Chapter 7 Fluvial Geomorphology

Outstanding issues [yellow=info needed for completion from ICF or Integration; blue=QA/QC globals for ICF Editing]
ICF/Integration: add citations where noted when documents are final
Integration/Authority: provide additional details about bypass flows (if known) where noted in chapter
Integration/Authority: Revised Sacramento Discharge structure for Alternative 2 is not in this chapter. Preliminary information about the design of this structure was received on 4/23 and GIS files came after 4/27. We would not expect determinations to change as a result of the revisions to the design; however, impact analysis will need to be reviewed/potentially modified to account for the revisions (particularly with respect to constructing a coffer dam in the Sacramento River).
Integration: we are adding details to Appendix 2D that will be considered part of the project; see note in this chapter.

7.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for fluvial geomorphology that would potentially be affected by the construction and operation of the Project. Fluvial geomorphology is a discipline that examines river processes (e.g., scour and deposition) and landforms (e.g., channel bed, channel banks, and floodplains), and the relationships between them. The study area for fluvial geomorphology consists of the local drainages associated with the Sites Reservoir (e.g., Funks, Stone Corral, and Hunters Creeks), as well as downstream waterbodies such as the Sacramento River and the Yolo Bypass. Engineered drainage canals (i.e., TC Canal, GCID Main Canal, and CBD) are also included in the study area. Other watercourses and flood storage facilities associated with northern California's water delivery and flood management infrastructure, such as the Trinity River, Feather River, American River, and San Luis Reservoir are not discussed below because, based on the various modeling results available for the Project (*REFER TO CHAPTER 5 TABLES once labeled and titled),* there would be no construction geomorphic impacts within these areas and operational geomorphic effects associated with the Project would have minimal or no impact on these watercourses and flood storage facilities.

Tables 7-1a and 7-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives that are described in the impact analysis.

Table 7-1a. Summary of Construction Impacts and Mitigation Measures for Fluvial Geomorphology

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation)			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 7-1b. Summary of Operation Impacts and Mitigation Measures for Fluvial Geomorphology

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation)			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the Sites Reservoir			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE
Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites			
No Project	NI/NE	-	NI/NE
Alternative 1	LTS/NE	-	LTS/NE
Alternative 2	LTS/NE	-	LTS/NE
Alternative 3	LTS/NE	-	LTS/NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
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7.2 Environmental Setting

This section describes the geomorphology of the watercourses in the study area from upstream to downstream. These watercourses consist of the local drainages in proximity to Antelope Valley and the inundation area, and downstream waterbodies such as the Sacramento River, CBD,

Delta, and Yolo Bypass. Appendix 7A, *Fluvial Geomorphic Setting Information*, provides detailed information on the environmental setting for fluvial geomorphology of the waterbodies in the study area, including the reaches of the Sacramento River, the Delta, and the Yolo Bypass.

7.2.1. Drainages in Proximity to Antelope Valley

The drainages in proximity to Antelope Valley consist of creeks that are upstream of and within the valley, and the creeks that are downstream of the valley. Grapevine, Antelope, Funks, Stone Corral, and Hunters Creeks are upstream of and within Antelope Valley. Funks and Stone Corral Creeks exit Antelope Valley and their downstream reaches are in the Sacramento Valley. Figures 1-2 and 1-3 in Chapter 1, *Introduction*, identify the locations of these creeks. The geologic and topographic setting, and geomorphic characteristics associated with these drainages are discussed below.

7.2.1.1. Geologic and Topographic Setting

The Antelope Valley soils are in the Coast Ranges geomorphic province and have formed in place from weathered rock, colluvium, and alluvium (Soil Survey Staff 2020). Most of the soils in the Antelope Valley are clayey and have high expansion potential. The soils are shallow to very deep and have a slight to moderate water erosion hazard (Soil Survey Staff 2020). A stream-cut water gap on Funks Creek is in the Venado sandstone member of the Cortina Formation. The lower portion of the channel is in the Yolo member of the Cortina Formation. The stream-cut water gap on Stone Corral Creek is in the Boxer and Cortina Formations.

Antelope Valley is characterized as a gently sloping valley with some subtly rounded knolls, mainly in the vicinity of the saddle dams. It is drained primarily by easterly flowing Funks and Stone Corral Creeks, with some minor northeasterly flowing drainages in the northwestern part of the reservoir. Most of the inundation area is level or consists of gentle slopes (up to 3%), but the slopes in the vicinity of the Golden Gate and Sites Dams, saddle dams, and saddle dikes mostly range from 15% to 75% (AECOM 2020:8).

7.2.1.2. Drainage Geomorphic Characteristics

The study area contains multiple drainages that originate in the eastside foothills of the Coast Range, including Grapevine, Antelope, Funks, Stone Corral, and Hunters Creeks. Table 7-2 summarizes the characteristics of these drainages.

Table 7-2. Drainage Geomorphic Characteristics Summary

Creek Name	Location, Flow Direction, and Approximate Length	Water Regime	Planform	Primary Habitat Unit[a]	Channel Substrate[a]
Upstream of Antelope Valley					
Grapevine Creek	Creek flows north/northeast for 14.5 miles until confluence with Funks Creek.	Ephemeral	Slightly sinuous	Pool	Small cobble and gravel
Antelope Creek	Creek flows from Calvin Creek confluence through south Antelope Valley for 9.9 miles until joining Stone Corral Creek.	Ephemeral	Slightly sinuous	Flatwater	Silt and clay

Creek Name	Location, Flow Direction, and Approximate Length	Water Regime	Planform	Primary Habitat Unit[a]	Channel Substrate[a]
Funks Creek	Headwater tributaries converge northwest of the reservoir footprint. Creek flows southeast for 3.7 miles until confluence with Grapevine Creek.[b]	Ephemeral to intermittent	Slightly sinuous	Flatwater	Gravel
Stone Corral Creek	Headwater tributaries converge along the Sites Lodoga Road; creek flows in southeast for 4.1 miles until confluence with Antelope Creek.	Ephemeral	Slightly sinuous	Flatwater	Bedrock
Hunters Creek	Headwaters north of Antelope Valley flow east into Sacramento Valley. There are four forks of this creek. The north fork is the longest (9.0 miles) and drains into the TC Canal. The other three forks converge into the north fork.	Ephemeral	Slightly sinuous	–	–
Downstream of Antelope Valley					
Funks Creek	Creek flows 1.8 miles downstream of the proposed Golden Gate Dam to Funks Reservoir, then flows 3.8 miles to the GCID Main Canal, then 2.4 miles to I-5[c], after which it confluences with Stone Corral Creek, roughly 3.5 miles downstream and southeast of I-5.	Intermittent	N/A[d]	–	–
Stone Corral Creek	Creek flows 4.7 miles to the TC Canal, then roughly 3.0 miles to the GCID Main Canal, after which it continues 4.1 miles to I-5 then another 1.4 miles to its confluence with Funks Creek, and finally terminating in 5.6 miles at the CBD.	Intermittent	N/A[d]	–	–

Notes: a = Brown 2000
b = Distance between confluence and Golden Gate Dam is approximately 5.4 miles
c = Interstate 5
d = channel has been modified and largely straightened along the Sacramento Valley floor.
–- = no data

7.2.2. Other Valley Drainages

The other valley floor drainages in the study area that would be directly or indirectly affected by the Project are Walker Creek, Willow Creek, and Bird Creek.

Walker and Willow Creeks (where siphon replacements would occur) are valley streams, possibly intermittent, whose headwater-contributing channels originate in the foothills northwest of the GCID Main Canal. Similar to other valley floor channels in the study area, these creeks transition from more natural channels to highly disturbed and channelized drainages a few miles before flowing under Interstate 5 (I-5).

Bird Creek exits the Coast Range foothills and drains in an easterly direction into the CBD. Based on geographical similarities between Funks and Stone Corral Creeks (i.e., drainage area, longitudinal position within the local drainage network, and observable geomorphic characteristics), Bird Creek is considered an intermittent stream. Approximately 0.25 mile west of I-5, Bird Creek transitions from more of a natural channel to a highly disturbed and channelized drainage that flows under I-5, extends through rice fields, and discharges into the CBD.

7.2.3. Sacramento River

The geomorphology of the Sacramento River varies through the region. The river transitions from a narrow and deep canyon environment (with a similarly narrow floodplain) in its upper reaches below Shasta Lake (i.e., the Keswick Dam to Red Bluff reach, further described below) to a meandering, shallower system with a broader alluvial floodplain in its lower reaches. The Sacramento River historically meandered across a wide floodplain. By geomorphic processes such as erosion and deposition, the river migrated across the deep alluvial soils from the Red Bluff area to about Chico Landing. At River Mile (RM) 190, the river has its confluence with Stony Creek (a western tributary). From this point downstream, high flows along the Sacramento River were historically divided between its mainstem and the adjacent flood basins (which were separated from the mainstem by natural levees).

The Sacramento Valley flood basins have been, and continue to be, primary influences on the hydrogeomorphic evolution of the Sacramento River and other watercourses in the study area. Most notably, these overflow areas cause the Sacramento River to get smaller downstream. In addition, suspended sediment that historically has been deposited in the flood basins has generated a thick, cohesive stratigraphic unit, which adds to the bank stability of the lower Sacramento River. The significance of these flood basin deposits increases downstream as the topographic lows become more pronounced between Chico and Verona (Water Engineering and Technology 1990:34–35). Because of these natural geomorphic processes, the riverbanks of the Sacramento River are generally higher than the surrounding floodplains. The stream power of flood flows in the mainstem Sacramento River has resulted in several distributary flood paths across the flat valley floor.

Today, both base flows and peak flows have been regulated to the extent that they limit natural geomorphic and ecosystem functions. Channel migration, meander cutoff and oxbow formation processes, and other smaller-scale geomorphic processes that operated in the past are limited by the presence of dams and levee construction.

7.2.3.1. Sedimentation

Under historical (i.e., unaltered) conditions, the Sacramento River lacked the capacity to carry the peak discharge events generated by winter season precipitation. Overbank flooding was

commonplace. As flow velocity in the overbank areas was reduced, the sediment transport capacity was also lowered, thus allowing a large portion of the transported sediment to be deposited onto these overbank areas. The Sacramento River formed natural levees composed of the coarser substrate carried by the larger flows each year, while the finer material stayed in suspension longer and settled out into the flood basins.

Both the flow regime and the sediment transport and deposition regimes in the Sacramento River have been significantly altered from historical conditions due to anthropogenic modifications. Many of the river levees were originally intended to decrease channel width to promote higher flow velocities that would perpetuate scouring large amounts of hydraulic mining sediments to deepen the channel for navigation. The narrow channels contribute to the self-eroding phenomena of the levees (stream energy is essentially directed towards the banks), which necessitates the need for constant levee maintenance. To protect from bank erosion, many levees are armored with large angular boulders (i.e., rock slope protection or riprap).

7.2.3.2. Regional Geomorphic Description

For the purposes of this chapter, the Sacramento River is divided into the same valley reaches[1] used in Chapter 5, *Surface Water Resources* (Figure 7-1). The diversions and re-entry points associated with the Project are located between Keswick Reservoir and Verona. Accordingly, the highest potential for change to the geomorphic regime of the Sacramento River would occur in these reaches:

- Keswick Dam to Red Bluff reach (RM 302 to RM 246)
- Red Bluff to Chico Landing reach (RM 246 to RM 194)
- Chico Landing to Colusa reach (RM 194 to RM 143)
- Colusa to Verona reach (RM 143 to RM 79)

The Keswick Dam to Red Bluff reach includes flows upstream of the Project diversions[2]. The Red Bluff to Chico Landing reach and the Chico Landing to Colusa reach contain all of the diversions that would be implemented under the Project. The Colusa to Verona reach is located downstream of the diversions and the ensuing stream discharges that would be implemented under the Project.

The Sacramento River discharge would be located in the Colusa to Verona reach of the Sacramento River between RMs 100 and 101). This reach is mostly confined by levees but there are locations where the levees are set back to provide overflow across point bars of major meander bends (e.g., Tyndall Landing). The location of the Sacramento River discharge shows no evidence of historical meandering and average channel width has only increased about 4% between 1987 and 2005 upstream of the Feather River confluence.

[1] Regional geomorphic descriptions for the Keswick Dam to Red Bluff and Red Bluff to Chico Landing reaches of the Sacramento River are summarized mainly from Chapters 3 and 4 of the Hydraulics section of the *Sacramento River Conservation Area Forum Handbook* (California Resources Agency 2003).

[2] Fluvial geomorphic conditions in this reach are presented for information purposes only, as this reach would not be affected by the Project.

7.2.4. Colusa Basin Drain

Landforms within the Colusa Basin include the levees along the west side of the Sacramento River and the large floodplains and flood basins on the valley floor. A low trough of relatively flat flood basins parallels the Sacramento River levees. The geomorphology of the Colusa Basin has been modified since via Euro-American settlement with the development of flood control facilities and water supply projects (H. T. Harvey & Associates et al. 2008:1). The CBD is the largest engineered drainage structure in the Colusa Basin. Eroded sediments from the adjacent agricultural areas are ultimately transported to the CBD, which has an outlet to the Sacramento River through the Knights Landing Ridge Cut and the Yolo Bypass.

7.2.4.1. Knights Landing Ridge Cut

The Knights Landing Ridge Cut conveys CBD drainage and flood flows into the Yolo Bypass several miles downstream of Fremont Weir. It is an entirely engineered drainage, approximately 8 miles long from its inception at the CBD to where it enters the Yolo Bypass. From the top of its surrounding levees, its width averages approximately 575 feet.

7.2.5. Delta and Yolo Bypass

The present geomorphic state of the Delta is a function of the intensity of water management in each of the tributary rivers, local farming practices, intra- and inter-Delta water transfers, and an extensive human-made levee system. Today, channel alignments are largely fixed by artificial levees and erosion control measures. Flooding, except when artificial levees break, no longer occurs on most islands and tracts. Instead, flow and sediment remain confined to the existing channel network. Upstream water diversions for municipalities and agriculture reduce the amount of flow entering the Delta and the amount of sediment transported to the Delta. In addition, conveyance of water within and out of the Delta alters flow directions and affects sedimentation and erosion rates and patterns. The levee system in the Delta restricts flow to a network of human-made and natural channels that reduce flood events and inhibit the accumulation of soils on the Delta islands.

7.2.5.1. Sediment Inputs

The Sacramento River Flood Control Project conveys released reservoir waters from various upstream sources and stormwater runoff through the Delta and into San Francisco Bay. These waters contain dissolved and undissolved solids, both of which are transported through the system. Undissolved solids (i.e., sediment) consist primarily of clay-, silt-, and sand-sized particles. Before construction of the flood control and conveyance system, the natural flow of freshwater runoff from the upstream mountainous regions transported significant quantities of silt and clay particles. Because of the wide expanse and flat terrain of the Delta area, these particles settled and formed the deposits of the Delta alluvial plain. During the wet season, when the volume of runoff water was much larger, the quantity of suspended and unsuspended solids was significant and included sands and gravels.

The natural processes described above continue in the present day but in a modified manner. Much of the naturally eroded and transported solid particles now settle out in instream water storage reservoirs. A percentage of the fine solids (e.g., silts and clays) are still transported during water releases that enter the system from waterways downstream of the reservoirs. These

sediments enter the Delta channels, and rather than settling out in the alluvial plain (as occurred before the channels were constructed), they now remain within the leveed channels.

7.3 Methods of Analysis

The evaluation of physical environmental impacts on with fluvial geomorphology is both quantitative (using and interpreting modeling results) and qualitative (using information about local fluvial geomorphology to establish context and impact mechanisms). The following sections outline the processes used in the determination of impacts on fluvial geomorphology associated with construction and operation of the Project.

7.3.1. Construction

Construction impacts are evaluated qualitatively based on the physical characteristics of the locations where construction would occur, including slope and soil type. Where appropriate, the impact analysis is combined for Alternatives 1, 2, and 3 depending on the impact being evaluated or the associated Project components. The BMPs described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential construction impacts on fluvial geomorphology, including the erosion and sediment control measures under the description of the Stormwater Pollution Prevention Plan(s) (SWPPP) under Stormwater Construction General Permit coverage, and drainage evaluations, design, and implementation. These BMPs minimize alterations to existing drainage infrastructure and patterns where needed.

7.3.2. Operation

Operational impacts of Alternatives 1, 2, and 3 were evaluated quantitatively and qualitatively using the modeled results. The USRDOM model is a non-predictive model that simulates daily river flows in the Sacramento River basin based on the operations specified by the CALSIM II model for Alternatives 1, 2, and 3. The USRDOM model utilizes results from CALSIM II to evaluate the impacts of changing diversions, in-basin use, and Delta operations under projected conditions within current or future regulatory and operational regimes. The model integrates the downstream monthly operational decisions in CALSIM II with a simulation of the associated sub-monthly operational response at Shasta Lake depending on the inflows. This approach is particularly useful in verifying the CALSIM II simulated river conditions and the availability of excess flows to fill the Sites Reservoir under the capacity and operational constraints of the diversions at the Red Bluff and Hamilton City locations.

The USRDOM model description and results are included in Appendix 5C, *Upper Sacramento River Daily River Flow and Operations Modeling*. Detailed discussion of the CALSIM II model is provided in Appendix 5B, *Water Resources System Modeling*. The USRDOM modeled flood flows are compared for each alternative, as well as the No Action Alternative, at key diversion and return locations across the study area. The flood metrics evaluated are monthly average flows exceeded 10% of the time because this is the percent of time during which flows are relatively high and most of the geomorphic work would be performed on the Sacramento River system.

