and consistent with existing visual variety and scenery designations.	Proposed action mining operations at the Pinto Valley Mine would result in minor scenery impacts that are relatively similar to existing conditions, including visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and typically associated with an operating open pit mine. These scenery impacts are not expected to further reduce the inventoried Forest Service variety class designations and Bureau of Land Management scenery class designations in the analysis area relative to existing conditions. As a result, direct and indirect impacts would be similar to those described for the no-action alternative and alternative 1, and minor relative to existing conditions.
Forest Service user sensitivity and Bureau of Land Management sensitivity levels	Portions of the 357 acres of disturbance associated with excavation of borrow and riprap sources on private lands for use in reclamation and closure under the no-action alternative would be within lands classified by the Forest Service as having the highest level of user sensitivity (level 1). However, 244 acres of this disturbance would occur in previously disturbed areas and new disturbances would be adjacent to existing mine facilities. Therefore, actual user sensitivity to these disturbances is expected to be minimal.	Some areas of additional surface disturbance on private lands under alternative 1 would be within lands classified by the Forest Service as having the highest level of user sensitivity (level 1). However, as under the no-action alternative, actual user sensitivity to these disturbances is expected to be minimal given that all new disturbance would be adjacent to existing mine facilities and, in some areas, within previously disturbed areas.	Proposed action mining would result in minor viewer impacts due to the relative similarity to existing conditions, including visually dominant forms, lines, colors, and textures consistent with the surrounding landscape and typically associated with an operating open pit mine. The proposed action would result in minor changes in scenic quality for viewers in the foreground, middleground, and background distance zones and this level of minor impact is not expected to further reduce the inventoried Forest Service user sensitivity designations and Bureau of Land Management sensitivity level designations in the analysis area. Therefore, direct and indirect impacts on viewers would be minor, though slightly more than those of the no-action alternative and alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Bureau of Land Management visual resource inventory classes	Disturbances under the no-action alternative that may be visible in the foreground-middleground zone when viewed from Bureau of Land Management lands east of Pinto Valley Mine would be consistent with assigned class IV visual resource inventory value. Modifications to Pinto Valley Mine under the no-action alternative would not be visible from and would have no effect on the scenic quality of Bureau of Land Management lands south of Pinto Valley Mine in the Red Hills area.	Potential effects on the scenic quality of Bureau of Land Management lands would be the same as described under the no-action alternative. Surface disturbance under alternative 1 that may be visible in the foreground-middleground zone when viewed from Bureau of Land Management lands east of Pinto Valley Mine would be consistent with assigned class IV visual resource inventory values. Modifications to Pinto Valley Mine under alternative 1 would not be visible from and would have no effect on the scenic quality of Bureau of Land Management lands south of Pinto Valley Mine in the Red Hills area.	Proposed action mining operations would result in overall landscape values that are relatively similar to existing conditions, the no-action alternative, and alternative 1. The proposed action would result in minor changes to the landscape for viewers in the foreground, middleground, and background distance zones and this minor level of impact would not be expected to reduce the inventoried Bureau of Land Management visual resource inventory class designations in the analysis area. Therefore, direct and indirect impacts on viewers and scenery would be similar to those under the no-action alternative and alternative 1, and minor relative to existing conditions.
Dark sky conditions at Tonto National Monument	The same types and amounts of existing nighttime lighting at Pinto Valley Mine would continue to be used during the 2 months of active operations under the no-action alternative. Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument during this time would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Nighttime lighting at Pinto Valley Mine would decrease substantially as the mine transitions to reclamation and closure activities because lighting would no longer be needed to support active mining operations and there would be fewer vehicles traveling to and within Pinto Valley Mine.	Potential contributions of the Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for the no-action alternative except that nighttime lighting for mine operations would continue for approximately 7 more years under alternative 1. The effects of operational lighting unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Decreases in nighttime lighting and associated contributions to light pollution would be the same as described for the no-action alternative but would begin approximately 7 years later.	Potential contributions of Pinto Valley Mine to light pollution at Tonto National Monument would be the same as described for alternative 1 except that nighttime lighting for mine operations would continue for approximately 12 more years under the proposed action. The effects of operational lighting would be unchanged from existing conditions and would not affect the criteria for its designation as an International Dark-Sky Park. Decreases in nighttime lighting and associated contributions to light pollution would be the same as described for alternative 1 but would begin approximately 12 years later.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Water Resources and Hydrogeochemistry			
Groundwater quantity	Groundwater modeling results predict a reduction in groundwater levels and that the drawdown area (defined as the area predicted to experience a reduction in groundwater levels of 5 feet or more at any point in time over the mining or post-mining period) would expand drawdown compared to the 2018 condition. Groundwater drawdown is predicted to continue to expand during the post-mining period from 15.6 square miles at the end of mining to 35.7 square miles at 100 years post-closure.	Groundwater drawdown is predicted to continue to expand during the post-mining period from 18.9 square miles at the end of mining to 36.2 square miles at 100 years post-closure.	Groundwater drawdown is predicted to continue to expand during the post-mining period from 23.8 square miles at the end of mining to 37.9 square miles at 100 years post-closure.
Surface water quantity	Groundwater drawdown is projected to encompass a total of 5.49 miles of perennial stream length that includes portions of Pinto Creek (4.43 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. These impacts would likely persist until pumping ceases and groundwater levels recover. Modeling results predict impacts on baseflow occurred as a result of pumping from the Peak Well field during the 2013–2018 period. Continued pumping from the Peak Well field under the no-action alternative is predicted to sustain those impacts through the end of mining. A long-term reduction in baseflow resulting from groundwater pumping would likely result in a measurable reduction in flow (or elimination of surface flow) during the low-flow periods, and a corresponding reduction in the length of perennial stream reaches that existed prior to being affected by groundwater pumping. Segments of Pinto Creek that were previously characterized as perennial prior to	Groundwater drawdown is projected to encompass a total of 5.68 miles of perennial stream length that includes portions of Pinto Creek (4.62 miles), Miller Springs Gulch (0.81 mile), and an unnamed tributary to Pinto Creek (0.25 mile). The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. These impacts would likely persist until pumping ceases and groundwater levels recover. Modeling results predict impacts on baseflow occurred as a result of pumping from the Peak Well field during the 2013–2018 period. Continued pumping from the Peak Well field under alternative 1 would be similar as under the no-action alternative; however, alternative 1 would extend the duration of maximum impacts on baseflow for approximately 7 more years. Compared to the no-action alternative, the peak baseflow recovery for alternative 1 is projected to occur approximately 8 years later. The continuation of substantial reductions in baseflow over the mine life included under alternative 1 is anticipated to increase the duration of the impacts on baseflow projected	Groundwater drawdown is projected to encompass a total of 5.86 miles of perennial stream length that includes portions of Pinto Creek (4.80 miles), Miller Springs Gulch (0.82 mile), and an unnamed tributary to Pinto Creek (0.25 mile). These results are similar to but slightly larger than those defined under the no-action alternative and alternative 1. The predicted expansion of drawdown resulting from mine-induced drawdown could result in a reduction in baseflow in these stream reaches. A reduction in baseflows would likely affect the perennial stream reach (reduce the length of or eliminate the perennial stream reach affected by drawdown). Modeling results predict impacts on baseflow that occurred as a result of pumping from the Peak Well field during the 2013–2018 period would continue at a slightly greater magnitude than under the no-action alternative (2019–2022) and alternative 1 (2019–2027) and would continue at a similar magnitude until pumping ceases under the proposed action (2038). Continued pumping from the Peak Well field under the proposed action is predicted to extend the duration of the impacts on baseflow

