**Appendix 2D Best Management Practices, Management Plans, and Technical Studies**

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| Live Edit Topic | Key Points | Location |
| BMP/Content Numbering and Appendix Title | Numbering will occur after 7/23 deliverable to Reclamation in this appendix and throughout the documentAppendix title will be updated throughout the document as well | Throughout |
| Utility Relocation | Reviewed with Integration/Engineering and confirmation that level of detail/information is unknown | ###UTL |
| Drainage BMP | Revised BMP per review with Integration/engineeringDrainage needs, location, and strategies are unknown at this time | ###DRAIN |
| Addition of Asphalt and Concrete Batching Odors and GHG Emission Minimization | No longer MM | ###ASPHALT |
| Fire Prevention Plan | Expansion of Fire Prevention Plan during Construction based on review of other documents BMP/Avoidance/MMsInclusion of Fire Prevention measures during Operation in the Recreation Management Plan | ###FIRE |
| Construction Equipment Exhaust Reduction Plan and Fugitive Dust Control Plans | Modified according to the BMPs that were modeled (e.g., added soil stabilizers) | ###AQ |
| Fish technical studies | Further definition of the technical studies identified in Chapter 2 as part of the project | ###FISH |
| Invasive Aquatic Plant and Invertebrate Species Control | Moved control of Invasive species during operation into the Reservoir Management Plan | ###INV |
| Initial Fill Plan | Engineers provided information and completedThis section is completely new | ###FILL |
| HAB Action Plan | Expanded requirements/criteria in Reservoir Management Plan per comments in this chapter and Chapter 6 | ###HAB |
| MeHg | Added details and cross checked with MM in chapter 6 | ###MeHg |
| Chapter 2 Fish Technical Studies | Several technical studies for fish are listed in Chapter 2 as required in order to establish flows in Funks and Stone Corral Creek. These technical studies are now more fully described in Appendix 2D. This is a completely new section  | ###CH2 |
| Other Fish Technical Studies | Revised by adding examples of types of criteria or actions that may be neededAdded technical studies to generally comport to BA information | ###FISH |
| Land Management Plan | Confirm this Plan should cover mitigation areas owned by the Authority that might be around the reservoir (is that even a possibility, or are we not ruling this out?)` | ###LMP |
| Recreation Management Plan | Keep information regarding emergency providers as demonstration of support of the AuthorityAdded operations fire prevention requirements for operation | ###REC |

# Appendix 2D Introduction

The Authority has incorporated numerous best management practices (BMPs) into the Project design. In addition, the Authority has identified various plans and technical studies that are being incorporated as components of the Project, including the Initial Reservoir Fill Plan, Reservoir Management Plan, Land Management Plan, Cultural Resources Management Plan, and Recreation Management Plan. This appendix describes the BMPs, management plans, and technical studies that are part of the Project. These BMPs, management plans and technical studies are discussed further where relevant to particular impact analyses in Chapters 5 through 30.

## Best Management Practices

The Project BMPs include applicable design standards, criteria, and requirements; standard general practices for construction, operations, and maintenance; and resource-specific protocols for project implementation. Table 2D-1 identifies the key features, responsible party(ies), and timing for implementation of each BMP.

Table 2D-1. Best Management Practices

| **Best Management Practice(s)** | **Key Features** | **Responsible Party(ies)** | **Timing** | **Monitoring and Reporting Requirements** | **Regulating or Permitting Agency** |
| --- | --- | --- | --- | --- | --- |
| Conform with Applicable Design Standards and Building Codes | The Authority will ensure that the standards, guidelines, and codes (the most current applicable version at the time of implementation), which establish minimum design criteria and construction requirements for levees, pipelines, excavations and shoring, pumping stations, dams, grading, foundations, bridges, access roads, structures, and other facilities, will be followed by the project engineers, where applicable, in the design of project facilities and will be included as minimum standards in the construction specifications. The project engineers will follow standards, guidelines, and code requirements that are legally mandated. Proposed design standards include, but may not be limited to the following:**Reservoir Roads and Bridges** * American Association of State Highway and Transportation Officials (AASHTO) “A Policy on Geometric Design of Highways and Streets” 2018, 7th edition
* AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, 8th edition
* California Department of Transportation (Caltrans) California Amendments to the AASHTO LRFD Bridge Design Specifications)
* Caltrans’ Seismic Design Criteria (SDC) 2.0. ARS curve
* Caltrans Seismic Design Criteria, Version 2.0. April 2019
* Caltrans Highway Design Manual (HDM), 6th Edition
* Colusa and Glenn County Standards (described in Appendix 2C).