Geomorphic processes are spatially and temporally variable throughout a river system and determining the exact locations of expected geomorphic change is difficult without the aid of rigorous one-dimensional or two-dimensional hydraulic modeling that includes variables such as changes in depth, velocity, and shear stress. Suspended sediment transport, bedload, and river meandering models were previously utilized in the 2017 Draft EIR/EIS for a 1.8-MAF reservoir with a Delevan intake/discharge location. The previous modeled results are valid for the scale at which impacts on fluvial geomorphology are being considered for Alternatives 1, 2, and 3. The previous modeling results are generally conservative (i.e., higher in volume) relative to the amount of diverted water (and sediment) being considered under Alternatives 1, 2, and 3. The previous modeling is summarized below and was applied and incorporated in the impact analysis under Impacts FLV-1 and FLV-2.

Results from a suspended sediment transport model and bedload analysis were reviewed and incorporated into the impact analysis (Appendix 7B, *Hydrodynamic Geomorphic Modeling Results*). A suspended sediment transport model evaluated the movement of sediment in the Sacramento River and estimated the amount of sediment that would be diverted under Alternatives 1, 2, and 3. The USRDOM model results for simulated daily flows were used in conjunction with actual U.S. Geological Survey gaging station sediment sampling results to develop a flow versus suspended sediment rating curve using the SRH-Meander model. The rating curve was then used to calculate the sediment transport in the Sacramento River and the amount of sediment entrained in the diversion under each alternative.

The bedload analysis investigated the sediment transport capacity of the Sacramento River from Keswick to Colusa Weir. The USRDOM model divided the Sacramento River into 15 reaches based on fluvial geomorphology and hydrology. The USRDOM model daily flows were used to develop flow duration curves. Bedload transport was calculated using several available equations in the SRH-Meander model, with one selected that best described the available observational data. The transport of sediment particles that were larger than 2 millimeters was calculated in tons per year for each reach. Using this approach, the aggrading and degrading reaches could be identified, as well as changes in streambed composition predicted over the 82-year simulation period.

The effects on natural river meandering, bank erosion, and deposition in the Sacramento River channel between Red Bluff and Colusa was modeled using the SRH-Meander model. Inputs to the model included USRDOM model daily flows, streambank erodibility, and channel hydraulic characteristics.

7.3.3. Thresholds of Significance

The evaluation criteria for the impact analysis are based on professional judgment that considers current regulations, standards, and/or consultation with agencies, knowledge of the area, and the context and intensity of the environmental effects. For the purposes of this analysis, an impact on fluvial geomorphology would be considered significant if the Project would:

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious

surfaces, in a manner which would result in substantial increase or decrease in on- or off-site erosion or siltation.

- Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation).
- Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the Sites Reservoir.
- Substantially alter geomorphic processes upstream of the dam sites

7.4 Impact Analysis and Mitigation Measures

Impact FLV-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Current drainage patterns, as well as existing routine operations and maintenance activities would continue, and there would be no alterations to existing drainage patterns relative to existing conditions.

Significance Determination

The No Project Alternative would not result in substantial alterations to existing drainage patterns, through either the alteration of a stream or river or the addition of impervious surfaces, that would result in a substantial increase or decrease in on- or off-site erosion or siltation because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

Construction

Temporary soil disturbance during construction in level to gently sloping areas (e.g., for pipeline installations, TRR East [Alternatives 1 and 3 only], existing road modifications, and siphon replacements on Walker and Willow Creeks) is expected to result in little or no erosion and sedimentation because of the lack of runoff energy (i.e., gradient) to entrain, transport, and deposit sediment. Drainage manipulations in areas with moderate to steep slopes (i.e., locations of the main dams, saddle dams, TRR West [Alternative 2 only], transition manifold, Huffmaster Road realignment, and South Road [Alternative 2 only]) would be more prone to accelerated erosion and sedimentation. Soil eroded within the reservoir's watershed and inundation area

would ultimately be deposited and retained in the inundation area. Soil eroded from areas outside the reservoir watershed and inundation area could reach outside receiving waters. BMPs would address potential increased erosion and siltation rates as a result of drainage pattern manipulation. The BMPs to Develop and Implement SWPPPs and Gain Coverage under Stormwater Construction General Permit would ensure that erosion and siltation rates would not be excessive. The BMPs would include erosion and sediment control measures and during-construction and post-construction runoff management measures. The erosion control measures would protect soils that have been exposed during excavation, filling, and stockpiling operations from eroding at rates greater than preconstruction conditions. The sediment control measures would capture sediment that was generated from exposed soils. The runoff management measures would reduce runoff rates and prevent concentrated runoff from causing scour, such as at culvert outfall points. System-wide, these measures would also ensure sediment would not be released into Sacramento River or the canals.

The Funks and TRR reservoirs and PGPs, administration and operation and maintenance buildings, Dunnigan Pipeline, Sacramento River discharge, and new roads, including the South Road (under Alternative 2 only) represent new facilities with the potential to alter existing drainage patterns and characteristics. The construction of these facilities would result in impervious surfaces or the facilities would be located in areas with characteristics that may lead to alterations of the existing drainage patterns (e.g., adjacent to existing receiving waterbodies, located in steeply sloped areas, or have moderately to highly erodible soils). Drainage infrastructure maintained by local landowners or local agencies would not be affected, and local surface runoff patterns would not be substantially altered because BMPs would identify design flows and incorporate measures to provide for drainage feature stability; incorporate appropriate relocation plans (for canals, ditches, wells, and other existing infrastructure); and incorporate other modifications to localized runoff amounts and/or patterns. Any necessary site features or procedures to remediate Project-induced drainage problems identified in the drainage evaluations would be installed before the Project was completed or as part of Alternatives 1, 2 or 3, depending on site-specific conditions.

Operation

Operation impacts were determined by evaluating suspended sediment increases and/or decreases. Decreases are important to identify for those aquatic organisms (e.g., delta smelt) that rely on suspended sediment and a certain level of turbidity within the study area. Suspended sediment transport modeling suggested that around 100,000–130,000 tons of sediment could be entrained annually by the TC Canal and GCID Main Canal diversions (as identified in the 2017 Draft EIR/EIS) compared to around 40,000–50,000 tons under existing conditions (see Table 2-6 of *Sediment Loads at Tehama-Colusa, Glenn-Colusa, and Delevan Diversions* in Appendix 7B). The entrained sediment load would represent less than or equal to 5% of Sacramento River sediment that otherwise could move downstream to the Delta, compared to around 3% under baseline conditions. Because water and sediment would both be diverted, the concentration of the sediment in the water would remain unchanged, so the turbidity of the water would be expected to remain the same as at the time the water was being diverted (i.e., principally in the winter/spring). The reduced (i.e., less than 5%) sediment load to the Delta under Alternatives 1, 2, and 3 may have relatively small effects on turbidity as a result of the reduction in sediment for

resuspension at other times of the year because it is less than or equal to a 2% difference in the total suspended sediment output of the Sacramento River when compared to existing conditions. The importance of maintaining the existing sediment load of the Sacramento River is described in Chapter 11, *Aquatic Biological Resources*. Implementation of the sediment entrainment component of the Adaptive Management Plan developed for fish (described in detail in Appendix 2D) would inform whether adaptive management measures such as sediment reintroduction are warranted based on actual effects on turbidity under operation of Alternative 1, 2, or 3.

Most Project components (i.e., main dams and saddle dam construction, reservoir construction, Funks and TRR East and West and associated PGPs construction, Funks and TRR pipelines construction, TC Canal intake upgrades, CBD outlet upgrades, and GCID system upgrades) would create minimal new impervious surfaces with limited footprints. Under Alternatives 1 and 3, the amount of impervious surface would be approximately 260 acres. Alternative 2 would have slightly more impervious surfaces, approximately 325 acres. The South Road accounting for approximately 47 acres of impervious surfaces that are not included in Alternative 1 or 3. Project impervious surfaces would be designed to adequately drain water away under the BMP described for construction impacts.

Activities associated with the addition of two new pumps at RBPP would occur within its present footprint and would not result in changes to the footprint. There would be no new impervious footprints and thus a substantial reduction in the amount of natural soil surfaces available for infiltration of rainfall and runoff, thereby generating little, if any, additional runoff and associated erosion and siltation during storm events would not occur.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1, 2, or 3 would not increase soil erosion and sedimentation rates as a result of alteration of existing drainage patterns. Where appropriate (i.e., depending on slope, soil type) the implementation of BMPs for erosion and sediment control would prevent increased soil erosion and sedimentation rates. Development and implementation of drainage evaluations for the Funks and TRR PGPs, administration and operation and maintenance buildings, Dunnigan Pipeline, Sacramento River discharge, road improvements, and new roads, including the South Road (under Alternative 2 only) would consider design flows, appropriate relocation plans, and other modifications to localized runoff amounts and/or patterns. This would reduce the potential for substantial alteration of existing drainage patterns, thereby not resulting in substantial erosion or siltation on- or off site as a result of construction.

Operation of Alternative 1, 2 or 3 would result in an increase in sediment entrainment. Implementation of the sediment entrainment component of the Adaptive Management Plan developed for fish would inform whether adaptive management measures such as sediment reintroduction are warranted based on estimated effects on turbidity. The addition of impervious surfaces would not substantially alter the existing drainage patterns of a site or area because of the limited area of impervious surfaces and the ability of the surrounding open area to infiltrate precipitation.

Construction and operation of the Project would not substantially alter the existing drainage pattern of the site or area in a manner which would result in a substantial increase or decrease in on- or off-site erosion or siltation. This impact is considered less than significant.

NEPA Conclusion

Construction and operation effects for Alternative 1, 2, or 3 would be the same as those described above for CEQA. The construction and operation of Alternative 1, 2, or 3 would not have an adverse effect on the existing drainage patterns or changes in on- or off-site erosion or sedimentation.

Impact FLV-2: Substantially alter natural river geomorphic processes (i.e., flow regime, sediment transport, and bank erosion) and existing river geomorphic characteristics (i.e., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation).

No Project

The No Project Alternative represents the continuation of the existing conditions in the study area. Current channel morphology conditions, as well as existing routine operations and maintenance activities would continue, and there would be no change in the geomorphic regimes.

Significance Determination

The No Project Alternative would not result in substantial alterations to natural river geomorphic processes and existing river geomorphic characteristics because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1 and 3

This section addresses potential impacts associated with alteration of natural river geomorphic processes and existing Sacramento River geomorphic characteristics as a result of operation of Alternatives 1 and 3 at RBPP and GCID Main Canal at Hamilton City. Construction impacts associated with Impact FLV-2 are discussed under Impact FLV-1.

Operation

Based on the USRDOM modeled flood flows, the differences (primarily reductions) in monthly average flow exceeded 10% of the time between the No Action Alternative and Alternatives 1 and 3 at the four Sacramento River locations shown in Table 7-3. These values show an increase of less than 1% to a decrease of less than 5% when compared to No Action Alternative, depending on the location (Table 7-4). These percentages are minor when considered in the context of the larger system.

Table 7-3. Percent Exceedance Values of USRDOM Modeled Monthly Average Flow for No Action Alternative and Alternatives 1, 2, and 3

Location	Location Relative to Project Elements	Capacity (cfs)	Month	Monthly Average Flow Exceeded 10% of the Time (cfs)				
				NAA	ALT 1A	ALT 1B	ALT 2	ALT 3
Sacramento River Flow at Bend Bridge	Between Shasta outflow and first diversion to Sites (Red Bluff)	98,000 (approx.)	Feb	40,506	40,526	40,461	40,509	40,461
Red Bluff Diversion	First diversion to Sites (serving TC Canal)	2,530	Jul	1,372	1,334	1,334	1,334	1,327
Sacramento River Flow below Red Bluff Diversion Dam	Between first diversion to Sites (Red Bluff) and second diversion to Sites (GCID)	260,000	Feb	41,165	39,155	39,091	41,146	39,091
Hamilton City Diversion	Second diversion to Sites (GCID)	3,000	Jun	2,696	2,689	2,678	2,670	2,663
Sacramento River near Wilkins Slough	Between second diversion to Sites (GCID) and Sites return (CBD)	30,000	Feb	26,450	26,211	26,473	26,424	26,401

Table notes:
The flood metrics are monthly average flows exceeded 10% of the time. This is the percent of time during which flows are relatively high and most of the geomorphic work would be performed on the system.
ALT = Alternative
CBD = Colusa Basin Drain
cfs = cubic feet per second
GCID = Glenn-Colusa Irrigation District
NAA = No Action Alternative

Table 7-4. Flow and Percent Change between the No Action Alternative and Alternatives 1, 2, and 3

Location	Month	Monthly Average Flow Compared to No Action Alternative (cfs change/percent change)			
		ALT 1A	ALT 1B	ALT 2	ALT 3
At Bend Bridge	Feb	+20 <1% increase	+45 <1% increase	+3 <1% increase	+45 <1% increase
Red Bluff Diversion	July	-38 <3% decrease	-38 <3% decrease	-38 <3% decrease	-45 <3% decrease
Below Red Bluff Diversion Dam	Feb	-2,010 5% decrease	-2,075 5% decrease	-20 <1% decrease	-2,074 5% decrease
Hamilton City Diversion	June	-7 <1% decrease	-18 <1% decrease	-26 <1% decrease	-33 <1% decrease
Near Wilkins Slough	Feb	-239 <1% decrease	+24 <1% increase	-26 <1% decrease	-48 <1% decrease

Table notes:
cfs = cubic feet per second

As computed from Table 7-3 and as shown in Table 7-4, the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 1A is approximately 2%; the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 1B is also approximately 2%; and the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 3 is less than 2%. As shown in Table 7-4, the monthly average flow would increase in two instances, where both instances represent a change of less than 1%. The biggest changes (decreases) would occur in the Sacramento River below the RBDD. This is because that diversion point is considered the primary point of diversion (under each Alternative 1 or 3).

A fundamental principle of fluvial geomorphology suggests that a decrease in the amount of flow generally causes a corresponding decrease in flow velocity that typically induces sediment deposition. There is potential for the creation of localized areas of sediment deposition under Alternatives 1 and 3. The relative amount of potential deposition would be extremely limited because Alternative 1 or 3 diversions would only occur under higher flow regimes in the Sacramento River. These high flows would maintain sediment transport. As such, implementation of the diversion rates and amounts under Alternatives 1 and 3 would not measurably alter the natural river geomorphic processes and existing river geomorphic characteristics.

Finally, sediment removal at the RBPP and the GCID Main Canal intake, and the TC Canal intake would occur during the regularly scheduled maintenance period for these intakes using the same practices currently employed. Therefore, maintenance activities at these locations are expected to result in minimal (if any) alterations to Sacramento River geomorphic regimes as compared to the existing conditions.

Bedload sediment balance of a river is an important consideration for potential impacts with regards to sediment transport and other related geomorphic processes. The bedload analysis for the 1.8-MAF reservoir suggested no significant effects on the distribution of annual flows (differences of no more than a few percentages) and therefore no significant alteration of the bedload sediment balance in the Sacramento River. Under existing conditions, most reaches in the Sacramento River are not experiencing measurable aggradation or degradation, except for the reach in the vicinity of Moulton Weir, which is experiencing aggradation. The modeled bedload analysis do not significantly affect the aggradation that would continue in this reach.

The river meandering, bank erosion, and deposition modeling concluded that there were no significant differences between the channel alignments between the existing conditions and the modeled alternatives. Meander tendency varied between alternatives. For example, the reach from Stony Creek to Moulton Weir was modeled to experience the most amount of active channel migration, and the reach from Moulton Weir to Colusa Weir was modeled to experience less channel migration (under all modeled alternatives).

CEQA Significance Determination and Mitigation Measures

The average (system-wide) decrease in monthly average flow between the No Action Alternative and operations under Alternative 1 or 3 is approximately 2% and diversions would only occur

under higher flow regimes in the Sacramento River. Operational impacts on the geomorphic regime (including natural river geomorphic processes such as sediment transport and bank erosion) and existing river geomorphic characteristics (e.g., sinuosity, channel gradient, substrate composition, channel width and depth, and riparian vegetation) of the greater Sacramento River system are expected to be minimal. The overall volume of water available and the pattern of water diversion in the Sacramento River (and therefore the canals, Yolo Bypass, and the Delta) would generally be similar to the amount and pattern of water diversion under existing conditions. Therefore, operation of Alternative 1 or 3 would not substantially alter natural river geomorphic processes and existing geomorphic characteristics for the Sacramento River and downstream of the river and impacts would be less than significant.

NEPA Conclusion

Operation effects for Alternative 1 or 3 would be the same as those described above for CEQA and would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics. As such, implementation of the diversion rates and amounts under Alternative 1 or 3 would have no adverse effect.

Alternative 2

Operation

Operational impacts under Impact FLV-2 for Alternative 2 would be similar but lesser in magnitude to those as described above for Alternatives 1 and 3. Based on the USRDOM modeled flood flows, the differences (primarily reductions) in monthly average flow exceeded 10% of the time between the No Action Alternative and Alternative 2 at the four Sacramento River locations shown in Table 7-3 are relatively minor and range from an increase of less than 1% to a decrease of less than 3% when compared to No Action Alternative, depending on the location (Table 7-4).

As computed from Table 7-3 and as shown in Table 7-4, the average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 2 is less than 1%. Monthly average flow would increase in one instance, with a change of less than 1%.

Similar to Alternatives 1 and 3, the relative amount of potential deposition under Alternative 2 would be extremely limited because diversions would only occur under higher flow regimes in the Sacramento River. As such, implementation of the diversion rates and amounts under Alternative 2 would not substantially alter the natural river geomorphic processes and existing river geomorphic characteristics.

Sediment removal activities at the RBPP and the GCID Main Canal intake and the results from the bedload and river meandering, bank erosion, and deposition modeling would be the same as described for Alternatives 1 and 3 and would not result in substantial alterations to natural river geomorphic processes and existing river geomorphic characteristics.