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
	2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration (approximately 3 years). Of the 15 inventoried spring sites (six wet, nine dry) within the drawdown area, groundwater drawdown could reduce baseflows to the six wet springs that are considered perennial and conservatively assumed to have baseflow controlled by discharge from the groundwater system.	to occur under the no-action alternative. A substantial long-term reduction in baseflow resulting from groundwater pumping would likely result in a measurable reduction in flow (or elimination of surface flow) during the low-flow periods, and a corresponding reduction in the length of perennial stream reaches that existed prior to being affected by groundwater pumping. Segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration. The reduction of stream flow in segments of Pinto Creek could adversely affect surface water quality in those reaches, particularly during low-flow conditions. Of the 17 inventoried spring sites (six wet, 11 dry) within the drawdown area, groundwater drawdown could reduce baseflows to the six wet springs as described under the no-action alternative.	for approximately 19 more years than under the no-action alternative and 12 more years than under alternative 1. The potential impacts on baseflow and on perennial stream flow in Pinto Creek in the affected area would be the same as those described under the no-action alternative in that long-term reduction in baseflow would likely result in a measurable reduction in flow (or elimination of surface flow) that would be particularly noticeable during the low-flow periods. Segments of Pinto Creek that were previously characterized as perennial prior to 2013, and that may have been affected by pumping that occurred between 2013–2018 (and no longer sustain perennial flow conditions), would be expected to continue to be affected at a similar magnitude but for a longer duration. Of the 19 inventoried spring sites (seven wet, 12 dry) within the drawdown area, groundwater drawdown could reduce baseflows to the seven wet springs that are considered perennial and conservatively assumed to have baseflow controlled by discharge from the groundwater system.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Groundwater and surface water quality – pit lake	The water quality of the pit lake is expected to have low pH, high sulfate concentrations, and high metal concentrations during the post-mining period, similar to the model-predicted pH and concentrations for alternative 1. As with alternative 1, the chemical composition of the lake would be largely controlled by the addition of pregnant leach drain-down solution that is predicted to have a low pH (ranging from 2.2 to 3.1), high sulfate concentrations (ranging from 71,500 to 86,207 milligrams per liter), and high metal concentrations. Because the pit lake is expected to behave as a strong hydraulic sink, the pit lake water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries.	The water quality of the pit lake is predicted to have low pH (2.02–2.22 standard units), high sulfate concentrations (20,336–32,814 milligrams per liter), and high metal concentrations over the simulated post-mining period. Although chemical weathering of pit wall rock is anticipated to provide a source of chemical loading to the lake, the chemical composition of the lake is fundamentally dictated by the addition of pregnant leach solution. Because the pit lake is expected to behave as a strong hydraulic sink, the pit lake water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries.	The water quality of the proposed action pit lake is predicted to have slightly better water quality than under the no-action alternative and alternative 1. Water quality is predicted to have a low pH (2.3–2.4 standard units), high sulfate concentrations (12,688–15,459 milligrams per liter), and high metal concentrations over the simulated post-mining period. The proposed action would result in a larger pit with a larger pit lake and a larger pit lake volume that would act to dilute the effect of pregnant leach solution. Because the pit lake is expected to behave as a strong hydraulic sink, the pit lake water would be fully contained within the pit and would not discharge to groundwater or surface water resources outside the pit boundaries.
Groundwater and surface water quality – Tailings Storage Facilities No. 3 and No. 4	Currently, tailings storage facilities discharge alkaline, high total dissolved solids and sulfate concentration water with variable but low metal concentrations. Some acid rock drainage storm water runoff may occur from embankments. These conditions would persist under the no-action alternative. During mining, the high sulfate water leachate would continue to drain through the tailings, seep out of the base of the facility, and enter the groundwater flow system. A series of existing groundwater production wells that are part of the Peak Well field is used to capture and pump back the high total dissolved solids and sulfate water immediately downgradient from Tailings Storage Facility No. 4 and Tailings Storage Facility No. 3. This pump-back system serves to reduce the potential for high total dissolved solids and sulfate process water in the tailings storage facilities from migrating outside of the project area or discharging into Pinto Creek.	Impacts on water quality from tailings storage facilities would be approximately the same or similar to those described under the no-action alternative.	The potential impact on water resources would be similar to but could be greater than that under the no-action alternative and alternative 1 owing to the expanded volume of tailings storage under the proposed action; a greater volume of neutral pH, high total dissolved solids, high sulfate leachate water would be generated and stored in the larger facilities.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
	After closure, the top surface of the tailings will be regraded and covered to minimize infiltration of ongoing precipitation. After closure, seepage resulting from draindown from Tailings Storage Facility No. 4 is predicted to continue at progressively reduced rates until approximately year 2080. However, the current mine closure and reclamation plans do not include a commitment for the construction, long-term operation, and maintenance of a pump-back system (seepage capture system) and treatment system to manage the predicted seepage. Without long-term capture and treatment, seepage from Tailings Storage Facility No. 4 would migrate downgradient (outside of the Pinto Valley Mine project boundary) and potentially discharge as baseflow (and degrade water quality) in Pinto Creek. Under the no-action alternative, there is a potential for long-term impacts on groundwater and surface water quality from draindown of entrained process water during the post-closure period.		