The point at which the Sacramento River discharge joins the Sacramento River possibly represents an area where historical meandering may have occurred (California Resources

Agency 2003:6-4). However, the Sacramento River discharge location does not have setback levees in the vicinity and a review of available aerial imagery (from 1985 to the present) shows no evidence of historical meandering in this reach. Furthermore, a study by Northwest Hydraulic Consultants (2010:4) concludes that the river channel in this general area is closely bordered by levees with extensive revetment, and lateral channel evolution is limited. Therefore, operation of the Sacramento River discharge at this location would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics.

Installation of the Sacramento River discharge would result in the removal of riparian vegetation along a short length of the west bank and replacement with rock slope protection. The operation of this facility would therefore occur in an area where vegetation was present prior to construction activities; however, the vegetation removal would not measurably affect overall stream function and geomorphic regime under Alternative 2 because there is already a significant amount of existing rock slope protection on the banks of the river in the vicinity of the discharge.

CEQA Significance Determination and Mitigation Measures

The average (system-wide) decrease in monthly average flow between the No Action Alternative and Alternative 2 is less than 1% and diversions would only occur under higher flow regimes in the Sacramento River. Similar to Alternatives 1 and 3, operation of Alternative 2 would not substantially alter natural river geomorphic processes and existing geomorphic characteristics and impacts would be less than significant.

NEPA Conclusion

Operation effects for Alternative 2 would be the same as those described above for CEQA and would not substantially alter natural river geomorphic processes and existing river geomorphic characteristics. As such, implementation of the diversion rates and amounts under Alternative 2 would have no adverse effect.

Impact FLV-3: Substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir.

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Current channel morphologic elements, as well as existing routing operations and maintenance activities would continue, and there would be no change in geomorphic attributes.

Significance Determination

The No Project Alternative would not substantially alter the amount of instream woody material, boulder, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of Sites Reservoir because there would be no construction and operation of new facilities to affect instream characteristics. There would be no impact.

Alternatives 1, 2, and 3

Construction

Construction would result in minimal impacts on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks because the Sites Dam and Golden Gate Dam would have relatively limited footprints within these channels (approximately 2 acres of temporary impacts on Funks Creek and Stone Corral Creek). Aerial imagery of the areas where the dams would be constructed was reviewed and the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel appears to be minimal.

Erosion and sedimentation impacts from construction (which could have direct or indirect effects on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks) associated with Impact FLV-3 are discussed under Impact FLV-1.

Operation

The reaches of Funks and Stone Corral Creeks likely to be most modified by the two main dams are the reaches from below the dams to where these creeks have been modified by historical water management practices. On Stone Corral Creek, the reach of interest is from the downstream face of the Sites Dam to just above the GCID Main Canal (7.7 miles); on Funks Creek, it is from the downstream face of Golden Gate Dam to the upper end of Funks Reservoir (1.8 miles). While these reaches have been modified by cattle grazing and minor diversions, they still have available fish habitat and both native and nonnative fish have been observed in each drainage. They also both experience much of their natural hydrograph and fluvial geomorphic processes. (*cite to: California Fish and Game Code 5937 and Funks and Stone Corral Creeks Memo, once finalized)*.

Stone Corral Creek would receive bypass flows from the reservoir from an outlet on the Sites Dam and Funks Creek would receive augmented flow from the Funks pipelines to its reaches immediately upstream of Funks Reservoir. Bypass flows would range from 0 to 100 cfs, with larger pulse flows to emulate natural flood conditions, and lower flows in the drier months (e.g., summer).

The augmentation of flow in each drainage would support the existing geomorphic functions of each channel (e.g., gravel, SRA). The following geomorphic field studies would be required once access is obtained and before final designs for Sites and Golden Gate Dams are completed, per the description in Chapter 2:

- Characterization of flows, including assessing the base flow during the summer months.
- Characterization of habitats available (e.g., spawning, rearing, foraging, and sheltering habitats) at varying flow levels. Characterization of habitats would help to inform what habitats are available at what flow regimes.

- Conducting a fluvial geomorphologic study to characterize bedload and flow levels necessary for substrate mobilization. Substrate mobilization is a key component of channel maintenance and supporting habitat diversity.
- Surface Water Ambient Monitoring Program (SWAMP) technical study (i.e., bioassessment) that focuses on relationships between physical habitat, water quality, and benthic macroinvertebrates. A SWAMP bioassessment would document the baseline conditions with individual metrics (i.e., scores) for physical habitat (the Index of Physical Integrity [IPI]) and benthic macroinvertebrates (the California Stream Conditions Index [CSCI]). The Project Operations Plan would ensure that the IPI and CSCI scores do not decrease relative to baseline conditions.

The Authority would use information from these field studies, along with currently available information, to prepare an Operations Plan for Funks and Stone Corral Creeks. The Operations Plan would identify the approach for releases, including release schedule and volumes, a monitoring plan, and an adaptive management plan to maintain fish in good condition consistent with California Fish and Game Code Section 5937. For example, characterizing the bedload would allow a determination as to whether the Operations Plan would require gravel augmentation. The information would be integrated to focus on aquatic species of concern in the lower portions of the two creeks to concentrate on habitat maintenance needs. It is expected flow releases from the Sites Reservoir to these creeks would mimic the natural discharge of the associated creeks, and that releases would be low during Dry and Critically Dry Water Years. The flow releases would be determined to support focus species. Conversely, flow releases would be higher during Above Normal Water Years.

Under Alternatives 1, 2 and 3, Sites Reservoir dams would be designed and constructed pursuant to criteria designed to prevent failure. The designs would incorporate multiple lines of defense or design redundancy as required to meet design standards reducing the potential for dam failure (Chapter 5, *Surface Water Resources* and Chapter 12, *Geology and Soils*). Furthermore, Alternatives 1, 2, and 3 would include the design and operation of facilities to meet criteria and requirements for emergency reservoir drawdown in the unlikely and rare event of an emergency. During an emergency release event, Saddle Dams 3 and 5 (Alternatives 1 and 3 only) and Saddle Dam 8B, the I/O Works, and Sites Dam would operate simultaneously to release water. In addition, the TRR East would have an emergency outlet into Funks Creek. In the unlikely and rare event of an emergency release, it is likely that overbank flooding (and localized deposition) would occur on the upper banks and floodplain surfaces of every channel receiving emergency release water, while the main channels would experience channel bed scour.

CEQA Significance Determination and Mitigation Measures

Construction impacts on the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks would be less than significant as the Sites Dam and Golden Gate Dam would have relatively limited footprints within these channels. In addition, and as described under Impact FLV-1, the impact of increased soil erosion and sedimentation rates as a result of alteration of existing drainage patterns would be less than significant for Project elements under Alternative 1, 2, or 3 because erosion and sediment control measures would minimize and reduce erosion in accordance with the BMPs.

These measures would also serve to ensure that there would be minimal to no substantial alteration of the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in smaller creeks.

Operation of Alternative 1, 2, or 3, would provide bypass flows to Stone Corral and Funks Creeks. These flows would be refined through studies required under Project Commitments. These flows would support geomorphic processes in these channels by maintaining channel-forming flows and maintaining geomorphic processes (e.g. mobilization of bedload and erosion of stream banks) that support the fish assemblage and other aquatic species below the dams. The Sites Reservoir would meet design criteria to greatly reduce the potential of emergency releases that would likely create localized deposition and scour. Impacts would be less than significant.

NEPA Conclusion

Construction and operation effects for Alternative 1, 2, or 3 would be the same as those described above for CEQA and would not substantially alter the amount of instream woody material, boulders, shaded riverine aquatic habitat, or spawning gravel in Funks and Stone Corral Creeks downstream of the reservoir. Construction and operation would have no adverse effect.

Impact FLV-4: Substantially alter geomorphic processes upstream of the dam sites

No Project

The No Project Alternative represents the continuation of the existing conditions within the study area. Antelope Valley and the ephemeral drainages within and extending upslope of the valley would remain intact and not be inundated. There would be no change in geomorphic attributes relative to existing conditions.

Significance Determination

The No Project Alternative would not result in a substantial alteration in the amount of ephemeral stream habitat and associated geomorphic processes upstream of Sites Reservoir. There would be no inundation within the existing Antelope Valley drainage network and no changes would occur to the existing geomorphic attributes because no new facilities would be constructed and operated. There would be no impact.

Alternatives 1, 2, and 3

This section addresses potential impacts associated with alteration of existing ephemeral stream habitat and associated geomorphic processes in the smaller creeks within and upslope of Antelope Valley.

Construction and Operation

Under Alternative 1 or 3 approximately 24.3 miles[3] of primarily marginal ephemeral channel habitat that experiences sediment transport, scour, and deposition based on the volume and duration of precipitation would be inundated. Under Alternative 2 approximately 24.1 miles[4] of primarily marginal ephemeral channel habitat would be inundated. This habitat is marginal because the streams are ephemeral, have abundant algae at low flow, have minimal and sporadic shrub or tree riparian vegetation, and have been degraded by cattle trampling. The current geomorphic processes would cease to function (e.g., sediment transport, scour, and deposition) as riverine geomorphic processes would be replaced with lacustrine/reservoir processes (e.g., limited transport and movement and sediment migrating to depressions within the inundation area). Over time, it is likely the channel segments in the Antelope Valley that would not be inundated would adjust to a new base level, albeit a temporally fluctuating one (i.e., the water surface of the Sites Reservoir) via adjustments to their channel beds upstream of the new water surface. Deposition of materials in short stretches of the downstream reaches of these channels would increase due to changes in base level. These channels appear to be relatively static (non-dynamic) fluvial systems. Impacts would be expected to be relatively small, although the magnitude of such changes is uncertain and difficult to quantify or qualify given the lack of predictive capability regarding fluvial geomorphic processes once the reservoir was inundated.

Habitats associated with these ephemeral channels are described in Chapter 9, *Vegetation and Wetland Resources*; Chapter 10, *Wildlife Resources*; and Chapter 11, *Aquatic Biological Resources*.

CEQA Significance Determination and Mitigation Measures

The current riverine geomorphic processes within the inundated area would be replaced with lacustrine/reservoir processes. The non-inundated portions of the ephemeral channel network would adjust to a new geomorphic equilibrium, although the magnitude of such changes is uncertain and difficult to quantify or qualify. No significant erosion or deposition is expected under the operation of the Sites Reservoir and substantial alteration of geomorphic processes upstream of the dam sites is not expected. Construction and operation impacts would be less than significant.

NEPA Conclusion

Construction and operation effects would be the same as those described above for CEQA. Sites Reservoir construction and operation would have no adverse effect on the alteration of geomorphic processes upstream of the main dam sites.

[3] This number only includes the named streams within the Antelope Valley. There are also various unnamed tributaries to the named channels.

[4] This number only includes the named streams within the Antelope Valley. There are also various unnamed tributaries to the named channels.

7.5 References

7.5.1. Printed References

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Chapter 9 Vegetation and Wetland Resources

Outstanding issues [yellow=info needed for completion from ICF or Integration; blue=QA/QC globals for ICF Editing]
Integration/Authority: Revised Sacramento Discharge structure for Alternative 2 is not in this chapter. Preliminary information about the design of this structure was received on 4/23 and GIS files came after 4/27. We would not expect determinations to change as a result of the revisions to the design; however, impact analysis will need to be reviewed/potentially modified to account for the revisions.
Integration/Authority: for this chapter (as with Chapter 10 and ultimately 11) we reduced repetition and use the phrase "Same as Alternative 1" in the summary tables with respect to mitigation measures.

9.1 Introduction

This chapter describes the environmental setting, methods of analysis, and impact analysis for vegetation and wetland resources that would potentially be affected by the construction and operation of the Project. Vegetation and wetland resources are defined as natural communities, wetlands and non-wetland waters of the United States and of the State, special-status plant species, and invasive plant species.

The study area for vegetation and wetland resources consists of areas of disturbance under Alternatives 1, 2, and 3 plus a 300-foot-wide buffer. The offsite borrow areas that would be aggregate sources for dam construction are not included in the study area for vegetation and wetland resources because the offsite borrow areas are existing active locations. Therefore, obtaining aggregate from these offsite locations during Project construction would not result in additional impacts on vegetation and wetland resources.

Tables 9-1a and 9-1b summarize the CEQA determinations and NEPA conclusions for construction and operation impacts, respectively, between alternatives.

Table 9-1a. Summary of Construction Impacts and Mitigation Measures for Vegetation and Wetland Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	**Mitigation Measure VEG-1.1:** Conduct Appropriately Timed Surveys for Special-Status Plant Species Prior to Construction Activities **Mitigation Measure VEG-1.2:** Establish Activity Exclusion Zones Around Special-Status Plants in Temporary Impact Areas and Compensate for Permanent Impacts on Special-Status Plants	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-2: Substantial adverse effect (i.e., loss or removal) on any riparian habitat or other sensitive natural community			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-2.2:** Avoid and Compensate for Adverse Effects on Sensitive Natural Communities	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact VEG-3: Substantial adverse effect (i.e., loss or removal) on state or federally protected wetlands			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-3.1:** Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities **Mitigation Measure VEG-3.2**: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands **Mitigation Measure VEG-3.3:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters	LTSM NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-4-1:** Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction **Mitigation Measure VEG-4-2** Compensate for Adverse Effects on Oak Woodlands	SU SA
Alternative 2	S SA	Same as Alternative 1	SU SA
Alternative 3	S SA	Same as Alternative 1	SU SA
Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan			
No Project	NI NE	-	NI NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Alternative 1	S SA	**Mitigation Measure VEG-2.1**: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities **Mitigation Measure VEG-2.2:** Avoid and Compensate for Adverse Effects on Sensitive Natural Communities **Mitigation Measure VEG-3.1:** Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities **Mitigation Measure VEG-3.2**: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands **Mitigation Measure VEG-3.3:** Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters **Mitigation Measure VEG-4-1:** Avoid and Minimize Potential Adverse Effects on Oak Woodlands **Mitigation Measure VEG-4.2** Compensate for Adverse Effects on Oak Woodlands	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-6: Introduction or increased spread of invasive plant species			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
S = CEQA determination of significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects

NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

Table 9-1b. Summary of Operations Impacts and Mitigation Measures for Vegetation and Wetland Resources

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, on plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-1.3:** Establish Activity Exclusion Zones Around Special-Status Plants Prior to Vegetation Maintenance Activities	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-2: Substantial adverse effect (i.e., loss or removal) on any riparian habitat or other sensitive natural community			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-2.3:** Establish Activity Exclusion Zones Around Sensitive Natural Communities Prior to Vegetation Maintenance Activities	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-3: Substantial adverse effect (i.e., loss or removal) on state or federally protected wetlands			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-3.4:** Establish Activity Exclusion Zones Around Wetlands and Non-Wetland Waters in Vegetation Maintenance Areas	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE

Alternative	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance			
No Project	NI NE	-	NI NE
Alternative 1	S SA	**Mitigation Measure VEG-4.3:** Establish Activity Exclusion Zones Around Blue Oak Woodlands in Vegetation Maintenance Areas	LTSM NE
Alternative 2	S SA	Same as Alternative 1	LTSM NE
Alternative 3	S SA	Same as Alternative 1	LTSM NE
Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan			
No Project	NI NE	-	NI NE
Alternative 1	NI NE	-	NI NE
Alternative 2	NI NE	-	NI NE
Alternative 3	NI NE	-	NI NE
Impact VEG-6: Introduction or increased spread of invasive plant species			
No Project	NI NE	-	NI NE
Alternative 1	LTS NE	-	LTS NE
Alternative 2	LTS NE	-	LTS NE
Alternative 3	LTS NE	-	LTS NE

Notes:
NI = CEQA determination of no impact
LTS = CEQA determination of less-than-significant impact
S = CEQA determination of significant impact
LTSM = CEQA determination of less than significant with mitigation
SU = CEQA determination of significant and unavoidable
B = NEPA conclusion of beneficial effects
NE = NEPA conclusion of no effect or no adverse effect
AE = NEPA conclusion of adverse effect
SA = NEPA conclusion of substantial adverse effect

9.2 Environmental Setting

This section describes the environmental setting for the vegetation and wetland resources in the study area. The environmental setting is composed of the physical setting, vegetation and wetland resource types, sensitive natural communities, wetlands and non-wetland waters, special-status plant species, and invasive plant species.

Appendix 9A, *Special-Status Species*, provides the species lists used to determine the special-status plant species with the potential to occur in the study area, special-status plant table, and species accounts. Appendix 9B, *Vegetation and Wetland Methods and Information*, contains the methods and sources of information for identifying the land cover types in the study area, as well as descriptions of vegetation communities (including sensitive natural communities), wetlands, non-wetland waters, unvegetated land cover types, and invasive plants.

9.3 Physical Setting

The physical setting for the study area is composed of its geography, topography, hydrology, soils, and climate. The geographic subdivisions of California that encompass the study area are the Inner North Coast Ranges District of the Northwestern California Region and the Sacramento Valley Subregion of the Great Central Valley Region, which are both in the California Floristic Province (Baldwin et al. 2012). The study area occurs in the Coast Range foothills surrounding the Antelope Valley and in a long swath of the northwestern Sacramento Valley. The topography of the study area varies from west to east. The west side of the study area is characterized by low rolling foothills and elevations range from approximately 400 to 800 feet above mean sea level (msl) in the hills surrounding Antelope Valley to 200 feet above msl in the Funks Reservoir area. From the Funks Reservoir, the valley gently slopes to the study area's lowest point, which is approximately 30 feet above msl at the eastern edge of the study area, along the Sacramento River south of Dunnigan.