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Groundwater and surface water quality – Leach Piles	Under the no-action alternative, seepage of residual acidic leachate generated from the Leach Piles would continue to drain at progressively reduced rates over the closure and post-closure periods compared to the active operation period. At closure (2021), the seepage rate from the facility is estimated to be approximately 250 gallons per minute, which is projected to be the average steady-state post-closure seepage rate. The Leach Piles are situated on low-permeability Ruin Granite, and during the closure and post-closure periods most of the seepage out of the facility would be captured in a lined pond located at the toe of the facility and discharged by pumping into the Open Pit (pit lake). A small portion of the seepage (less than 5 percent) is assumed to infiltrate directly into the low-permeability substrate beneath the Leach Piles footprint.	Under alternative 1, seepage of residual acidic leachate generated from the Leach Piles would be similar as described under the no-action alternative and continue to drain at progressively reduced rates over the closure and post-closure periods compared to the active operation period. The seepage rate from the facility at closure (2028) would occur later than under the no-action alternative but is estimated to be approximately 250 gallons per minute as under the no-action alternative. From 2028 to 2050, the seepage rate is predicted to gradually reduce to approximately 25 gallons per minute, which is projected to be the average steady-state seepage rate for the post-closure period after 2050. A small portion of the seepage (less than 5 percent) is assumed to infiltrate directly into the low-permeability substrate beneath the Leach Piles footprint.	There would be no change to the ongoing operation and planned closure of the Leach Piles under the proposed action. Potential impacts associated with the closure of the Leach Piles would be similar to those described under the no-action alternative and alternative 1. However, because the long-term residual drawdown area is larger under the proposed action compared to the no-action alternative and alternative 1, the percentage of the facility area that would be within the groundwater capture zone is larger under the proposed action (94 percent) compared to the no-action alternative (71 percent) and alternative 1 (72 percent). Consequently, the facility area located outside of the groundwater capture zone is smaller (6 percent) compared to the no-action alternative (28 percent) and alternative 1 (29 percent). Therefore, the rate of seepage that would enter and mix with the groundwater system and flow west toward Pinto Creek would be less than projected under the no-action alternative and alternative 1. As with the no-action alternative and alternative 1, the small portion of the seepage that is predicted to flow toward Pinto Creek has the potential to degrade groundwater quality west of the facility and could potentially affect the water quality in Pinto Creek. Acidic seepage has the potential to be neutralized if it flows through Apache Leap Tuff geologic units.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Groundwater and surface water quality – waste rock facilities	For waste rock dumps, any production of acid rock drainage in response to rain events would tend to react with other rock materials, which may act to dilute and neutralize to an unknown extent. Currently, groundwater wells proximal to waste rock dumps do not show impacts from acid rock drainage. This and the absence of reported routine or sporadic acid rock drainage seeps or runoff suggest that infiltration of meteoric precipitation into the waste rock dumps is insufficient to produce a discharge of acid rock drainage in the long term.	Impacts on surface and groundwater quality are expected to be the same as described under the no-action alternative.	Impacts on surface and groundwater quality are expected to be the same as described under the no-action alternative and alternative 1.

Resource/ Resource Element	No-action Alternative	Alternative 1	Proposed Action
Water rights	There are 25 surface water rights in the drawdown area that include 16 used for livestock, eight used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife. Nine of these 25 surface water rights also occurred within the projected drawdown area resulting from groundwater pumping between 2013 and 2018. There are no water rights for individual or community users located in areas that are adjacent to and downgradient of the Pinto Valley Mine. As such, there are no anticipated impacts on community drinking water sources or private wells. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right.	There are 26 surface water rights in the drawdown area that include 17 used for livestock, seven used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife. Nine of these 26 surface water rights also occurred within the projected drawdown area resulting from groundwater pumping between 2013 and 2018. Similar to the no-action alternative, there are no anticipated impacts on drinking water sources or private wells. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right.	There are 26 surface water rights in the drawdown area that include 17 used for livestock, seven used for stock and wildlife, and one (the Tonto National Forest Pinto Creek in-stream flow water right) used for recreation and wildlife. Nine of these 26 surface water rights also occurred within the projected drawdown area resulting from groundwater pumping between 2013 and 2018, and 25 of the 26 water rights also occur within the projected drawdown area under the no-action alternative. The same 26 water rights identified within the drawdown area under the proposed action were identified within the projected drawdown area under alternative 1. Similar to the no-action alternative and alternative 1, there are no anticipated impacts on drinking water sources or private wells. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right. However, the results of the groundwater modeling indicate that the impacts on baseflow in Pinto Creek would persist for a longer period under the proposed action compared to the no-action alternative and alternative 1. Therefore, potential impacts on the Forest Service in-stream flow right could persist for a longer period compared to the no-action alternative and alternative 1 (19 more years or 12 more years, respectively).