Streams in the central and eastern parts of the study area include Stone Corral Creek and its tributary Funks Creek, which cross Antelope Valley and drain to the Sacramento Valley. Antelope Creek extends north through Antelope Valley and drains to Stone Corral Creek. Wilson Creek and Grapevine Creek are in the western part of the study area. Wilson Creek, which follows the northern half of the South Road alignment, is tributary to Squaw Creek and the East Park Reservoir, which is west of and outside the study area. Grapevine Creek follows the southern half of the South Road alignment. The downstream section of Stone Corral Creek and most of Antelope Creek are supported by groundwater and remain inundated or saturated throughout the year, while the other named streams flow primarily during the winter and spring, with some reaches becoming dry during the summer and fall. Streams in the study area support riparian woodland and wetlands. Numerous unnamed intermittent and ephemeral streams also drain the study area, and many are tributary to the named streams. Canals in the study area that carry flows to and from reservoirs include the GCID Main Canal and the TC Canal. Numerous agricultural ditches supply water to orchards, rice fields, row crops, and vineyards in the study

area. Additional discussion of creek hydrology in the study area is provided in Chapter 5, *Surface Water Resources.*

The soils in the eastern portion of the study area were formed in flood basins and terraces (Natural Resources Conservation Service 2020a). Most of the soils that formed in the flood basins have been levelled for rice production and are subject to flood control improvements (Natural Resources Conservation Service 2006:16). They are generally clayey, and some have a high sodium content (Natural Resources Conservation Service 2020a). Soils in the western portion of the study area, including Antelope Valley, are on gentle to very steep slopes. Most of the soils are clayey (Natural Resources Conservation Service 2020a). Serpentine soils, which occur intermittently in the Coast Ranges, are upslope from the lower elevations and outside the study area. Chapter 12, *Geology and Soils,* provides additional information on soils in the project construction area.

The climate in the study area is characterized by hot, dry summers and cool, relatively wet winters, depending on the water year type. Data from two weather stations, one north (Stony Gorge Reservoir, California) and one east (Colusa 2 SSW, California) of the study area, were reviewed for temperature and precipitation averages (Natural Resources Conservation Service 2020a, 2020b). The average high temperatures range from between 95.2°F and 94°F in July to between 55.2°F and 55.6°F in January, and the average low temperatures range from between 32.4°F and 36.6°F in December to between 59.1°F and 60.3°F in July. The average annual precipitation is from 16.37 to 22.51 inches, with precipitation falling mostly as rain with less than 1 inch of snow, primarily between October and May (Natural Resources Conservation Service 2020b, 2020c).

9.3.1 Vegetation and Wetland Resource Types in the Study Area

The study area and vicinity are predominantly vegetated by natural and agricultural vegetation. Property access restrictions precluded field investigations of vegetation and wetland resources in the study area since the preparation of the 2017 Draft EIR/EIS. The information on the types and extent of vegetation and wetland resources in the study area presented in this RDEIR/SDEIS is primarily based on the results of previous surveys of parts of the study area conducted between 1998 and 2003 (California Department of Water Resources 2000a, California Department of Water Resources 2000b, Sites Project Authority and U.S. Bureau of Reclamation 2017) and on the interpretation of recent high-resolution aerial imagery of the entire study area.

The study area contains 28 mapped land cover types that are shown in Figure 9B-1 and are listed in Table 9B-1, which also provides acreage estimates for each type (Appendix 9B). All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the U.S. Army Corps of Engineers (USACE) and State Water Resources Control Board (State Water Board).

The most abundant plant community in the study area is annual grassland, with areas of oak savanna and blue oak woodlands becoming more common as elevations increase from east to west and eventually transitioning to chamise and foothill pine in the westernmost part of the study area. Riparian woodland and wetlands are present along most of the major creeks including Antelope Creek, Funks Creek, Grapevine Creek, and Stone Corral Creek. Open water types in

the survey area include Funks Reservoir, GCID Main Canal, TC Canal, Salt Pond, and small ponds. Seasonal wetlands are located in grasslands and topographic lows where clay soils are present. To the east, agricultural areas containing rice and orchards are the most abundant land cover type.

9.3.2 Sensitive Natural Communities

Sensitive natural communities are habitats that are considered sensitive because of their high species diversity, high productivity, unusual nature, limited distribution, or declining status. Local, state, and federal agencies consider these habitats important and generally require compensation for loss of sensitive communities. The California Natural Diversity Database (CNDDB) contains a current list of rare natural communities throughout the state (California Department of Fish and Wildlife 2020). U.S. Fish and Wildlife Service (USFWS) considers certain habitats, such as riparian and wetland communities, important to wildlife. The USACE and U.S. Environmental Protection Agency consider stream habitats important for water quality and wildlife. The acreages and rarity ranks for the sensitive natural communities identified in the study area are shown in Tables 9B-1 and 9B-2, respectively (Appendix 9B).

One sensitive natural community, upland riparian, is mapped in the study area. Upland riparian in the study area may be classified as either Fremont cottonwood forest (S3), Goodding's willow – red willow riparian woodland and forest (S3), and/or California rose briar patches (G3 S3). This riparian community may also function as shaded riverine aquatic (SRA) cover for fish species, as described in detail in Chapter 11, *Aquatic Biological Resources*, for Impact FISH-1 under "Loss of Riparian Vegetation (Including SRA Cover) and Increased Water Temperature."

Three other common upland vegetation types are also identified as having the potential to contain sensitive natural communities: (1) annual grassland with potential for California brome–blue wildrye prairie (G3 S3), gum plant patches (G2, G3 S2, S3), needlegrass–melic grass grassland (G3 S3), and white-tip clover swales (G3? S3?); (2) foothill pine with potential for foothill pine-herbaceous association (Provisional Alliance); and (3) oak savanna with potential for valley oak woodland and forest (G3 S3).

9.3.3 Wetlands and Non-Wetland Waters

Wetlands and non-wetland waters in the study area are subject to regulation as waters of the United States and waters of the state that fall in the jurisdictions of the USACE and the State Water Board, respectively. The wetland and non-wetland water resources regulated by these agencies may vary because of differences in federal and state laws and regulations. The regulations relating to wetlands and non-wetland waters are described in Chapter 4, *Regulatory and Environmental Compliance: Project Permits, Approvals, and Consultation Requirements*.

Wetland types identified in the study area that are subject to federal and/or state regulations include forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland. The forested wetland and scrub-shrub wetland types are riparian habitats that may also function as SRA cover for fish species, as described for Impact FISH-1 in Chapter 11, *Aquatic Biological Resources*.

Non-wetland waters identified in the study area that are subject to federal and/or state regulations include canal, ditch, pond, reservoir, ephemeral stream, intermittent stream, and perennial stream. The acreages of wetlands and non-wetland waters presented are preliminary, as the aquatic resources delineation has not been completed with onsite surveys or jurisdictional review by the USACE and State Water Board.

9.3.4 Special-Status Plant Species

For the purpose of this RDEIR/SDEIS, special-status plant species are defined as those in one or more of the following categories.

- Species listed or proposed for listing as threatened or endangered under Endangered Species Act (ESA) (50 Code of Federal Regulations 17.12, and various notices in the Federal Register [FR]).
- Species that are candidates for possible future listing as threatened or endangered under ESA (85 FR 73164, November 16, 2020).
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations 670.5).
- Plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code 1900 et seq.).
- Plants with a California Rare Plant Rank (CRPR) of 1 or 2, which are plants considered by CDFW and CNPS to be "rare, threatened, or endangered in California" (California Native Plant Society 2020).
- Plants with a CRPR of 3 or 4, which are plants identified by CDFW and CNPS about which more information is needed to determine their status, and plants of limited distribution and may be included as special-status species on the basis of local significance or recent biological information.

Table 9A-1 (Appendix 9A) lists the 42 special-status plant species that occur in or within 5 miles of the study area. Please refer to Table 9A-1 for the scientific names of the special-status species. The special-status species were identified based on the CNDDB records query (California Department of Fish and Wildlife 2021), California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (2020) search, the USFWS species list (U.S. Fish and Wildlife Service 2021), and review of species distribution and habitat requirements data.

Surveys for special-status plant species were conducted between 1998 and 2003 in parts of the study area (California Department of Water Resources 2000a; Sites Project Authority and U.S. Bureau of Reclamation 2017), but not all parts of the study area were included in these surveys and more recent surveys have not been performed. Therefore, all species identified as present in the study area vicinity were evaluated for their potential to occur in the study area itself, based on the known range of each species and their habitat associations, as well as the previous survey data. The following sections focus on the two federally and/or state listed species with potential to occur in the study area. Twenty-eight of the non-listed species are not known to be present in the study area and have low or no potential to occur in the study area. These 28 species are not

addressed further. The other 12 non-listed, special-status plant species have moderate to high potential to occur in the study area.

9.3.4.1 Keck's Checkerbloom

Keck's checkerbloom (also referred to as Keck's checkermallow) is listed as endangered under ESA (65 FR 7764, February 16, 2000); it is not listed under CESA. The species was thought to be restricted to three sites in Fresno and Tulare Counties at the time of its listing, and critical habitat for the species is located in those counties (68 FR 12875–12880, March 18, 2003). Subsequent taxonomic studies have concluded that the species also occurs in the southern Inner North Coast Ranges in Colusa, Napa, Solano, and Yolo Counties (Hill 2015). There are 50 occurrences, five of which are within 5 miles of the study area. Keck's checkerbloom grows in grasslands and on grassy slopes in blue oak woodland, generally on clay soils, and sometimes on soils derived from serpentinite. Grasslands, blue oak woodland, and oak savanna in the study area are potential habitat for this species.

Botanical surveys of the Sites Reservoir project area were conducted prior to Keck's checkerbloom being listed and before it was recognized to occur in northern California. Consequently, these surveys identified all checkerbloom plants in the area as fringed checkerbloom (*Sidalcea diploscypha*) (California Department of Water Resources 2000a), a common species that is similar in appearance to Keck's checkerbloom, so that any potential occurrences of Keck's checkerbloom in the survey area were not mapped.

A species habitat model developed for Keck's checkerbloom can be used to predict locations of suitable habitat in the study area. The model presently considers annual grassland, blue oak woodland, and oak savanna communities where the soil map unit Cibo-Ayar-Altamont also occurs. This map unit includes soils with high clay content that represent potentially suitable microhabitat for Keck's checkerbloom.

9.3.4.2 Palmate-Bracted Bird's Beak

Palmate-bracted bird's-beak is federally listed as endangered (51 FR 23769, July 1, 1986). It is also state listed as endangered. This species was listed under the name *Cordylanthus palmatus* but is now known as *Chloropyron palmatum.* No critical habitat has been designated for this species. The species is known from 25 occurrences, eight of which are extirpated (i.e., destroyed) or possibly extirpated. These occurrences are present at widely separated locations in the Central Valley, ranging from Glenn County to Fresno County. Three occurrences are present within 5 miles of the study area. Habitat for the species is iodine bush scrub and alkaline meadow. Palmate-bracted bird's-beak was not found in the study area (California Department of Water Resources 2000a), and there is potential for this species to occur in alkali seasonal wetlands in the current study area. A species habitat model developed for palmate-bracted bird's-beak can be used to predict where suitable habitat is present in the study area. The model considers seasonal wetlands and intermittent streams where Capay soils are present. Capay soils are generally alkaline.

9.3.5 Invasive Plant Species

The California Invasive Plant Council defines invasive species as plants that are not native to an environment, and once introduced, establish, quickly reproduce and spread, and cause harm to

the environment, economy, or human health. Table 9B-5 (Appendix 9B) lists species of invasive plant species that have been observed in the study area or are documented from Glenn or Colusa Counties and occur in land cover types similar to those in the study area (California Invasive Plant Council 2021, CalFlora 2021). Please refer to that table for the scientific names of invasive plant species. Thirty-two of these species were identified in the study area during botanical resource surveys conducted between 1998 and 2003 (California Department of Water Resources 2000a; Sites Project Authority and U.S. Bureau of Reclamation 2017). Nearly all plant communities in the study area support invasive plant species, although some have more extensive invasive plant infestations than others. Annual grassland in the inundation area supports invasive grass species such as ripgut and other bromes, hedgehog dogtail, and medusahead, as well as invasive forbs, such as yellow star-thistle, which is widespread (Sites Project Authority and U.S. Bureau of Reclamation 2017). Italian thistle, bull thistle, and other nonnative thistles are common in the grassland understory of oak woodland at the edges of the Sites Reservoir inundation area. Ruderal areas by roads in grassland understory of blue oak woodlands can become infested with milk thistle, olive, California bur-clover, cutleaf geranium, and invasive thistles and mustards. Edges of agricultural fields, ranches or homesteads, and roadsides through agricultural areas are also vulnerable to infestations of many invasive species. Wetlands in the study area may support hyssop loosestrife and Himalayan blackberry. Upland riparian habitat may support tree-of-heaven, giant reed, and tree tobacco.

9.4 Methods of Analysis

The methods for analysis of impacts on vegetation and wetland resources are organized into direct and indirect impacts. Direct impacts are those effects that would be directly caused by Project construction and operation even if it took time for the resulting effect to develop (e.g., filling of the reservoir over a 20-year period). Indirect impacts are those that would occur either later in time or at a distance from the area where direct impacts would occur but are reasonably foreseeable, such as erosion and alteration of existing hydrology. Direct and indirect impacts may be either permanent or temporary. Impacts on vegetation and wetland resources are generally considered temporary where they would be restored to preconstruction conditions within 1 year. The study area and land cover mapping area for vegetation and wetland resources includes a 300-foot-wide buffer outside of the temporary and permanent impact areas. The buffer area was assessed for potential temporary and indirect impacts on vegetation and wetland resources.

9.4.1 Construction

Direct permanent impacts on natural communities, wetlands, and non-wetland waters were assessed using the estimated amount of land cover that would be converted by Project construction. Construction impacts include both construction of new facilities and filling of the reservoir. Temporary impacts on natural communities, wetlands, and non-wetland waters were calculated using the estimated amount of land cover that would be temporarily disturbed during Project construction but would be restored to pre-Project conditions within 1 year of disturbance. Temporarily affected areas that would ultimately be inundated by the Sites Reservoir were included in the permanent impact area to avoid double counting acreages, and because these

areas would ultimately be permanently affected. The impact analysis assumed that the conditions on parcels of land surrounding the reservoir would be maintained similar to existing conditions (e.g., as grazing lands). In addition, temporary impacts on special-status plants from ground disturbance, even if followed by restoration, would constitute a permanent impact, unless the particular species benefits from disturbance.

Impacts on vegetation and wetland resources were calculated using geographic information system (GIS) software. The Project footprint and associated temporary impact areas were overlaid on the land cover mapping data to quantify the permanent and temporary impacts associated with the construction of the Project facilities.

Impacts on occurrences of special-status plants known to occur in the study area were based on previous survey results and CNDDB occurrence data. Special-status plant species identified as having moderate to high potential to occur in the study area were included in the impact analysis. The full extent of impacts on special-status plants is currently unknown because recent botanical surveys for special-status plants have not been conducted throughout the study area. The extent of impacts cannot be calculated based on the current available data; therefore, the impact assessment is qualitative.

The following assumptions and alternative details regarding specific Project components were applied to the impact analysis:

- Construction of the TC Canal diversion pumps would not affect any areas of natural communities, wetlands, or non-wetland waters because construction would occur within the existing facility footprint. This area is not considered further in this analysis.
- Temporary impacts from the use of coffer dams in Stone Corral and Funks Creeks during dam construction are included in the impacts shown in Tables 9-2b and 9-4b.
- Impacts from construction of TRR East are included in the impacts shown in Tables 9-2a and 9-2b for Alternatives 1 and 3. Impacts from construction of TRR West are included in the impacts shown in Tables 9-4a and 9-4b for Alternative 2.
- Impacts in the north-south transmission line and the east-west transmission line would be primarily temporary for installation of new high-voltage electrical transmission lines to power the regulating reservoirs. Only one of the two alignments described in Chapter 2 would be constructed. Small areas for new transmission line towers would be required in the alignment, but specific locations are currently unknown. The maximum permanent impact from the towers would total less than 0.01 acre and is largely within annual grassland, therefore the potential permanent impact on special-status plants, sensitive natural communities, wetlands, and non-wetland waters would be much less than 0.01 acre. The entire area of the transmission line alignments is included in the temporary impacts shown in Tables 9-2b and 9-4b. Final Project design for placement of the new towers within the transmission line alignments would avoid special-status plants, sensitive natural communities, wetlands, and non-wetland waters to the extent feasible.
- Quarries located outside the inundation area would be regraded and allowed to revegetate at the bottoms, but they would not return to pre-Project conditions.

- Offsite borrow areas would be in existing commercial facilities and would not impact land cover.
- The inundation area would replace natural communities, wetlands, and non-wetland waters with open water. Alternative 1 or 3 would permanently flood a larger area than Alternative 2.
- The footprints for the Peninsula Hills, Stone Corral Creek, and day-use boat ramp/parking recreation areas represent the total area that could be used for recreation activities. Only part of each footprint would experience a permanent loss of vegetation for the construction of camp sites, picnic areas, hiking trails, potable water source, utility connections, and kiosk (at Peninsula Hills and Stone Corral Creek Recreation Areas), and toilets.
- New road construction would result in permanent loss of existing vegetation in the entire construction disturbance area, and improvements to existing roads would affect only the area to the edges of the right-of-way. The exact locations of the realigned Huffmaster Road, new Comm Road South, and new South Road are not yet finalized. Therefore, corridors have been used to identify potential direct and indirect impacts. For example, on the South Road a 400-foot-wide conceptual road alignment plus a 300-foot-wide buffer has been identified to allow for design flexibility. Because the final South Road corridor is unknown, the entire corridor was assumed to be permanently affected for the purposes of the impact analysis. Within the corridors, the actual permanent impact area would be only the footprint of roads and shoulders with additional temporarily affected areas for construction staging and equipment movement.