4.0 Preparers, Contributors, and Public Involvement

4.1 Introduction

This chapter documents the U.S. Department of Agriculture, Forest Service's (Forest Service's) public involvement, consultation, and coordination efforts throughout the preparation of the Pinto Valley Mine environmental impact statement (EIS). Tribes; organizations; Federal, State, and local government agencies; cooperating agencies; and other parties consulted during the development of the EIS are listed in this chapter. This chapter also identifies the staff that were involved in preparation of the Pinto Valley Mine EIS.

4.2 Cooperating Agencies

In March 2017, the Forest Service invited a variety of Federal, State, and local agencies to participate in the Pinto Valley Mine EIS process as cooperating agencies because they provided special expertise or jurisdictional authority relevant to the project. These cooperating agencies do not have a decision-making responsibility in the record of decision. The Forest Service invited the following agencies to participate as cooperating agencies:

- U.S. Army Corps of Engineers
- Bureau of Land Management
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Arizona Game and Fish Department
- Arizona Department of Environmental Quality
- Arizona Department of Water Resources
- Arizona State Mine Inspector
- Arizona State Historic Preservation Office
- Arizona State Parks
- Pinal County Air Quality Control District

Three of these agencies agreed to participate as cooperating agencies, including:

- Bureau of Land Management
- U.S. Environmental Protection Agency
- Arizona Game and Fish Department

In April 2017, the Forest Service hosted two cooperating agency scoping meetings at the Tonto National Forest Supervisor's Office in Phoenix, which were attended by the Bureau of Land Management, Arizona Game and Fish Department, and the U.S. Environmental Protection Agency. Additional meetings were held with cooperating agencies to provide updates on the EIS process or discuss specific issues as needed (such as alternatives development), but cooperating agencies did not develop analyses for the draft or final EIS. Cooperating agencies were also provided with preliminary versions of the draft and final EIS for review and comment. The U.S. Environmental Protection Agency and Arizona Game and Fish Department submitted formal comments on the draft EIS.

4.3 National Historic Preservation Act Section 106 Consultation

Section 106 consultation was initiated by Tonto National Forest and the State Historic Preservation Office on June 12, 2017, and the Advisory Council on Historic Preservation on June 5, 2018. In consultation with the Arizona State Historic Preservation Office, Advisory Council on Historic Preservation, Pinto Valley Mining Corp., and tribes, the Forest Service developed a memorandum of agreement and historic properties treatment plan that identifies roles and responsibilities, stipulations, and treatment or mitigation measures (such as data recovery, signage, and barriers) that would be applied to avoid and minimize potential adverse effects on historic properties. The memorandum of agreement was signed and finalized in September 2020 (Forest Service 2020d).

4.4 Tribal Consultation and Involvement

The U.S. has a unique legal relationship with Native American tribal governments as set forth in the U.S. Constitution, treaties, Executive Orders, Federal statutes, and Federal policy. Federal agencies are required to consult with American Indian tribes as part of the Advisory Council on Historic Preservation regulations, Protection of Historic Properties (Title 36, Part 800 of the Code of Federal Regulations), implementing section 106 of the National Historic Preservation Act. Accordingly, the National Historic Preservation Act outlines when, during an undertaking, Federal agencies must consult with tribes. Furthermore, under Executive Order 13175, executive departments and agencies are charged with engaging in regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications and are responsible for strengthening the government-to-government relationship between the United States and Indian tribes.

The Tonto National Forest has been conducting tribal consultation related to Pinto Valley Mine since 2017. That consultation has focused on identifying issues of tribal concern and possible measures to mitigate the potential adverse effects on those issues. Consultation has included formal government-to-government and informal meetings, correspondence, information sharing, site visits, and documentation of tribal comments and concerns.

In accordance with section 106 of the National Historic Preservation Act, the following tribes were involved in the consultation process:

- Fort McDowell Yavapai Nation
- Gila River Indian Community
- Hopi Tribe
- Mescalero Apache Tribe
- Pueblo of Zuni
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tonto Apache Tribe
- White Mountain Apache Tribe
- Yavapai-Apache Nation
- Yavapai-Prescott Indian Tribe

In addition to the tribes listed above, the Tonto National Forest provided the Tohono O'Odham Nation and AK-Chin Indian Community, in accordance with the Native American Graves Protection and Repatriation Act, with the Native American Graves Protection and Repatriation Act Plan of Action and other documents related to the project and the opportunity to consult on the project.

4.5 Endangered Species Act Section 7 Consultation

In accordance with section 7 of the Endangered Species Act, the Forest Service consulted with the U.S. Fish and Wildlife Service on the project. The Forest Service initially reached out to the U.S. Fish and Wildlife Service in June 2018 to provide notification of the project and to solicit preliminary input on possible concerns and issues. The Forest Service held a meeting with the U.S. Fish and Wildlife Service on August 1, 2018, to provide an overview of the project and to solicit information on concerns and issues. In August 2019, the U.S. Fish and Wildlife Service provided concurrence on the species list, which identifies those species and critical habitat listed on the Endangered Species Act that could be affected by the project. The Forest Service prepared a biological assessment for the project that was submitted to the U.S. Fish and Wildlife Service in February 2020, with subsequent versions and additional information provided to the U.S. Fish and Wildlife Service in April 2020 and July 2020. Based on the biological assessment, the U.S. Fish and Wildlife Service completed the final biological opinion in August 2020 that describes the potential impacts on federally listed species and their critical habitat, conservation and protection measures that would be required, and other information resulting from the section 7 consultation process. Refer to appendix D, "Biological Opinion," for additional information.

4.6 Conformance with Regional, State, and Local Plans, Policies, and Controls

The National Environmental Policy Act at Title 40 part 1502.16 of the Code of Federal Regulations (CFR) directs, "Statements shall discuss (c) Possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See 1506.2(d).)" Title 40 CFR 1506.2(d) states, "To better integrate environmental impact statements into State or local planning processes, statements shall discuss any inconsistency of a proposed action with any approved State or local plan and laws (whether or not federally sanctioned). Where an inconsistency exists, the statement should describe the extent to which the agency would reconcile its proposed action with the plan or law."

The Forest Service has not identified any conflicts with regional, State, or local plans, policies, and controls.

4.7 Public Involvement

4.7.1 Public Scoping

The Forest Service conducted public scoping for the Pinto Valley Mine EIS as summarized in section 1.7, "Public Scoping," and described in detail in the "Pinto Valley Mine Environmental Impact Statement Final Scoping and Issues Report" (Forest Service 2017a). Through external (public, cooperating agencies, and tribes) and internal scoping, the Forest Service identified nine key issues for analysis in the Pinto Valley Mine EIS, as listed in section 1.8, "Key Issues for Detailed Analysis."

4.7.2 Web Site

The Forest Service developed a public Web site for the Pinto Valley Mine EIS, which went live to the public on March 20, 2017. The Web site includes a detailed description of the proposed action for the Pinto Valley Mine EIS, documents relevant to the EIS analysis (such as the mining plan of operations and the alternatives report), a description of the scoping process, photographs and other media for the project, the project schedule, and contact information. The Web site can be viewed at: http://www.pintovalleymineeis.us/. The project was also posted on the Tonto National Forest schedule of proposed actions and updated periodically at https://www.fs.fed.us/sopa/forest-level.php?110312.

4.7.3 Draft EIS Distribution and Comment Period

Council on Environmental Quality regulations (Title 40, Part 1503.1 of the Code of Federal Regulations) require that Federal agencies invite review and comment on a draft EIS from members of the public and other interested parties. The Forest Service published a notice of availability in the Federal Register on December 13, 2019, announcing the availability of the draft EIS for public review and comment during a 45-day comment period ending January 27, 2020. During the draft EIS comment period, the Forest Service hosted two public meetings to provide additional information to the public and to solicit comments that were used to inform preparation of the final EIS. The public meetings were held in Superior and Miami, Arizona on January 7 and 8, 2020. Refer to appendix J, “Draft EIS Comment Report,” for additional information on the public meetings and Forest Service responses to public comments on the Draft EIS.

4.7.4 Final EIS Distribution and Objection Process

This final EIS and the draft record of decision are subject to 36 CFR 218 subparts A and B, “Project-Level Pre-decisional Administrative Review Process.” Issues raised in objections must be based on previously submitted specific written comments regarding this project proposal and attributed to the objector, unless the issue is based on new information that arose after the opportunities for comment (36 CFR 218.8(c)). Specific written comments should be within the scope of the proposed action, with a direct relationship to the proposed action, and include supporting reasons for the responsible official to consider (36 CFR 218.2). Following resolution of objections, the Forest Service will issue a final record of decision.

A legal notice to initiate the 45-day objection period on the draft record of decision has been published in the official newspaper of record, the *Arizona Capitol Times*. The date the legal notice is published is the exclusive means for calculating the time to file an objection. The time to file an objection cannot be extended in accordance with 36 CFR 218.6(d). Those wishing to object should not rely upon dates or timeframes provided by any other source. It is the objector’s responsibility to ensure evidence of timely receipt (36 CFR 218.9).

Objections, including attachments, must be addressed to the Reviewing Officer, Regional Forester, filed via mail or express delivery to 333 Broadway Boulevard SE, Albuquerque, New Mexico 87102; by facsimile to (505) 842-3800; or by email to objections-southwestern-regional-office@usda.gov. An automated response will confirm the electronic objection has been received. If an automated response is not received, it is the sender’s responsibility to ensure timely filing by other means. Electronic objections must be submitted in Microsoft Word, portable document format, or rich text format. The subject line for electronic submissions should contain the words “Pinto Valley Mine.”

Eligible objections must be filed, in writing, with the Reviewing Officer of the project, and must be open to public inspection during the objection process. At a minimum, an objection must include the following (36 CFR 218.8(d)):

- Objector's name and address as defined in 36 CFR 218.2, with a telephone number, if available.
- Signature or other verification of authorship upon request (a scanned signature for electronic mail may be filed with the objection).
- When multiple names are listed on an objection, identification of the lead objector as defined in 36 CFR 218.2. Verification of the identity of the lead objector must be provided upon request or the reviewing officer will designate a lead objector as provided in 36 CFR 218.5(d).
- The name of the proposed project, the name and title of the responsible official, and the name of the national forest on which the proposed project will be implemented.
- A description of those aspects of the proposed project addressed by the objection, including specific issues related to the proposed project; if applicable, how the objector believes the environmental analysis or draft decision specifically violates law, regulation, or policy; suggested remedies that would resolve the objection; and supporting reasons for the reviewing officer to consider.
- A statement that demonstrates the connection between prior specific written comments on the particular proposed project or activity and the content of the objection, unless the objection concerns an issue that arose after the designated opportunities for comment (36 CFR 218.8(c)).