The following BMPs, which are described in Appendix 2D, *Best Management Practices*, are incorporated into the analysis of potential construction and operations impact on vegetation and wetland resources.

- Salvage, Stockpile, and Replace Topsoil and Prepare a Topsoil Storage and Handling Plan – requires evaluation of topsoil for salvaging suitability and storage and handling plans when topsoil cannot be used without stockpiling.
- Develop and Implement Stormwater Pollution Prevention Plan(s) (SWPPP) and Gain Coverage under Stormwater Construction General Permit (Storm Water and Non-Storm Water) – requires development and use of erosion control measures, sediment control measures, construction materials management measures, waste management measures, non-stormwater control measures, and post-construction stormwater management measures.
- Develop and Implement Spill Prevention and Hazardous Materials Management/Accidental Spill Prevention, Containment, and Countermeasure Plans (SPCCPs) and Response Measures – requires site-specific plans with measures to minimize effects from spills of hazardous or petroleum substances during construction and operation/maintenance.

- Worker Environmental Awareness Program (WEAP) – requires training of all construction crews and contractors on protection and avoidance of biological, cultural, archaeological, paleontological, and other sensitive resources.
- Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities – requires a construction monitoring plan for sensitive biological resources and in-water construction activities, use of exclusion fencing around sensitive biological resources, and measures for construction personnel to protect wildlife.
- Control of Invasive Plant Species during Construction and Operation – requires identification of invasive plant infestations, measures for handling removed invasive plants during construction, and control of invasive aquatic plants during operation of Sites Reservoir.

9.4.2 Operation

Because operation of the Project would not involve additional earth-moving or substantial disturbance of new areas beyond those that would be disturbed during construction, acreage impacts due to operation were not assessed. The operation phase would include primarily changes in water diversions to Sites Reservoir, energy generation and use, and routine tasks to maintain the facilities after construction according to operations and maintenance plans to be developed. Maintenance would include vegetation control and grazing around all facilities, recreation areas, and a 100-foot buffer around the facilities. These activities would affect undeveloped land where sensitive natural communities, wetlands and non-wetland waters, or special-status plants could occur. Public use of recreation areas could affect areas that support special-status plants, sensitive natural communities, or wetlands and non-wetland waters, impacts that could result during operation of recreation areas were considered.

9.4.3 Thresholds of Significance

An impact on vegetation resources (including wetlands and non-wetland waters) would be considered significant if the Project would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any plant species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFW or USFWS.
- Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
- Conflict with any local policies or ordinances protecting vegetation resources, such as a tree preservation policy or ordinance.

- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.
- Introduce or increase the spread of invasive plant species.

9.5 Impact Analysis and Mitigation Measures

Impact VEG-1: Substantial adverse effect (i.e., loss or removal), either directly or through habitat modifications, of plant species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service

No Project

The No Project Alternative would not construct or operate any new facilities. Special-status plants occur in the study area. Because the No Project Alternative would not construct or operate new facilities, there would be no temporary impacts on special-status plants from temporary construction staging or other disturbance or permanent impacts from placement of facilities that would remove special-status plants.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on special-status plants.

Alternatives 1 and 3

The extent of permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis*, of Alternatives 1 and 3 is shown in Tables 9-2a and 9-2b. All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the USACE and State Water Board.

Table 9-2a. Alternatives 1 and 3 Acreages of Permanent Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regulating Reservoirs and Conveyance Complex	6	0	2	0	1	0	0	<1	0	0	0	0	<1	<1	1	<1	<1	<1	0
Sites Reservoir Inundation Area	11,271	159	<1	<1	<1	0	2	38	0	0	282	36	0	6	256	23	164	22	46
Inlet/Outlet Works	23	0	0	0	0	0	0	0	0	0	2	0	0	0	<1	0	<1	<1	<1
Dams and Dikes	154	5	0	0	0	0	<1	1	0	0	4	<1	0	<1	11	1	3	1	2
Quarries and Rock Processing	409	0	0	0	0	0	0	<1	0	0	17	0	0	<1	2	0	4	2	0

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Facilities																			
Conveyance to Sacramento River	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		<1
Roads	772	97	<1	0	<1	0	3	2	0	1	122	2	0	2	60	<1	10	<1	5
Recreation Areas	460	79	0	0	0	0	0	0	0	0	239	<1	0	<1	<1	0	1	2	4
Alternatives 1 and 3 Total Permanent Impacts	13,095	340	2	<1	2	0	6	42	0	1	666	39	<1	8	329	25	182	27	57

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Table 9-2b. Alternatives 1 and 3 Acreages of Temporary Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	<1	0	1	0	0	0	0	0	0	1	0	0	0	0	<1
Regulating Reservoirs and Conveyance Complex	580	0	8	0	<1	0	<1	13	0	0	0	3	223	<1	15	<1	3	1	2
Inlet/Outlet Works	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Dams and Dikes	42	2	0	0	0	0	<1	<1	0	0	<1	<1	0	0	2	0	0	<1	<1
Quarries and Rock Processing Facilities	155	0	0	0	0	0	0	1	0	0	1	1	0	<1	19	0	6	<1	0
Conveyance to Sacramento	0	0	<1	0	<1	0	0	0	6	0	0	0	0	0	0	0	3	0	2

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
River																			
Roads	144	21	0	1	0	0	1	<1	0	0	16	0	0	1	0	0	2	1	2
Recreation Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternatives 1 and 3 Total Temporary Impacts	928	23	8	1	1	0	2	14	6	0	19	4	223	2	36	<1	14	2	6

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Construction

Construction of Alternative 1 or 3 would result in direct permanent loss of occupied habitat for bent-flowered fiddleneck and red-flowered bird's-foot trefoil in annual grassland, blue oak woodland, and oak savanna, and of occupied habitat for brittlescale and San Joaquin spearscale in alkali seasonal wetlands. Construction of Alternative 1 or 3 could also result in an undetermined loss of potential habitat for the special-status plants that were assessed as having a moderate to high probability of occurring in the study area (Table 9A-1 lists the special-status species, including their scientific names, and their habitat requirements): Bolander's horkelia, California alkali grass, Colusa layia, deep-scarred cryptantha, Keck's checkerbloom, Konocti manzanita, and Tracy's eriastrum. Potential habitats for these species include annual grassland, blue oak woodland, oak savanna, chamise, mixed chaparral, and seasonal wetland. For federally listed species (Keck's checkerbloom and palmate-bracted bird's-beak), habitat models have been used to identify impacts on suitable species habitat in the study area. Table 9-3 below shows the acreages of direct permanent and temporary impacts on the two modeled plant species. Tables 9-2a and 9-2b show the acreages of direct permanent and temporary impacts on habitats for other special-status plant species in each component area under Alternatives 1 and 3.

Table 9-3. Acreages of Permanent and Temporary Impacts on Modeled Special-Status Plant Species Habitat in the Study Area

	Alternative 1 and 3		Alternative 2	
	Permanent Impacts	Temporary Impacts	Permanent Impacts	Temporary Impacts
Keck's checkerbloom	10,094	700	9,735	682
Palmate-bracted bird's-beak	217	8	214	7

Preconstruction and construction measure BMPs are part of Alternatives 1 and 3 and would limit direct impacts on special-status plants. Construction workers would be trained on the importance of avoiding special-status species and require fencing of sensitive habitats and any occupied special-status plant habitats where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided special-status plants could be damaged or destroyed. BMPs for controlling invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into occupied special-status plant habitats. The BMPs would also limit indirect impacts on special-status plants by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation.

These BMPs would not prevent the permanent loss of or degradation of habitat quality for special-status plants in the footprint for Alternatives 1 and 3. Under Alternative 1 or 3, construction of facilities would result in the loss and habitat modification for the four species known to occur in the affected area (bent-flowered fiddleneck, brittlescale, red-flowered bird's-foot trefoil, and San Joaquin spearscale) through direct removal and habitat quality degradation,

which could include disturbance of the seed bank and changes to soil structure and mycorrhizal (symbiotic fungal) systems. Permanent impacts on the species' habitats would result from earth moving and vegetation removal for construction of facilities associated with the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, recreation areas, and new roads, including Comm Road South and the realigned Huffmaster Road. These permanent impacts would include both the facility footprints and the temporary construction areas where earth-moving would occur. These facilities would result in the permanent loss of occupied special-status plant habitats, including annual grassland, blue oak woodland, oak savanna, and alkaline seasonal wetland in the construction footprint. Alternative 1 or 3 could also result in the direct permanent loss of occupied habitat for seven other special-status species with potential to occur in the construction footprint, including the two federally listed, modeled species, Keck's checkerbloom and palmate-bracted bird's-beak.

Under Alternative 1 or 3, construction activities would also result in the temporary disturbance of special-status plant habitat during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on potential special-status plant habitat would occur during construction activities for most facilities, except those associated with the Sacramento River diversion and conveyance to regulating reservoirs. Temporary impacts would result from equipment movement that does not affect living plants or disrupt the soil surface (e.g., driving over dead annual plants). Construction would result in temporary impacts on annual grassland, blue oak woodland, oak savanna, and seasonal wetland. There would be no temporary impacts on special-status plant habitat from the construction of the Sacramento River diversion and conveyance to regulating reservoirs because those facilities already exist and construction activities would be located within existing footprints.

Potential indirect impacts on special-status plants from the construction of Alternative 1 or 3 from changes in the hydrology of special-status plant habitat outside the construction area due to erosion and sedimentation from earth moving during construction would be avoided by implementation of BMPs and the SWPPP.

Operation

Operation of the Sites Reservoir under Alternatives 1 and 3 would not result in additional impacts on special-status plant species beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction and impacts on occupied special-status plant habitat from maintenance activities after construction. Additional operation-phase impacts could occur in undeveloped parts of the recreation areas due to visitor use of spaces outside of the constructed facility. The permanent footprint of these recreation areas is currently at a conceptual design stage, and the actual location of facilities is not yet known. Impacts shown in Table 9-2a include a substantially larger area than would ultimately be part of the recreation area footprints, and much of the designated recreation areas would remain undeveloped. Because the construction impact acreage assessed for the recreation areas includes all habitat in the recreation area boundaries, therefore, there would be no additional impact on occupied special-status plant habitat in the recreation areas due to operation.

Maintenance of Alternative 1 or 3 facilities could require access that is adjacent to occupied special-status plant habitat. Although 15-foot-wide maintenance roads would be constructed to provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is potential for maintenance equipment to cause erosion of or sedimentation into adjacent habitats in the buffer areas and adversely affect vegetation cover and occupied special-status plant habitat quality. The SWPPP would contain erosion and sedimentation control measures that would be required as part of maintenance activities to prevent erosion and sedimentation off site, and these effects would be avoided. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect special-status plants or occupied special-status habitats if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on special-status plant species by reducing the number of occurrences of special-status plants and lowering the quality of occupied habitat for bent-flowered fiddleneck, brittlescale, red-flowered bird's-foot trefoil, and San Joaquin spearscale. Construction could also affect potential habitat for additional special-status plant species, including the federally listed Keck's checkerbloom and palmate-bracted bird's-beak. Indirect impacts under Alternative 1 or 3 due to erosion and sedimentation in occupied special-status plant habitats located outside of the construction area would be avoided with implementation of applicable BMPs (e.g., implementation of a SWPPP). The occurrences of special-status plants in the construction footprint are significant because their loss could substantially decrease genetic diversity for the species, particularly the red-flowered bird's-foot trefoil, which is known from only eight locations. While measures would be implemented before and during construction to avoid and minimize impacts on special-status plants, Alternative 1 or 3 would still result in the loss and habitat quality degradation of their habitats. Additionally, the construction footprint has not been completely surveyed for special-status plants, and there is potential for additional species or locations of the known special-status plant species to occur in the footprint and be subject to construction-related impacts. The direct and permanent losses of special-status plants would be a significant impact. Implementation of Mitigation Measures VEG-1.1 and VEG-1.2 would reduce the level of impact to less than significant because all locations of special-status plants in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of occupied habitat for each affected species at identified ratios would ensure some of the populations of these species would survive in perpetuity.

Operation impacts on special-status plants from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts on special-status plants from vegetation maintenance could result in losses of special-status plants, and this would be a significant impact. Implementation of Mitigation Measure VEG-1.3 would reduce the level of impact to less than significant because all locations of special-status plants in the vegetation maintenance areas would be identified, fenced, and avoided.

Mitigation Measure VEG-1.1: Conduct Appropriately Timed Surveys for Special-Status Plant Species Prior to Construction Activities

The Authority will employ qualified botanists to conduct special-status plant surveys of the Project footprint, including all permanent and temporary construction impact areas and a 250-foot-wide buffer area to encompass areas where indirect effects may occur. The surveys will be conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California Department of Fish and Wildlife 2021), or the most current protocols. Surveys will occur during the season that special-status plant species would be evident and identifiable, which generally is during their blooming period. The surveys will be conducted no more than 3 years prior to the start of ground-disturbing activities. The results of the surveys will be submitted in a report to CDFW and/or USFWS for review no less than 1 year prior to the start of ground-disturbing activities.

The survey report will include the location and description of all work areas and the location and description of all occupied habitat for special-status plant species. The report will also identify locations where effective avoidance measures could be implemented. In areas where no special-status plant species are present, no further mitigation will be required.

Mitigation Measure VEG-1.2: Establish Activity Exclusion Zones Around Special-Status Plants in Temporary Impact Areas and Compensate for Permanent Impacts on Special-Status Plant Species

Where surveys determine that a special-status plant species is present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on the species through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for special-status plant species will be established around each occupied habitat site, the boundaries of which will be clearly marked with construction exclusion fencing or its equivalent. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur within 250 feet of the occupied habitat. The size of activity exclusion zones may be reduced through consultation with a qualified biologist and with concurrence from CDFW or, for any federally listed species, from USFWS based on site-specific conditions.

Prior to any activities that would result in permanent impacts on special-status plants, the Authority will acquire and permanently protect compensation habitat for each affected species at a minimum 2:1 ratio (2 acres restored or created for every 1 acre filled), but the final compensation ratios will be based on site-specific information and determined through coordination with state and/or federal agencies (CDFW, USFWS) during permit processing. Compensation habitat will consist of existing off-site occupied habitat acquired in-fee, through conservation easements, or from a certified conservation bank. The Authority will monitor compensation habitat annually to verify that the habitat suitability is maintained. The Authority will prepare and implement an operations and

management plan for each compensation habitat, with funding provided through an endowment. The plan will include requirements to monitor the habitat and determine and implement appropriate management measures to maintain the habitat. The Authority will submit annual monitoring reports to CDFW or, for any federally listed species, to USFWS for review and determination that the Project remains in compliance with the mitigation requirements.

Mitigation Measure VEG-1.3: Establish Activity Exclusion Zones Around Special-Status Plants Prior to Vegetation Maintenance

A qualified botanist employed by the Authority will conduct special-status plant surveys of vegetation maintenance areas in annual grassland, chaparral, oak woodland and savanna, and wetlands at a minimum of every 3 years. If any special-status plants are found in or within 50 feet of the vegetation maintenance areas, the Authority will fence and avoid the plants that could be affected by surface-disturbing maintenance activities.

NEPA Conclusion

The construction and operation effects under Alternative 1 or 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and the Mitigation Measures VEG-1.1 and VEG-1.2 construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 could result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and Mitigation Measure VEG-1.3 operation effects would be reduced to no adverse effect.

Alternative 2

The extent of Alternative 2 permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis,* is shown in Tables 9-4a and 9-4b. All land cover type acreages are preliminary, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the USACE and State Water Board.

Table 9-4a. Alternative 2 Acreages of Permanent Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<1
Regulating Reservoirs and Conveyance Complex	181	0	3	0	<1	0	<1	4	0	0	0	0	<1	<1	2	<1	<1	<1	<1
Sites Reservoir Inundation Area	10,648	108	0	0	<1	0	3	38	0	0	209	36	0	9	251	22	160	16	42
Inlet/Outlet Works	24	0	0	0	0	0	0	0	0	0	2	0	0	0	<1	0	<1	<1	<1
Dams and Dikes	83	5	0	0	0	0	<1	<1	0	0	5	0	0	<1	8	1	3	<1	2
Quarries and Rock Processing Facilities	437	0	0	0	0	0	0	0	0	0	17	2	0	0	2	0	4	2	0

Conveyance to Sacramento River	0	0	<1	0	<1	0	0	0	0	0	0	0	0	0	0	<1	0	0	<1
Roads	832	131	1	141	<1	86	1	1	0	8	117	5	0	<1	61	<1	21	4	44
Recreation Areas	450	53	0	0	0	0	0	0	0	0	213	<1	0	<1	0	0	1	2	3
Alternative 2 Total Permanent Impacts	12,655	297	4	141	<1	86	4	43	0	8	563	43	<1	9	323	23	189	24	92

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Table 9-4b. Alternative 2 Acreages of Temporary Impacts on Special-Status Plant Habitats, Sensitive Natural Communities, and Wetland and Non-Wetland Water Types in Project Component Areas

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Sacramento River Diversion and Conveyance to Regulating Reservoirs	0	0	<1	0	<1	0	1	0	0	0	0	0	0	1	0	0	0	0	<1

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Regulating Reservoirs and Conveyance Complex	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1
Sites Reservoir Inundation Area	550	0	3	0	<1	0	<1	9	0	0	0	3	223	<1	15	<1	3	1	0
Inlet/Outlet Works	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	<1
Dams and Dikes	34	2	0	0	0	0	<1	<1	0	0	2	<1	0	<1	2	0	<1	<1	0
Quarries and Rock Processing Facilities	98	0	0	1	0	0	<1	<1	0	0	1	<1	0	0	<1	0	1	0	2
Conveyance to Sacramento River	0	0	2	0	5	0	0	0	6	0	0	0	0	0	0	0	3	0	2
Roads	226	21	0	0	0	0	<1	1	0	0	16	1	0	<1	17	0	7	1	0
Recreation Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Alternative 2 Total	908	23	5	1	5	0	2	10	6	0	20	4	223	2	34	<1	14	2	<1

Project Components	Annual Grassland[1]	Blue Oak Woodland	Canal	Chamise Chaparral	Ditch	Foothill Pine[1]	Forested Wetland	Freshwater Marsh	Managed Wetland	Mixed Chaparral	Oak Savanna[1]	Pond	Reservoir	Scrub-Shrub Wetland	Seasonal Wetland	Perennial Stream	Intermittent Stream	Ephemeral Stream	Upland Riparian[1]
Temporary Impacts																			

[1] Sensitive natural community or may contain areas that are sensitive natural communities. In annual grassland, there is potential for California brome – blue wildrye prairie, gum plant patches, needlegrass – melic grass grassland, and white-tip clover swales. In foothill pine, there is potential for foothill pine-herbaceous. In oak savanna, there is potential for valley oak woodland and forest.

Construction

Construction of Alternative 2 would result in direct permanent and temporary impacts and indirect impacts on special-status plant species. Table 9-3 shows the acreages of direct permanent and temporary impacts on the two modeled plant species. Tables 9-4a and 9-4b show the acreages of direct permanent and temporary impacts on each habitat type under Alternative 2. Overall, less acreage would be affected under Alternative 2 as compared to Alternative 1 or 3 but impacts on several habitats would be greater—chamise chaparral, foothill pine, mixed chaparral, pond, shrub-scrub wetland, intermittent stream, and upland riparian. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent and direct loss or habitat quality degradation for special-status plant species in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of special-status plant species through direct removal and habitat degradation. The Alternative 2 footprint contains adobe lily, as well as the four special-status plant species discussed for Alternatives 1 and 3. Permanent impacts on special-status plant species would result from construction of the same components as described for Alternatives 1 and 3 with two differences. First, additional permanent impacts from construction of the new South Road under Alternative 2 would result in the loss of annual grassland, chamise, mixed chaparral, blue oak woodland, oak savanna, and seasonal wetland. Second, permanent impacts on special-status plant habitats would be reduced due to the decreased reservoir size and inundation area. Under Alternative 2, temporary and indirect impacts would occur at the same facilities as those as described for Alternatives 1 and 3.

Operation

As described for Alternatives 1 and 3, there would be no additional impact from operation of the recreation areas on special-status plant species under Alternative 2, as the recreation areas would be the same between Alternatives 1, 2, and 3. Impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of the South Road would result in greater loss of annual grassland, chamise, mixed chaparral, blue oak woodland, oak savanna, and seasonal wetland, and the smaller reservoir would result in somewhat smaller loss of special-status plant habitats. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-1.1 and VEG-1.2 would reduce the level of impact to less than significant. Operation impacts on special-status plants would be the same as Alternatives 1 and 3. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-1.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA. Construction of Alternative 2 would result in a substantial adverse effect on special-status plant species, but through implementation of BMPs and the Mitigation Measure VEG-1.1 and VEG-1.2 construction effects would be reduced to no adverse effect. Operation of Alternative 2 could result in a substantial adverse effect on special-status plant species. Through implementation of BMPs and Mitigation Measure VEG-1.3, operation effects would be reduced to no adverse effect.

Impact VEG-2: Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service

No Project

The No Project Alternative would not construct or operate any new facilities, and there would be no temporary impacts on sensitive natural communities from temporary construction staging or other disturbance and no permanent impacts from placement of facilities in sensitive natural communities.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on state or federally protected sensitive natural communities.

Alternatives 1 and 3

Construction

Construction of Alternative 1 or 3 would result in direct permanent and temporary impacts on sensitive natural communities. Tables 9-2a and 9-2b show the acreages of permanent and temporary impacts on the sensitive natural community types in each component area under Alternatives 1 and 3. Indirect impacts due to construction of Alternative 1 or 3 could occur due to changes in hydrology of sensitive natural communities outside the construction area due to erosion and sedimentation during construction.

BMPs are incorporated into Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on sensitive natural communities. These BMPs would limit direct impacts on sensitive natural communities because they would train construction workers on the importance of preserving sensitive natural communities outside of the construction footprint and require fencing of sensitive natural communities where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided sensitive natural communities could be damaged or destroyed. BMPs for controlling invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into sensitive natural communities. The

BMPs would also limit indirect impacts on sensitive natural communities by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation. Preconstruction and construction measures are part of Alternatives 1 and 3. The measures would not prevent the permanent loss or habitat quality degradation of sensitive natural communities in the footprint for Alternatives 1 and 3.

Sensitive natural community types include upland riparian habitat, sensitive natural communities in annual grasslands, and sensitive natural communities in oak savanna. All these sensitive natural community types would experience similar types of permanent, direct impacts associated with construction, including earth moving, vegetation removal, filling, and hydrological interruption. Construction activities would also result in the temporary disturbance of these sensitive natural community types during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. The impacts on riparian habitat that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

There would be no permanent or temporary impacts associated with the following sensitive communities and facilities because of the lack of the sensitive community in the area of the facility:

- no permanent impacts on upland riparian habitat from the construction of the Sacramento River diversion and conveyance to regulating reservoirs or the regulating reservoirs and conveyance complex
- no permanent or temporary impacts on annual grassland from the construction of the Sacramento River diversion or conveyance to the Sacramento River
- no permanent or temporary impacts on oak savanna from the construction of the Sacramento River diversion and conveyance to regulating reservoirs, regulating reservoirs and conveyance complex, conveyance to Sacramento River, or Comm Road South
- no temporary impact on upland riparian habitat, annual grassland, or oak savanna from the construction of new roads or recreation areas

Operation

Operation of the Sites Reservoir under Alternative 1 or 3 would not result in additional impacts beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction and impacts on sensitive natural communities from maintenance activities after construction. Additional operation-phase impacts could occur in undeveloped parts of the recreation areas due to visitor use of spaces outside of the constructed facility. As discussed for operation effects in Impact VEG-1, the construction impact acreages for the recreation areas are overestimated and there would be no additional operations impacts on sensitive natural communities in the recreation areas.

Maintenance of Alternatives 1 and 3 facilities would require access that is adjacent to sensitive natural communities. Although 15-foot-wide maintenance roads would be constructed to provide

access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is potential for maintenance equipment to cause erosion of or sedimentation into adjacent sensitive natural communities in the buffer areas and adversely affect vegetation cover or habitat quality. SWPPP and erosion and sedimentation control measures would be required as part of maintenance activities, and these effects would be avoided through implementation of these measures. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect sensitive natural communities if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would result in significant impacts on state- and federally protected sensitive natural communities by direct removal of vegetation in these communities for the regulating reservoirs and conveyance complex, Sites Reservoir, roads, and recreation areas. Indirect impacts under Alternative 1 or 3 due to erosion and sedimentation into sensitive natural communities located outside of the construction area would be avoided with implementation of applicable BMPs (e.g., implementation of a SWPPP). The sensitive natural communities in the construction footprint are significant because they are rare and/or declining in California and elsewhere. Measures would be implemented before and during construction to avoid and minimize impacts on sensitive natural communities. The construction of Alternative 1 or 3 would still result in the loss of sensitive natural communities and habitat quality degradation. The loss of sensitive natural communities would be significant. Implementation of Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the level of impact because all locations of sensitive natural communities in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of in-kind communities for each affected sensitive natural community at identified ratios would ensure survival of the affected sensitive natural community in perpetuity. Mitigation for impacts on sensitive communities within annual grassland could be accomplished in one or two seasons because of the relatively rapid growth rate of herbaceous plants. Implementation of mitigation would reduce the level of impact on sensitive communities within annual grassland to less than significant. For upland riparian and oak savanna communities, the removal of mature trees would be a long-term impact because of the length of time that would be required for newly planted trees to reach mature size and fully replace the habitat function and habitat value of the removed trees. This impact would remain significant and unavoidable even with mitigation because of the long-term loss of upland riparian and oak savanna habitat.

Operation impacts on sensitive natural communities from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts from vegetation maintenance could result in losses of sensitive natural communities in annual grasslands, oak savanna, oak woodland, or upland riparian, and this would be a significant impact. Implementation of Mitigation Measure VEG-2.3 would reduce the level of impact to less than significant because sensitive natural communities in vegetation maintenance areas would be identified, fenced, and avoided during vegetation maintenance activities.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

Prior to the start of any Project construction activities, the Authority will employ qualified botanists to conduct surveys of the Project area, including all permanent and temporary impact areas and an additional buffer of 250 feet to encompass potential indirectly affected areas. The surveys will be conducted in accordance with *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (California Department of Fish and Wildlife 2018), or most current protocols. Surveys will occur during the season that plant species would be evident and identifiable, which generally is during their blooming season. The surveys will be conducted no more than 3 years prior to the start of ground-disturbing activities. The results of the survey will be submitted in a report to CDFW and/or USFWS for review no less than 1 year prior to the start of ground-disturbing activities.

The report will include the location and description of all work areas and the location and description of all sensitive natural communities and oak woodlands, and it will identify locations where effective avoidance measures could be implemented. In areas where no sensitive natural communities or oak woodlands are present, no further mitigation will be required.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

Where surveys determine that a sensitive natural community is present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on the community through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for sensitive natural communities will be established around each community site, the boundaries of which will be clearly marked with construction exclusion fencing or its equivalent. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur in 250 feet of the community site. The size of activity exclusion zones may be reduced through consultation with a qualified biologist and with concurrence from CDFW or, for any federally protected communities of concern, from USFWS based on site-specific conditions.

Prior to any activities that would result in permanent impacts on sensitive natural communities, the Authority will acquire and permanently protect compensation habitat for each affected sensitive natural community at a minimum 1:1 ratio (1 acre restored or created for every 1 acre removed), but the final compensation ratios will be based on site-specific information and determined through coordination with state and/or federal agencies (CDFW, USFWS) during permit processing. In addition to mitigating the loss of riparian habitat, specific measures will be included to compensate for the loss of SRA cover (area and linear feet), as portions of the affected riparian habitat also provide SRA cover for fish. The mitigation credits for SRA cover mitigation will apply toward riparian

habitat mitigation requirements (i.e., the acreage required for compensation will not be duplicated).

Compensation habitat will consist of existing off-site occupied habitat acquired in-fee, through conservation easements, or from a certified conservation bank. The Authority will monitor compensation communities annually to verify that the community suitability is maintained. The Authority will prepare and implement an operations and management plan for each compensation community, with funding provided through an endowment. The plan will include requirements to monitor the community and determine and implement appropriate management measures to maintain the community. The Authority will submit annual monitoring reports to CDFW or, for any federally protected communities, to USFWS for review and determination that the Project remains in compliance with the mitigation.

Mitigation Measure VEG-2.3: Establish Activity Exclusion Zones Around Sensitive Natural Communities Prior to Vegetation Maintenance Activities

A biologist employed by the Authority will use the results of the surveys conducted under Mitigation Measure VEG-2.1 to mark the locations of sensitive natural communities in vegetation maintenance areas. The Authority will fence and avoid any parts of sensitive natural communities that occur in or within 50 feet of the vegetation maintenance areas that could be affected by surface-disturbing maintenance activities. The fencing will allow for wildlife movement and the Authority will maintain the fencing throughout the operations period. Alternatively, if sensitive natural communities cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. If the remaining impacts on sensitive natural communities as the result of vegetation maintenance activities exceed 0.1 acre, the Authority will implement additional compensatory mitigation based on the same requirements as described in Mitigation Measure VEG-2.2.

NEPA Conclusion

The construction and operation effects under Alternative 1 or 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on sensitive natural communities. Implementation of BMPs and the Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the construction effects to no adverse effect for sensitive communities in annual grassland, but the effects would remain substantially adverse for upland riparian and oak savanna. Operation of Alternative 1 or 3 could result in a substantial adverse effects on sensitive natural communities. Implementation of BMPs and Mitigation Measure VEG-2.3 would reduce operation effects on sensitive natural communities to no adverse effect.

Alternative 2

Construction

The extent of Alternative 2 permanent and temporary impacts, quantified as described above in Section 9.3, *Methods of Analysis,* is shown in Tables 9-4a and 9-4b. All land cover type acreages are preliminary and subject to change pending field review. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent loss or habitat quality degradation of sensitive natural communities in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of sensitive natural communities through direct removal of vegetation and habitat quality degradation. Permanent and temporary impacts on sensitive natural communities would result from construction of the same facilities as described for Alternatives 1 and 3, with three differences. First, additional permanent impacts from construction of the new South Road under Alternative 2 would result in permanent loss of upland riparian, foothill pine woodland, and oak savanna. Second, permanent impacts resulting from fill of Sites Reservoir on sensitive natural communities would be smaller due to the decreased reservoir size and inundation area. Third, additional impacts from construction of the Sacramento River discharge would result in permanent loss of upland riparian. The effects on upland riparian that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

Under Alternative 2, temporary impacts would be as described for Alternatives 1 and 3, except for additional temporary loss of upland riparian at the Sacramento River discharge.

Operation

As described for Alternatives 1 and 3, there would be no additional impact in recreation areas on sensitive natural communities under Alternative 2. All impacts on sensitive natural communities in the recreation areas have been included in the construction phase impacts, and additional impacts for access roads in the area of disturbance under Alternative 2 would be avoided during the operation phase by implementation of BMPs, including a SWPPP. The impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that construction of the new South Road under Alternative 2 would result in permanent loss of upland riparian, foothill pine woodland, and oak savanna; the smaller reservoir would result in somewhat smaller loss of sensitive natural communities; and construction of the Sacramento River discharge would result in permanent loss of upland riparian. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-2.1 and VEG-2.2 would reduce the level of impact to less than significant for the loss of sensitive communities in annual grassland. This impact would remain significant and unavoidable even with mitigation for upland riparian, foothill pine woodland, and oak savanna.

Operation impacts on sensitive natural communities would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-2.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA. Construction of Alternative 2 would result in a substantial adverse effect on sensitive natural communities, but through implementation of BMPs and the Mitigation Measures VEG-2.1 and VEG-2.2 construction effects would be reduced to no adverse effect for sensitive communities in annual grassland. Effects on upland riparian, foothill pine woodland, and oak savanna would remain significant and unavoidable. Operation of Alternative 2 could result in a substantial adverse effect on sensitive natural communities. Through implementation of BMPs and Mitigation Measure VEG-2.3, operation effects would be reduced to no adverse effect.

Impact VEG-3: Substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means

No Project

The No Project Alternative would not construct or operate any new facilities. State and federally protected wetlands and non-wetland waters occur in the study area. Because the No Project Alternative would not construct or operate new facilities, there would be no temporary impacts on wetlands and non-wetland waters from temporary construction staging or other disturbance or permanent impacts from placement of facilities in wetlands or non-wetland waters.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact on state or federally protected wetlands and non-wetland waters.

Alternatives 1 and 3

Construction

Construction of Alternative 1 or 3 would result in direct permanent and temporary impacts and indirect impacts on wetlands and non-wetland waters, including waters of the state regulated by the State Water Board and federally protected wetlands and non-wetland waters of the United States regulated by the USACE. Tables 9-2a and 9-2b show the acreages of direct permanent and temporary impacts on each wetland and non-wetland water type in each component area under Alternatives 1 and 3.

The Authority has incorporated BMPs into the design of Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on wetlands and non-wetland waters. These BMPs would limit direct impacts on wetlands and non-wetland waters because they would train construction workers on the importance of preserving wetlands and non-wetland waters outside of the construction footprint and require fencing of wetlands and non-wetland waters where avoidance is feasible. The BMPs would also restrict off-road driving in the construction area, where avoided wetlands and non-wetland waters could be damaged or destroyed. BMPs for controlling invasive species by removing, bagging, and disposing at a waste facility would reduce the potential for the spread of invasive plant species into wetlands and non-wetland waters. The BMPs would also limit indirect impacts on wetlands and non-wetland waters by implementing a SWPPP that would protect habitats outside of the construction area from erosion and sedimentation. While these preconstruction and construction measures are part of Alternatives 1 and 3, the measures would not prevent the permanent loss or habitat quality degradation of wetlands and non-wetland waters in the Alternatives 1 and 3 footprint.

Wetlands

Construction of Alternative 1 or 3 would result in the loss of wetlands through direct removal, filling, and hydrological interruption and in habitat quality degradation. Permanent impacts on wetlands would result from earth moving and vegetation removal for construction of facilities associated with the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, conveyance to the Sacramento River, recreation areas, and new roads. Construction of the aforementioned facilities would result in the permanent loss of forested wetland, freshwater marsh, scrub-shrub wetland, and seasonal wetland in the Alternatives 1 and 3 footprint. The impacts on forested wetland or scrub-shrub wetland that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11. There would be no permanent impacts on wetlands from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Because exact locations of construction-related activities are not known, construction of the new roads is expected to result in direct permanent loss of wetlands in the entire construction disturbance area. A substantial portion of these impacts would be avoided or be temporary if the wetlands were avoided or restored after construction. The maximum extent (in acres) of wetlands that would be affected by construction of the new roads is shown in Table 9-2a.

Under Alternatives 1 and 3, construction activities would also result in the temporary disturbance of wetlands during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on wetlands would occur during construction of the regulating reservoirs and conveyance complex, Sites Reservoir and related facilities, conveyance to Sacramento River, the day-use boat ramp/parking recreation area, and roads. Construction of most facilities would result in temporary impacts on freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland. There would be no temporary impacts on wetlands from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Indirect impacts due to construction of Alternative 1 or 3 could occur due to changes in hydrology of wetlands outside the construction area due to erosion and sedimentation during construction.