Incorporation of documents by reference is permitted only as provided in 36 CFR 218.8(b).

4.8 List of Preparers

The Pinto Valley Mine EIS was prepared under the supervision of the Forest Service. Preparers of the Pinto Valley Mine EIS included Forest Service staff and a consultant team. In accordance with 40 CFR 1506.5, the Forest Service's selected third-party consultant (ICF) does not have any financial or other interest in the outcome of the project.

Table 4-1 identifies the key staff involved in preparation of the EIS and their roles on the project.

Table 4-1. List of preparers

Name	Project Role
U.S. Forest Service	
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Judd Sampson	Forest Service Project Lead (2016–2019)
Lee Ann Atkinson	Forest Service Assistant Project Lead
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Richard Adkins	Cultural Resources and Tribal Resources
William Reed	Cultural Resources
Travis Bone	Cultural Resources
Mark Taylor	Biology & Vegetation / Biology Team Lead
Alex Mankin	Geology & Minerals Admin / Minerals Team Lead
Kelly Mott Lacroix	Groundwater & Surface Hydrology / Forest Hydrology Team Lead
Edward Gazzetti	Groundwater & Surface Hydrology / Groundwater Modeling Team Lead
Chad Harrold	Mining Reclamation Team Lead

Name	Project Role
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Chandler Mundy	Range Team Lead
Ryan Nichols	Soils Team Lead
Scott Williams	Air Quality Team Lead
Anne Thomas	Environmental Justice / Socioeconomic Team Lead
Mark McEntarffer	Lands & Permitting Team Lead
Chris Crawford	Transportation (Roads) Team Lead
Tyna Yost	National Environmental Policy Act Compliance and Review / Forest South Zone National Environmental Policy Act Lead
John Scaggs	Public Affairs
Frank Williams	Geographic Information Systems Team Lead
Peter Werner	Mining Engineering & Construction / Mining and Soils Technical Advisor
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Noni Nez Lyndon	Tribal Relations Program Manager
Brad Johnson	Fire Management Officer / Fire and Fuels Lead
A. Jamie Wages	Range Team Reviewer
ICF Consultant Team	
Scott Duncan	Project Director
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Dan Nally	Deputy Project Manager
Alan Rabinoff	Technical Advisor
Meghan Heneghan	Administrative Record
Will Ericson	Administrative Record
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Janet Shangraw (Plumley & Associates, Inc.)	Surface Water
Dr. Mark Williamson (Geochemical Solutions, LLC)	Geochemistry
Dr. Debora Miler (Plumley & Associates, Inc)	Geotechnical
Alex Bartlett	Transportation and General National Environmental Policy Act Support
Ed Carr	Air Quality
David Ernst	Air Quality
Tommy Hendrickson	Climate Change
Kasey Knoell	Climate Change
Bobby Renz	Climate Change
Laura Stewart (Archaeological Consulting Services, Ltd.)	Wildlife & Biological Resources
Lourdes Aguila (Archaeological Consulting Services, Ltd.)	Cultural Resources
Nathan Wagoner	Socioeconomics, Environmental Justice
Hana Colwell	Socioeconomics
Merlyn Paulson	Visual Resources
Jason Volk	Noise

Name	Project Role
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Lissa Johnson	Geographic Information Systems
Saadia Byram	Editor and Document Production
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Tim Ralston	Project Lead
Mike Wickersham	General Manager
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Avi Buckles (WestLand Resources, Inc.)	Cultural Resources
Cori Hoag (SRK Consulting, Inc.)	Geology, Groundwater, Surface Water, Slope Stability, Ecological Risk Assessment
Sam Clark	Tailings, Water
Tony Freiman (Wood)	Tailings, Traffic, Geotechnical
Eddie Al-Rayes (Trinity Consultants)	Air Quality
Kim Furphy	Air & Water Quality Compliance & Reporting
Disha Gadre (Trinity Consultants)	Air Quality
Dave Strohm (Trinity Consultants)	Air Quality
Basil Boyd (AJAX Consulting Services)	Field Services, Groundwater
Adam Hawkins (Global External Relations)	Government Affairs
Jim Fallon	Environmental
Josh Moncrieff	Tailings

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6.0 Glossary

This glossary defines select terms used within this document that may be unfamiliar to some readers or have a unique meaning in the context of this document.

Acid Rock Drainage: Drainage that occurs as a result of natural oxidation of sulfide minerals contained in rock that is exposed to air and water. It is not confined to mining activities, but can occur wherever sulfide-bearing rock is exposed to air and water.

Acre: A unit of land measure equal to 43,560 square feet.

Affecting: Will or may have an effect on.

Animal Unit Month: The amount of forage necessary to feed one animal unit equivalent, which is a 1,000-pound cow or one cow with a 6-month-old calf, for a period of 1 month.

Aquifer: A zone, stratum, or group of strata acting as a hydraulic unit that stores or transmits water in sufficient quantities for beneficial use.

Average Annual Daily Traffic: The total volume of vehicle traffic of a highway or road for a year divided by 365 days.

Bedrock: Solid rock exposed at the surface of the Earth or overlain by unconsolidated material, weathered rock, or soil.

Borrow and Riprap Sources: Materials used for cover during the reclamation process. Riprap is an erosion-resistant ground cover composed of large, angular, and loose stones used for slope protection.

Closure Period: Mine closure is the period of time when the ore-extracting activities of a mine have ceased, and final decommissioning and mine reclamation are being completed.