Non-Wetland Waters

Construction would result in the loss of non-wetland waters and habitat quality degradation through direct removal, filling, and hydrological interruption. Permanent impacts on non-wetland waters would result from earth moving and vegetation removal for construction of the regulating reservoirs, Sites Reservoir and related facilities, conveyance to Sacramento River, recreation areas, and new roads. Construction of these facilities would result in the permanent loss of canal, ditch, ephemeral stream, intermittent stream, perennial stream, pond, and a small area of Funks Reservoir in the footprint of Alternative 1 or 3. There would be no permanent impacts on non-wetland waters from the construction of the Sacramento River diversion and conveyance to regulating reservoirs.

Because exact locations of construction-related activities are not known, construction of the new roads is expected to result in direct permanent loss of non-wetland waters in the entire construction disturbance area. A substantial portion of these impacts would be avoided or be temporary if the non-wetland waters were avoided or restored after construction. The maximum extent (in acres) of non-wetland waters that would be affected by construction of the new roads is shown in Table 9-2a.

Construction activities would also result in the temporary disturbance of non-wetland waters during construction and reduced habitat quality in the interim between the completion of construction and the establishment of habitat restoration plantings. Temporary impacts on non-wetland waters would occur during construction of the Sacramento River diversion and conveyance to regulating reservoirs, Sites Reservoir and related facilities, conveyance to Sacramento River, the day-use boat ramp/parking recreation area, and roads. Construction of these facilities would result in temporary impacts on canal, ditch, ephemeral stream, intermittent stream, pond, and reservoir.

Indirect construction impacts, such as erosion and sedimentation, could change the hydrology of non-wetland waters outside the construction area.

Operation

Operation of the Sites Reservoir under Alternative 1 or 3 would not result in additional impacts beyond those described for construction, including ongoing recreational activities in the three recreation areas after construction, and impacts on wetlands and non-wetland waters from maintenance activities after construction. As discussed for operation effects in Impact VEG-1, the construction impact acreages for the recreation areas are overestimated and there would be no additional operations impacts on wetlands and non-wetland waters in the recreation areas.

Maintenance of Alternatives 1 and 3 facilities would require access that is adjacent to wetlands and non-wetland waters. Although 15-foot-wide maintenance roads would be constructed to provide access to the main dams, saddle dams and dikes, I/O Works, and Funks PGP, there is

potential for maintenance equipment to cause erosion of or sedimentation into adjacent wetlands and non-wetland waters in the buffer areas and adversely affect vegetation cover or habitat quality. As part of the SWPPP, erosion and sedimentation control measures would be required as part of maintenance activities, and these effects would be avoided. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect wetlands or non-wetland waters if they are present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would result in significant impacts on state- and federally protected wetlands and non-wetland waters by direct removal, filling, hydrological interruption, and other indirect impacts due to erosion and sedimentation into wetlands and non-wetland waters located outside of the construction area. The loss of ditch and canal habitats would be considered significant only where the ditch or canal supports wetland habitat, such as freshwater marsh, scrub-shrub wetland, or seasonal wetland. While measures would be implemented before and during construction to minimize impacts on wetlands and non-wetland waters, Alternatives 1 or 3 would still result in the permanent loss of wetlands and non-wetland waters and habitat quality degradation. The permanent loss of wetlands and non-wetland waters would be significant. Implementation of Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant because all wetlands and non-wetland waters in and within 300 feet of the Project footprint would be identified and mapped, and the acquisition and permanent protection of in-kind wetlands and non-wetland waters for each affected wetland and non-wetland water at identified ratios would ensure no net loss of wetlands and non-wetland waters in perpetuity.

Operation impacts on wetlands and non-wetland waters from erosion and sedimentation would be avoided and applicable BMPs (e.g., implementation of a SWPPP) would be implemented. Operation impacts on wetlands and non-wetlands waters from vegetation maintenance could result in losses of wetlands and non-wetland waters, and this would be a significant impact. Implementation of Mitigation Measure VEG-3.4 would reduce the level of impact to less than significant, because all locations of wetlands and non-wetland waters within the vegetation maintenance areas would be identified, fenced, and avoided by vegetation maintenance activities.

Mitigation Measure VEG-3.1: Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities

To the extent practicable, the Authority will avoid and minimize impacts on wetlands and non-wetland waters during construction by implementing the measures listed below. These measures will be incorporated into contract specifications and implemented by the construction contractor. Compliance will be monitored by a qualified biologist and reported as indicated in the BMP "Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities".

- The roads, pipelines, electrical corridors, and recreation areas will be designed, to the extent practicable, to avoid direct and indirect impacts on wetlands and non-wetland waters.

- In wetlands and non-wetland waters that will be preserved, construction activities will be avoided in saturated or ponded natural wetlands and drainages during the wet season (spring and winter) to the maximum extent feasible. Where such activities are unavoidable, protective practices such as use of padding or vehicles with balloon tires will be employed.
- Exposed drainage banks and levees above drainages will be stabilized immediately following completion of construction activities. Non-wetland waters will be restored in a manner that encourages vegetation to reestablish to its pre-Project condition and reduces the effects of erosion on the drainage system.
- Any trees, shrubs, debris, or soils that are inadvertently deposited below the ordinary high-water mark of streams will be removed in a manner that minimizes disturbance of the drainage bed and bank.
- To the extent feasible, in-stream construction below the ordinary high-water mark of natural drainages will be restricted to the low-flow period (generally April through October).

Where wetlands or non-wetland waters (streams or ponds) are present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid Project impacts on wetlands, streams, and ponds through the establishment of activity exclusion zones, in which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones will be established around each wetland and at the edges of each stream or pond, the boundaries of which will be clearly marked with construction exclusion fencing. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur in 250 feet of wetland, stream, or pond. The size of activity exclusion zones may be reduced through consultation with a qualified biologist. Where temporary impacts on wetlands, streams, or ponds cannot be avoided, the impact will be compensated as a permanent impact.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

For permanently affected wetlands, the Authority will compensate for the loss by creation or acquisition and permanent protection of suitable wetland habitat to ensure no net loss of wetland habitat functions and values. The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled), but the final compensation ratios may include additional compensation and will be based on site-specific information and determined through coordination with state and federal agencies (State Water Board, USACE) during permit processing. Where wetland impacts overlap with listed species impacts, mitigation will be coordinated for both resources and not be duplicated. Where impacts on forested wetland and scrub-shrub wetland overlap with loss of SRA cover for fish, specific measures will be included to compensate for the loss of SRA cover (area and linear feet). The mitigation credits for SRA cover mitigation will apply toward wetland mitigation requirements (i.e., the acreage required for compensation will not be duplicated).

Wetland mitigation will consist of replacement habitat that may be a combination of the following two options, purchase of mitigation bank credits and permittee-responsible mitigation.

- The Authority will purchase offsite mitigation bank credits for the affected wetland type (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], seasonal wetland) at a USACE-approved mitigation bank to allow for economy of scale and higher quality habitat due to large patch size. The Authority will provide written evidence to the resource agencies that compensation has been established through the purchase of mitigation credits.
- The Authority will employ a qualified restoration biologist to develop a wetland restoration and monitoring plan that involves creating or enhancing the affected wetland type (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], seasonal wetland) in open space in the Project area or at an offsite location. The Authority will coordinate with USACE and the State Water Board for final plan approval prior to the removal of any wetland habitat and will ensure implementation of the wetland restoration plan. The plan will be based on the Project alternative selected and the extent of wetlands at the time of construction. The plan will identify how, where, and when mitigation will occur, monitoring and maintenance activities, success criteria, funding assurances, appropriate long-term management measures, and agency reporting requirements. The plan will include a species list and specify the number of each species, planting locations, and maintenance requirements. Plantings will use an appropriate method (i.e., seed, container plant, or plug) for the best survival potential and cost efficiency. The extent of planting will be adequate to ensure that the required mitigation ratio will be reached by the end of the monitoring period and that stem density, canopy cover, and species composition requirements are met. Species seeded will be similar to those removed from the Project area and will consist of inoculum taken from the affected wetlands. The survival rates and vegetative cover of wetland plantings and wetland hydrology will be monitored annually for 3 years, or as required in the Project permits, and compared with nearby undisturbed reference wetlands. Progress reports will be provided to the USACE and the State Water Board at the completion of each monitoring period. If vegetative cover of wetland plants is equivalent to reference sites at the end of the monitoring period, the revegetation will be considered successful. If the survival criterion is not met in any monitoring year or at the end of the monitoring period, planting and monitoring will be repeated after mortality causes have been identified and remedial measures have been implemented, and the monitoring period will be extended to account for the required number of monitoring years for all plantings. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

For permanently affected streams and ponds, the Authority will compensate for the loss by creation or acquisition and permanent protection of suitable open-water habitat to

ensure no net loss of stream or pond habitat functions and values. The compensation will be at a minimum 1:1 ratio (1 acre restored or created for every 1 acre filled), but the final compensation ratios may include additional compensation and will be based on site-specific information and determined through coordination with state and federal agencies (State Water Board, USACE) during permit processing. Where stream or pond impacts overlap with listed species impacts, mitigation will be coordinated for both resources and not be duplicated.

Stream and pond mitigation will consist of replacement habitat that may be a combination of the following two options, which include purchase of mitigation bank credits and permittee-responsible mitigation.

- The Authority will purchase offsite mitigation bank credits at a USACE-approved mitigation bank. Out-of-kind compensation may be used based for stream or pond (i.e., forested wetland [riparian], freshwater marsh, scrub-shrub wetland [riparian], or seasonal wetland), if approved by the regulatory agencies. The Authority will provide written evidence to the USACE and State Water Board that compensation has been established through the purchase of mitigation credits.
- The Authority will employ a qualified restoration biologist to develop a non-wetland restoration and monitoring plan that involves creating or enhancing the affected water type (i.e., ephemeral, intermittent, or perennial stream or pond) in open space in the Project area or at an offsite location. The Authority will coordinate with USACE and the State Water Board for final plan approval prior to the removal of any stream or pond habitat and will ensure implementation of the restoration plan. The plan will be based on the Project alternative selected and the extent of streams and ponds at the time of construction. The plan will identify how, where, and when mitigation will occur, monitoring and maintenance activities, success criteria, funding assurances, appropriate long-term management measures, and agency reporting requirements. The plan will include grading specifications and design information for creation of stream and pond habitat. The bank stability and downcutting of streams and hydrology of ponds will be monitored annually for 3 years, or as required in the Project permits. Progress reports will be provided to the USACE and the State Water Board at the completion of each monitoring period. If stream and pond structure and stability are retained at the end of the monitoring period, the mitigation will be considered successful. If the stream stability or pond hydrology is not met in any monitoring year or at the end of the monitoring period, remedial measures will be implemented, and the monitoring period will be extended to account for the required number of monitoring years. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-3.4: Establish Activity Exclusion Zones Around Wetlands and Non-Wetland Waters Prior to Vegetation Maintenance Activities

A wetland specialist employed by the Authority will mark the boundaries of wetlands and non-wetland waters in vegetation maintenance areas using the verified aquatic resources delineation prepared for Project permitting. If wetlands or non-wetland waters occur in or

within 50 feet of the vegetation maintenance areas, the wetlands or non-wetland waters will be fenced and avoided by all surface-disturbing maintenance activities. All requirements of the SWPPP will also be implemented to avoid indirect impacts on water quality. Alternatively, if wetlands and non-wetland waters cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. The Authority will implement additional compensatory mitigation that is based on the same requirements as those specified in Mitigation Measures VEG-3.2 and VEG-3.3 for any remaining impacts on wetlands or non-wetland waters from vegetation maintenance activities.

NEPA Conclusion

The construction and operation effects under Alternatives 1 and 3 would be the same as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternatives 1 and 3 would result in a substantial adverse effect on wetlands and non-wetland waters, but through implementation of BMPs and the Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3, construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 could result in substantial adverse effects on wetlands and non-wetland waters. Through implementation of BMPs and Mitigation Measure VEG-3.4, operation effects would be reduced to no adverse effect.

Alternative 2

Construction

Construction of Alternative 2 would result in direct permanent and temporary impacts and indirect impacts on wetlands and non-wetland waters, including waters of the state regulated by the State Water Board and federally protected wetlands and non-wetland waters of the U.S. regulated by the USACE. Tables 9-4a and 9-4b show the acreages of direct permanent and temporary impacts on each wetland and non-wetland water type under Alternative 2. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. While these preconstruction and construction measures are part of Alternative 2, their implementation would not prevent the permanent loss or habitat quality degradation of wetlands and non-wetland waters in the Alternative 2 footprint.

Construction of Alternative 2 would result in the loss of wetlands and non-wetland waters and habitat quality degradation through direct removal, filling, and hydrological interruption. Permanent and temporary impacts on wetlands and non-wetland waters would result from construction of the same facilities as described for Alternatives 1 and 3 with two differences. First, additional impacts from construction of the new South Road under Alternative 2 would result in permanent loss of forested wetland, seasonal wetland, scrub-shrub wetland, ephemeral stream, and intermittent stream. Second, permanent impacts resulting from fill of Sites Reservoir on forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland would be smaller due to the decreased reservoir size and inundation area. The impacts on forested wetland or scrub-shrub wetland that is also a component of SRA cover for fish are described for Impact FISH-1 in Chapter 11.

Under Alternative 2, temporary and indirect impacts would be as described for Alternatives 1 and 3.

Operation

As described for Alternatives 1 and 3, there would be no additional impacts from operation of the recreation areas for Alternative 2 on wetlands and non-wetland waters. The impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3. Construction of the South Road would result in greater loss of forested wetland, seasonal wetland, scrub-shrub wetland, ephemeral stream, and intermittent stream when comparted to Alternatives 1 and 3, given the larger footprint. Construction of the smaller reservoir would result in somewhat smaller losses of forested wetland, freshwater marsh, managed wetland, scrub-shrub wetland, and seasonal wetland due to the locations of these resources and the smaller reservoir footprint. As with Alternatives 1 and 3, implementation of Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3 would reduce the level of impact to less than significant.

Operation impacts on wetlands and non-wetland waters would be the same as Alternatives 1 and 3. There would be no impact in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-3.4 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA, and the same mitigation measures would be implemented. Construction of Alternative 2 would result in a substantial adverse effect on wetlands and non-wetland waters, but through implementation of BMPs and the Mitigation Measures VEG-3.1, VEG-3.2, and VEG-3.3, construction effects would be reduced to no adverse effect. Operation of Alternative 2 could result in substantial adverse effects on wetlands and non-wetland waters. Through implementation of BMPs and Mitigation Measure VEG-3.4, operation effects would be reduced to no adverse effect.

Impact VEG-4: Conflict with any local policies or ordinances protecting vegetation resources (including wetlands and non-wetland waters), such as a tree preservation policy or ordinance

All local policies and ordinances that could pertain to the Project are described in Appendix 4A, Section 4A.5.3, *Local/Regional Policies and Regulations*.

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no conflict with local policies or ordinances that protect vegetation and wetland resources.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no conflicts with local policies or ordinances.

Alternatives 1 and 3

Construction

As described in Impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 1 or 3 would affect vegetation and wetland resources. These resources are protected by policies in the Colusa County General Plan (Colusa County 2012), Glenn County General Plan (Glenn County 2020), Tehama County General Plan (Tehama County 2009), and Yolo County General Plan (County of Yolo 2009). General plan policies for these counties protect vegetation and wetland resources such as special-status plant species, riparian habitat, oak woodlands, wetlands, and streams. The Yolo County General Plan also protects large valley oaks (*Quercus lobata*), although there are none in the Alternatives 1 and 3 footprint in Yolo County, and promotes removal of invasive plant species.

As described under Impacts VEG-1, VEG-2, and VEG-3, BMPs are incorporated into Alternatives 1 and 3 to avoid and minimize permanent and temporary impacts on special-status species, sensitive natural communities, wetlands, and non-wetland waters.

The BMPs would not prevent the permanent loss or habitat quality degradation of special-status species habitats, sensitive natural communities, wetlands, and non-wetland waters in the footprint for Alternatives 1 and 3. As described for Impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 1 or 3 facilities would result in permanent and temporary impacts on special-status species habitats, sensitive natural communities, wetlands, and non-wetland waters. One vegetation community not included in Impact VEG-2 as a sensitive natural community is blue oak woodland, which is protected by county policies, as well as the state Oak Woodlands Conservation Act. The extent of blue oak woodland that would be permanently and temporarily affected by construction of Alternative 1 or 3 is shown in Tables 9-2a and 9-2b.

In Glenn County, construction of the GCID Main Canal head gate and improvements would result in temporary impacts on upland riparian habitat and wetlands located in staging areas. In Colusa County, construction of the Sites Reservoir and related facilities would result in permanent and temporary impacts on special-status species habitats, sensitive natural communities, wetlands, non-wetland waters, and blue oak woodland. In Yolo County, construction of the Dunnigan Pipeline and CBD outlet would result in permanent and temporary impacts on upland riparian habitat, wetlands, and non-wetland waters. No vegetation or wetland

resources protected by policies in the Tehama General Plan would be affected by work at the RBPP, the only Alternative 1 or 3 facility in Tehama County, because no ground disturbance would occur.

Operation

Operation under Alternative 1 or 3 in the recreation areas would not result in additional impacts or require additional mitigation measures. Vegetation maintenance activities for land around facilities that involve grading, tilling, disking, or controlled burns could affect blue oak woodland if it is present in the vegetation maintenance areas.

CEQA Significance Determination and Mitigation Measures

Alternative 1 or 3 would have significant impacts on sensitive vegetation and wetland resources protected by local general plan policies. Mitigation Measures VEG-1.2, VEG-2.2, VEG-3.1, VEG-3.2, and VEG-3.3 would minimize and compensate for impacts on these protected sensitive resources except blue oak woodland. Oak woodlands are considered important under the state Oak Woodlands Conservation Act and county general plans. Loss of blue oak woodland from construction under Alternative 1 or 3 would be considered significant. Implementation of Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the level of impact because all locations of blue oak woodland in and within 300 feet of the construction footprint would be identified and mapped, and the acquisition and permanent protection of blue oak woodland for each affected woodland at identified ratios would ensure survival of blue oak woodland in perpetuity. However, the removal of mature blue oak trees would be a long-term impact due to the length of time required for newly planted trees to reach mature size and fully replace the habitat function and habitat value of the removed trees in the woodland community. Additionally, in accordance with the California Oak Woodland Conservation Act (California Public Resources Code 21083.4), no more than 50% of the blue oak woodland loss could be compensated directly through planting. Therefore, there would be a long-term and permanent loss of blue oak woodland habitat from construction even with mitigation and this impact would remain significant and unavoidable.

Operation impacts from vegetation maintenance could result in loss of blue oak woodland, and this would be a significant impact. Implementation of Mitigation Measure VEG-4.3 would reduce the level of impact to less than significant, because all locations of blue oak woodland in the vegetation maintenance areas would be identified, fenced, and avoided during vegetation maintenance activities.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

This mitigation measure is described for Impact VEG-2.

Mitigation Measure VEG-4.1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands During Construction

Where surveys determine that oak woodlands are present in or adjacent to an area where temporary ground-disturbing activities would take place, the Authority will avoid impacts on oak woodlands through the establishment of activity exclusion zones, within which no ground-disturbing activities will take place, including construction staging or other temporary work areas. Activity exclusion zones for oak woodlands will be established at the edges of oak woodland habitat that is within 50 feet of construction activity, the boundaries of which will be clearly marked with construction exclusion fencing. The establishment of activity exclusion zones will not be required if no construction-related disturbances will occur within 50 feet of an oak woodland.

The following measures will also be implemented during construction of each Project component to protect and minimize effects on retained oak woodland trees that are adjacent to construction activities.

- The potential for long-term loss of woody vegetation will be minimized by pruning vegetation rather than removing entire trees or shrubs in areas where complete removal is not required. Any trees or shrubs that need to be trimmed will be cut at least 1 foot above ground level to leave the root systems intact and allow for more rapid regeneration. Cutting will be limited to the minimum area necessary in the construction zone. To protect nesting birds, no pruning or removal of woody vegetation will be performed between February 1 and August 31 without preconstruction bird surveys conducted in accordance with CDFW and/or USFWS requirements, as described in Mitigation Measures WILD-1.21 and WILD-1.22.
- Operation or parking of vehicles, digging, trenching, slope cuts, soil compaction, grading, paving, or placement of fill will be prohibited in at least 6 feet outside the driplines of retained oak woodland trees.
- Any off-site drainage will be directed in such a way as to prevent drainage into adjacent oak woodlands.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

Per Policy CON 1-9 from the Colusa County General Plan, the Authority, in coordination with Colusa County, will develop a management plan for the protection and enhancement of oak woodlands to offset the loss of oak woodlands. This plan will mitigate the loss of oak woodlands using one or more of the following options:

- Offsite deed restriction or conservation easement acquisition and/or acquisition in fee title by a land conservation organization for purposes of offsite oak woodland conservation;
- In-lieu fee payment to the Oak Woodlands Conservation Fund;

- Replacement planting onsite in an area subject to deed restriction or conservation easement;
- Replacement planting off site in an area subject to a conservation easement; or
- A combination of these options.

Prior to any activities that would result in permanent impacts on oak woodlands, the Authority will mitigate the loss of oak woodlands at a minimum 1:1 ratio (1 acre restored or created for every 1 acre removed), but the final compensation ratios will be based on site-specific information and determined through coordination with Colusa County during permit processing. In accordance with requirements of the California Oak Woodland Conservation Act (California Public Resources Code 21083.4), replacement planting will not account for more than 50% of the oak woodland mitigation requirement. Therefore, up to half of the oak woodland impact mitigation requirement may consist of onsite or offsite replacement planting. The replacement planting area must be suitable for tree planting, not conflict with current or planned land uses, and be large enough to accommodate replacement plantings at a density equal to the density of the affected oak woodlands, up to a maximum density of 200 trees per acre. The remaining portion of the oak woodland impact mitigation requirement will be implemented in the form of an in-lieu fee payment to the county in which the oak woodland is affected.

The Authority will prepare and implement a mitigation and monitoring plan for oak woodlands, with funding provided through an endowment. The plan will include requirements to implement appropriate management measures to maintain the oak woodlands. The Authority will monitor oak woodland plantings annually for at least 5 years to verify that the habitat quality is maintained. Success criteria for oak woodland plantings may include criteria such as survival of plantings, tree canopy cover, and plant density. If the criteria are not met in any monitoring year or at the end of the monitoring period, planting and monitoring will be repeated after mortality or insufficient growth causes have been identified and remedial measures have been implemented, and the monitoring period will be extended to account for the required number of monitoring years for all plantings. Mitigation sites will be protected in perpetuity in a conservation easement or through deed restriction.

Mitigation Measure VEG-4.3: Establish Activity Exclusion Zones Around Blue Oak Woodlands Prior to Vegetation Maintenance Activities

A botanist employed by the Authority will mark the locations of blue oak woodlands in vegetation maintenance areas using the results of the surveys conducted under Mitigation Measure VEG-2.1. If blue oak woodland occurs in or within 50 feet of the vegetation maintenance areas, the outer dripline of the woodland canopy will be fenced and avoided by all surface-disturbing maintenance activities. Alternatively, if blue oak woodlands cannot be completely avoided, the size of the affected area will be minimized to the full extent possible. If the remaining impacts on blue oak woodland by vegetation maintenance activities exceed 0.1 acre, the Authority will implement additional

compensatory mitigation based on the same requirements as described in Mitigation Measure VEG-4.2.

NEPA Conclusion

The construction and operation effects of Alternatives 1 and 3 would be the same as described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on vegetation and wetland resources that are protected under local general plan policies. Implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the construction effects, but the long-term effects would remain adverse. Operation of Alternative 1 or 3 could result in a substantial adverse effect on oak woodlands protected by general plan policies and the California Oak Woodland Conservation Act, but through implementation of BMPs and Mitigation Measure VEG-4.3 operation effects would be reduced to no adverse effect.

Alternative 2

Construction

As described in impacts VEG-1, VEG-2, and VEG-3, construction of Alternative 2 would affect vegetation and wetland resources that are protected by policies in the Colusa County General Plan (Colusa County 2012), Glenn County General Plan (Glenn County 2020), Tehama County General Plan (Tehama County 2009), and Yolo County General Plan (County of Yolo 2009). General plan policies for these counties protect vegetation and wetland resources, including special-status species, riparian habitat, oak woodlands, wetlands, and streams. The BMPs for Alternatives 1 and 3 would also apply to Alternative 2. Blue oak woodland is protected by county policies, as well as the state Oak Woodlands Conservation Act, but is not included in Impact VEG-2 as a sensitive natural community. The extent of blue oak woodland that would be permanently and temporarily affected by construction is shown in Tables 9-4a and 9-4b. Loss of blue oak woodland would be less under Alternative 2 than under Alternative 1 or 3 due to the smaller size of the inundation area.

Operation

Operation of recreation areas for Alternative 2 would not result in additional impacts or require additional mitigation measures. All impacts on vegetation and wetland resources protected under local general plan policies have been included in the construction phase impacts for recreation areas, and additional impacts within access road areas throughout the Alternative 2 area would be avoided during the operation phase by implementation of BMPs, including a SWPPP. Impacts of vegetation maintenance would also be the same between Alternatives 1, 2, and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 except that the smaller reservoir size would result in a somewhat smaller loss of blue oak woodland. Implementation of Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the

level of impact. There would be a long-term and permanent loss of blue oak woodland habitat even with mitigation and this impact would remain significant and unavoidable.

As with Alternatives 1 and 3, operation of Alternative 2 would not result in additional impacts in the recreation areas, but there would be potential impacts in vegetation maintenance areas. As with Alternatives 1 and 3, implementation of Mitigation Measure VEG-4.3 would reduce the level of impact from vegetation maintenance to less than significant.

NEPA Conclusion

The construction and operation effects of Alternative 2 would be the same as described above for CEQA and the same mitigation measures would be implemented. Construction of Alternative 2 would result in substantial adverse effects on vegetation and wetland resources protected by general plan policies, but through implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-4.1, and VEG-4.2 would reduce the construction effects, but the long-term effects would remain substantially adverse. Operation of Alternative 2 could result in a substantial adverse effect on blue oak woodlands protected by general plan policies and the California Oak Woodland Conservation Act. Through implementation of BMPs and Mitigation Measure VEG-4.3, operation effects would be reduced to no adverse effect.

Impact VEG-5: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no conflict with adopted conservation plans.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no conflicts with any approved conservation plans.

Alternatives 1 and 3

Construction

The Yolo County HCP/NCCP (Yolo Habitat Conservancy 2018) and the Yolo Bypass Wildlife Area Land Management Plan (Yolo Bypass Wildlife Area LMP) (California Department of Fish and Game 2008) are the only conservation plans that apply to Alternatives 1 and 3. These plans apply to the Dunnigan Pipeline and CBD outlet, which are the only parts of the Alternatives 1 and 3 footprint located in Yolo County. The construction of Alternatives 1 and 3 is not covered under the Yolo County HCP/NCCP, because the project was not included in the 2030 Countywide General Plan for Yolo County or in the covered activities of the Yolo County HCP/NCCP. Construction of the Dunnigan Pipeline and CBD outlet would create primarily

temporary impacts and a small area of permanent impact that would not conflict with the establishment of conservation areas under the HCP/NCCP. No construction would occur in the Yolo Bypass Wildlife Area under Alternatives 1 and 3, and potential impacts in the wildlife area would consist of only water releases that would not adversely affect vegetation or wetland resources.

As discussed in Impacts VEG-1, VEG-2, and VEG-3 for the conveyance to Sacramento River component, construction of Alternatives 1 and 3 in the Dunnigan Pipeline and CBD outlet footprint would have permanent and temporary impacts on sensitive natural communities, wetlands, and non-wetland waters that are habitats for covered species in the Yolo County HCP/NCCP, consisting of upland riparian, managed wetland, and intermittent stream. Mitigation Measures VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 for riparian habitat, wetlands, and streams would align with the conservation strategy of the Yolo County HCP/NCCP, in that they would require compensatory mitigation for impacts on these habitat types.

Operation

Operation under Alternative 1 or 3 would not result in additional impacts or require additional mitigation measures. There would be no operation-related impacts due to conflicts with the Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 1 or 3 would result in significant impacts on special-status plant species habitats, sensitive natural communities, wetlands, and non-wetland waters through direct removal of vegetation, filling, hydrological interruption, and other indirect impacts as described above under Impacts VEG-2, VEG-3, and VEG-4. Implementation of Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of these impacts and avoid conflicts with the adopted Yolo County HCP/NCCP and Yolo Bypass Wildlife Area LMP because all locations of special-status species, sensitive natural communities, wetlands, and non-wetland waters in and within 300 feet of the construction footprint under Alternatives 1 and 3 would be identified and mapped, and the acquisition and permanent protection of these resources at identified compensation ratios would ensure survival of special-status plant species, sensitive natural communities, wetlands, and non-wetland waters in perpetuity. Therefore, the level of this impact would be reduced to less than significant with mitigation. Operation of Alternative 1 or 3 would not result in additional impacts.

Mitigation Measure VEG-2.1: Conduct Surveys for Sensitive Natural Communities and Oak Woodlands in the Project Area Prior to Construction Activities

This mitigation measure is described above for Impact VEG-2.

Mitigation Measure VEG-2.2: Avoid and Compensate for Adverse Effects on Sensitive Natural Communities

This mitigation measure is described above for Impact VEG-2.

Mitigation Measure VEG-3.1: Avoid and Minimize Disturbance of Wetlands and Non-Wetland Waters During Construction Activities

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-3.2: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Wetlands

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-3.3: Compensate for Temporary and Permanent Impacts on State- or Federally Protected Non-Wetland Waters

This mitigation measure is described above for Impact VEG-3.

Mitigation Measure VEG-4-1: Avoid and Minimize Potential Adverse Effects on Oak Woodlands

This mitigation measure is described above for Impact VEG-4.

Mitigation Measure VEG-4.2: Compensate for Adverse Effects on Oak Woodlands

This mitigation measure is described above for Impact VEG-4.

NEPA Conclusion

The construction effects under Alternatives 1 and 3 would be the same as those described above for CEQA. Construction of Alternative 1 or 3 would result in a substantial adverse effect on vegetation and wetland resources that are protected under the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP, but through implementation of BMPs and the Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 construction effects would be reduced to no adverse effect. Operation of Alternative 1 or 3 would have no additional effects on vegetation and wetland resources protected by the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP.

Alternative 2

Construction

As described for Alternatives 1 and 3, construction of Alternative 2 in the Dunnigan Pipeline and CBD outlet footprint would have permanent and temporary impacts on habitats for covered species in the Yolo County HCP/NCCP. Impacts under Alternative 2 would be slightly larger, due to the extension of the pipeline alignment to the Sacramento River. As discussed for Alternatives 1 and 3, construction of the pipeline would not conflict with establishment of conservation areas under the Yolo County HCP/NCCP and the compensatory mitigation proposed for impacts on sensitive natural communities, wetland, and non-wetland waters would

align with the Yolo County HCP/NCCP conservation strategy. The BMPs identified in Section 9.3.1, *Construction*, would also apply to Alternative 2.

Operation

Under Alternative 2, the impacts related to conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP during operation would be as described for Alternatives 1 and 3.

CEQA Significance Determination and Mitigation Measures

Construction of Alternative 2 would result in similar impacts to Alternatives 1 and 3 but slightly greater, due to the extension of the pipeline alignment to the Sacramento River. As with Alternatives 1 and 3, implementation of BMPs and Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2 would reduce the level of impact to less than significant.

Under Alternative 2, the impacts related to conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP during operation would be as described for Alternatives 1 and 3 and there would be no additional impacts.

NEPA Conclusion

The construction effects under Alternative 2 would be the same as those described above for CEQA and the same mitigation measures would be implemented. Construction of Alternative 2 would result in substantial adverse effects on special-status plant species habitats, sensitive natural communities, wetlands, and non-wetland waters protected by the Yolo County HCP/NCCP and Yolo Bypass Wildlife Area LMP. Through implementation of BMPs and Mitigation Measures VEG-2.1, VEG-2.2, VEG-3.1, VEG-3.2, VEG-3.3, VEG-4.1, and VEG-4.2, potential conflicts with the adopted Yolo County HCP/NCCP or Yolo Bypass Wildlife Area LMP would be reduced to no adverse effect. Operation of Alternative 2 would have no additional conflicts with these plans.

Impact VEG-6: Introduction or increased spread of invasive plant species

No Project

The No Project Alternative would not construct or operate any new facilities. Therefore, there would be no potential to introduce or increase the spread of invasive plant species.

Significance Determination

Under the No Project Alternative, no new facilities would be constructed or operated, and there would be no temporary or permanent impacts due to the Project. The No Project Alternative would have no impact due to introduction or spread of invasive plant species.

Alternatives 1, 2, and 3

Construction and Operation

The Authority would incorporate BMPs into Alternatives 1, 2, and 3 to avoid and minimize permanent and temporary impacts due to the spread of invasive plants, including "Control of Invasive Plant Species during Construction and Operation" Additionally, the invasive plant species identified Table 9B-5 (Appendix 9B) are also very common and widespread throughout California and the Central Valley; consequently, there is a relatively low likelihood they would spread from the Alternatives 1, 2, and 3 footprints to places where they are not present and have an adverse effect on sensitive terrestrial natural communities, wetlands, or non-wetland waters.

During the operation of Alternative 1, 2, or 3, the use of the on-water recreation facilities and boat ramp could cause the spread of aquatic invasive plant species, such as Brazilian water weed (*Egeria densa*), water hyacinth (*Eichhornia crassipes*), and water milfoil (*Myriophyllum spicatum*) through boating on the Sites Reservoir. The reservoir would be in an area that was mostly terrestrial prior to inundation, and invasive aquatic species could be introduced from boats and boating equipment and become established in the reservoir. Conveyance of water from the Sites Reservoir into canals and downstream systems could further spread aquatic invasive plant propagules.

The operation of Alternative 1, 2, or 3 includes vegetation control that would limit the spread and introduction of invasive species around proposed facilities. Vegetation control activities that are part of Project operation would include the use of vegetation control and grazing around all facilities, recreation areas, and the Project buffer around all facilities. The Reservoir Management Plan would include protocols for invasive aquatic weed control.

CEQA Significance Determination and Mitigation Measures

Construction and operation of Alternative 1, 2, or 3 would not result in the increased spread of invasive plants that would result in an adverse effect on sensitive terrestrial natural communities, wetlands, or non-wetland waters because of the low likelihood of spread. Implementation of BMPs and vegetation control measures as part of construction, and the Reservoir Management Plan for invasive weed control as part of operation would reduce the potential for introduction and spread. Therefore, the potential for introduction and increased spread of invasive plants is a less-than-significant impact.

NEPA Conclusion

The construction and operation effects under Alternative 1, 2, or 3 would be the same as those described for CEQA. The potential effects associated with the introduction and increased spread of invasive plants would not be adverse.

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