Cooperating Agency: Any Federal agency other than a lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in Title 40, part 1501.6 of the Code of Federal Regulations (CFR). A State or local agency of similar qualifications or, when the effects are on a reservation, a Native American tribe, may by agreement with the lead agency become a cooperating agency.

Cultural Resources: Archaeological sites, architectural structures or features, traditional use areas, and Native American sacred sites or special use areas.

Cumulative Impact: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Day-Night Level (L_{dn}): The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 decibels added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

Deposit: A natural accumulation, such as precious metals, minerals, coal, gas, oil, etc., that may be pursued for its intrinsic value; gold deposit.

Dewatering: The lowering of the water level in a well as a result of withdrawal; the reduction in groundwater level at a point caused by the withdrawal of water from an aquifer.

Downgradient: In relation to any fixed point with regard to the direction of drainage or flow, downgradient is at a lower point of elevation than the chosen observation point and thus downward in relation to the direction of flow.

Drawdown: Vertical distance that a water elevation is lowered or the pressure head is reduced due to the removal of water from the same system. This EIS identifies and evaluates potential impacts on streams, springs, and seeps located within the maximum extent of the projected 5-foot groundwater drawdown contour. The 5-foot drawdown contour defines the area where the water table would be lowered by 5 feet or more at some point in time during the mining or post-mining period. For discussion purposes, the area contained within the maximum extent of the 5-foot drawdown contour is referred to as the “drawdown area.”

Effects include:

a) Direct effects, which are caused by the action and occur at the same time and place.

b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects also may include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

Electrowinning: A process whereby metals are recovered from a solution by means of electrolytic chemical reaction. See also **Solvent Extraction**.

Employment: Represents the jobs created by industry, based on the output per worker and output impacts for each industry.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitation creep.

Equivalent Sound Level (L_{eq}): The average of sound energy occurring over a specified period. In effect, the equivalent sound level is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.

Exploration: The search for economic deposits of minerals, ore, gas, oil, or coal through the practices of geology, geochemistry, geophysics, drilling, shaft sinking, or mapping.

Extraction: The process of mining and removal of coal or ore from a mine. Also used in relation to all processes of obtaining metals from ores.

Feasible: Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

Federal Agency: All agencies of the Federal Government. It does not mean the Congress, the Judiciary, or the President, including the performance of staff functions for the President in his Executive Office. For the purposes of regulation it includes States and units of general local government and Native American tribes assuming National Environmental Policy Act responsibilities under section 104(h) of the Housing and Community Development Act of 1974.

Forage: All browse and non-woody plants that are available to livestock or game animals for grazing or harvestable for feed.

Fugitive Dust: Dust particles suspended randomly in the air from road travel, excavation, and rock-loading operations.

Gangue: The commercially valueless material that surrounds, or is closely mixed with, a wanted material in an ore deposit.

Geochemistry: The study of the distribution and amounts of the chemical elements in minerals, ores, rocks, soils, water, and the atmosphere, and their circulation in nature, on the basis of the properties of their atoms and ions. The geology in chemistry concerned with the chemical composition of, or chemical reactions taking place within, the Earth's crust.

Geotechnical: A branch of engineering that is essentially concerned with the engineering design aspects of slope stability, settlement, earth pressures, bearing capacity, seepage control, and erosion.

Gravity Placement: The process by which tailings slurry separate with coarser and higher specific gravity particles being deposited on the upper beach, and finer and lower specific gravity particles settle to the decant pond.

Groundwater: Water found beneath the land surface in the zone of saturation below the water table.

Growth Media: All materials, including topsoil, specified soil horizons, vegetative debris, and organic matter, that are classified as suitable for stockpiling or reclamation.

Haul Road: A road used by large (less than 50-ton capacity) trucks to haul ore and waste rock from an open pit mine to other locations.

Heavy Metals: A group of elements, usually acquired by organisms in trace amounts, that are often toxic in higher concentrations; includes lead, mercury, molybdenum, nickel, copper, cobalt, chromium, iron, silver, etc.

High-density Polyethylene: A plastic, impermeable material used for liners. This material deforms with a low probability of puncturing or splitting. Seams are heat welded instead of glued, thus preventing rupture.

Human Environment: Comprehensively includes the natural and physical environment and the relationship of people with that environment. (See the definition of "effects" [40 CFR 1508.8].) This means that economic or social effects are not intended by themselves to require preparation of an EIS. When an EIS is prepared and economic or social and natural or physical environmental effects are interrelated, then the EIS will discuss all of these effects on the human environment.

Impoundment: A surface retaining structure designed to store byproducts of mining operations after separating the ore from the gangue.

Industry Activity: Represents the total economic output generated by direct spending.

Labor Income: Includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income.

Lead Agency: The agency or agencies preparing or having taken primary responsibility for preparing the EIS.

Leaching: The process of applying a chemical agent that bonds preferentially and dissolves into solution the target metal(s) in an ore. The metal complexes or binds to the solution, which is then called a "pregnant" solution. The pregnant solution is collected for processing to recover the metals.

Legacy Encroachment: Placement or expansion of mining facilities onto National Forest System lands without authorization by Pinto Valley Mining Corp.'s predecessors.

Locatable Minerals: Locatable minerals are minerals for which a statutory right exists to go onto public domain Federal lands open to mineral entry to stake ("locate") a mining claim for the purpose of mineral prospecting, exploration, development, and extraction as granted under the General Mining Law of 1872, as amended. All National Forest System lands classified as public domain lands are open to prospecting and developing locatable minerals unless they have been appropriated, withdrawn, or segregated from mineral location and entry (16 U.S. Code 482).

Maximum and Minimum Sound Levels (L_{max} and L_{min}): The maximum and minimum sound levels measured during a measurement period.

Milling: The general process of treating, or to separate and concentrate, the valuable metal(s) or mineral(s) from the rest of the ore material.

Mine Pit: Surface area from which ore and waste rock are removed.

Mitigation: Includes:

a) Avoiding the impact altogether by not taking a certain action or parts of an action.
b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
e) Compensating for the impact by replacing or providing substitute resources or environments.

Monitor: To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.

National Environmental Policy Act Process: All measures necessary for compliance with the requirements of section 2 and title I of the National Environmental Policy Act.

Notice of Intent: A notice that an EIS will be prepared and considered.

The notice shall briefly:

a) Describe the proposed action and possible alternatives.
b) Describe the agency's proposed scoping process including whether, when, and where any scoping meeting will be held.
c) State the name and address of a person within the agency who can answer questions about the proposed action and the EIS. "Proposal" exists at that stage in the development of an action when an agency subject to the act has a goal and is actively preparing to make a decision on one or more alternative means of accomplishing that goal and the effects can be meaningfully evaluated. Preparation of an EIS on a proposal should be timed (40 CFR 1502.5) so that the final statement may be completed in time for the statement to be included in any recommendation or report on the proposal. A proposal may exist in fact as well as by agency declaration that one exists.

Open Pit Mining: A type of mining that involves excavation of ore by digging downward from the ground surface, removing the overburden and extracting the ore beneath. The result of the mining operation is an "open pit."

Ore: An earth material containing target metal(s) or mineral(s) in sufficient concentration and quantity that may be mined and processed at an economic profit.

Patented Claims: Private land that has been secured from the U.S. Government by compliance with the laws relating to such lands.

Percentile Sound Levels (L_N): Because the noise levels in a community vary with time in a more or less random manner, the descriptors of these time-varying noise levels may be defined in statistical terms. The statistical descriptors are referred to as the percentile sound levels, with L_N defined as the level exceeded N percent of the time. The descriptors often used are:

- L_1, level of highly intrusive sounds—The level exceeded 1 percent of the time, a measure of highly intrusive sounds.
- L_{10}, level of intrusive sounds—The level exceeded 10 percent of the time, used to indicate the average level of the intrusive sounds.
- L_{50}, median level—The level exceeded 50 percent of the time, or the median level, a useful measure of the average noise conditions on a site.
- L_{90}, background level—The level exceeded 90 percent of the time. It provides a good indication of the steady background noise level on a site.

Plan of Operations: A submittal required by operators whose mining operations may cause significant surface disturbance having the content prescribed by 36 CFR 228.4 (c).

Post-Closure Period: The post-closure period generally refers to the period after operations and closure whereby additional monitoring and maintenance activities are conducted to ensure that reclamation, monitoring, and mitigation goals are met. The post-closure period for the Pinto Valley Mine is estimated to last for approximately 30 years after operations and closure, although this period may be extended if reclamation objectives are not met or monitoring identifies ongoing impacts that require continued monitoring and mitigation.

Precious Metal: Any of the less common and highly valuable metals; gold, silver, platinum.

Reclamation: Upon exhaustion of the mineral deposit or at the earliest practicable time during operations, or within 1 year of the conclusion of operations, unless a longer time is allowed, taking such measures as will prevent or control on-site and off-site damage to the environmental and forest surface resources where practicable in accordance with 36 CFR 228.8(g).

Record of Decision: A document separate from but associated with an EIS that states the decision; identifies all alternatives, specifying which were environmentally preferable; and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not (40 CFR 1505.2).

Right-of-Way: Strip of land or corridor over which a power line, pipeline, access road, or maintenance road would pass.

Riparian: Pertaining to or situated on the bank of a body of water, especially of a watercourse such as a river.

Scope: Consists of the range of actions, alternatives, and impacts to be considered in an EIS. The scope of an individual statement may depend on its relationships to other statements (as established in 40 CFR 1502.20 and 1508.28).

Solvent Extraction: A two-stage process that first extracts and upgrades metal ions from low-grade leach solutions into a solvent containing a chemical that selectively reacts with and binds the metal in the solvent. The metal is then extracted from the solvent with an acid, which then deposits the pure metal using the **Electrowinning** procedure.

Stockpile: An accumulation of ore, stone, or other mined or quarried material.

Subsume: Remove facilities and equipment and build over an existing project component in order to excavate or build a different project component in the same location.

Supernatant Pool: Clear liquid overlying tailings sands and silts deposited by settling.

Surface Water: Water found in ponds, lakes, inland seas, streams, and rivers or above the ground surface.

Survey Monument: A marker set by a land surveyor to mark or reference a point on a property or land area.

Tailings: Tailings are the finely ground rock material produced by the copper milling process, which separates copper-bearing minerals from non-economic material.

Tailings Storage Facility: Impoundments created by embankments constructed from waste rock to contain mixtures of crushed rock and processing fluids from the extraction of mine resources.

Total Value Added: The difference between an industry’s total output and the cost of its intermediate inputs; is the State-level counterpart to gross domestic product.

Unpatented Claim: A particular parcel of Federal land, valuable for a specific mineral deposit or deposits. It is a parcel for which an individual has asserted a right of possession. The right is restricted to the extraction and development of a mineral deposit. The rights granted by a mining claim are valid against a challenge by the United States and other claimants only after the discovery of a valuable mineral deposit.

Waste Rock: A non-ore rock that is removed to access the ore zone. It contains target metal(s) or mineral(s) below the economic cutoff level, and must be removed to gain access to the ore zone.

Watershed: The entire land area that contributes water to a particular drainage system or stream.

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