**Conveyance Pipelines and Manifold** * American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering, Volume 2, Chapter 9, Seismic Design for Railway Structures, 2008.
* American Concrete Institute (ACI) 350 for hydraulic structures
* ACI 318 for miscellaneous, non-hydraulic, concrete structures, including building slabs and foundations
* American Water Works Association (AWWA) Concrete Pressure Pipe (M9) 3rd Edition.
* AWWA Steel Pipe Guide for Design and Installation (M11) 5th Edition.
* AWWA C200-05.
* AWWA M11 Chapters 6, 8, 9, 12, 13.
* AWWA C205, C207, C208, C214, 216, C217, C219, C222.
* AWWA M-51
* American Society for Testing and Materials (ASTM) A1018/A1018M for specification of structural steel.
* ASTM A516/A516M for specification of structural steel.
* American Society of Civil Engineers (ASCE) 27-00, Standard Practice for Design of Precast Concrete Pipe for Jacking in Trenchless Construction.
* ASCE Steel Penstock Design (Manual of Practice (MOP) 79).
* American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC) Section VIII, Division 1, Part 2.
* ASME 16.5 and ASME 16.47.
* ASME BPVC, Section IX.
* American Welding Society D1.1 for field welds.
* CI/ASCE 36-01, Standard Construction Guidelines for Microtunneling.
* New & O'Reilly 1992 or an equivalent method for settlement predictions
* Underground Technology Research Council (UTRC) 1997 Geotechnical Baseline Reports for Underground Construction – Suggested Guidelines and Practices. Reston: American Society of Civil Engineers.
* UTRC 2006 Final Design Geotechnical Baseline Report

**Structures (non-hydraulic concrete, steel, and masonry structures)** * current governing codes and standards applicable to the construction of buildings, structures, and appurtenances in the State of California (California Building Code, YEAR (Title 24 California Code of Regulations; California Code of Regulations, Title 8)
* The Masonry Society Building Code Requirements and Specifications for Masonry Structures (TMS 402)
* latest edition of the American National Standards Institute (ANSI)
* /American Institute of Steel Construction (AISC) Steel Construction Manual and the ANSI/AISC Specification for Structural Steel Buildings
* RCSC Specification for Structural Joints Using High Strength Bolts

**Electrical Supply** * The point of interconnection, transmission, and substation design criteria, dependent on the point of interconnection option, will incorporate the following references:

California General Order 95, Rules for Overhead Electric Line Construction Western Area Power Administration Service and Generation Interconnection Requirements Pacific Gas and Electric Company (PG&E) Interconnection Requirements PG&E Substation Design Criteria * The latest edition and addenda of the following publications, as applicable, will be incorporated in the design specifications codes and standards sections.

ANSI Institution of Electrical and Electronics Engineers, Inc. (IEEE) Association of Edison Illuminating Companies (AEIC) Transmission Interconnections Handbook (TIH) North America Electric Reliability Corporation Standards (NERC) National Fire Protection Agency (NFPA) 70 National Electric Code National Electrical Safety Code (ANSI C2) **Transmission Lines** In addition to the point of interconnection requirements, transmission lines will be designed in accordance with the latest edition and addenda of the following publications, as applicable which will be incorporated in the design specifications.California Building Code 2016, Title 24 Vol. 2 ASCE-113 Substation Structure Design Guide ASCE/SEI 7-05 Minimum Design Loads for Buildings and Other Structures ANSI/AISC 41-10 Seismic Provisions for Structural Steel Buildings **Reservoir, Dam, and Inlet/Outlet Works:** The dam embankments, foundations, abutments, and appurtenant facilities must be stable under design conditions of construction and reservoir operation including seismic. Applicable guidelines and requirements include:* ASTM C33 (2018) for aggregate for filters and drains and aggregate use in structural concrete
* California Department of Water Resources, Division of Safety of Dams Emergency Drawdown Criteria (DSOD)
* International Building Code (IBC) (2018). Chapter 16 Structural Design.
* U.S. Army Corps of Engineers (USACE) 1997 Tunnels and Shafts in Rocks, EM-2-1110-2901.
* USACE 2000 Roller Compacted Concrete, EM 1110-2-2006
* USACE 2005 Stability Analysis of Concrete Structures, EM 1110-2-2100
* USACE 2018 Hydrologic Engineering Center, HEC-HMS Hydrologic Modeling System, Version 4.3.
* Reclamation 1987 Design of Small Dams.
* Reclamation 1989 Flood Hydrology Manual, First Edition.
* Reclamation 2011 Design Standards No. 13, Embankment Dam Design Standards, Chapter 4: Static Stability Analysis Phase 4 (Final).
* Reclamation 2011 Design Standards, No. 13, Embankment Dam Design Standards, Chapter 5: Protective Filters Phase 4 (Final).
* Reclamation 2016 USBR Design Standards No. 6, Hydraulic and Mechanical Equipment, Chapter 12, Trashracks and Trashrack Cleaning Devices.

**Slope Protection** * USACE 2002 Coastal Engineering Manual
* Reclamation 1989 Flood Hydrology Manual
 | AuthorityDesign engineersConstruction contractors | Prior to and during construction | The Authority will review all project facility designs to ensure the standards, guidelines, and codes listed above are included where appropriate. The Authority will ensure that the identified design standards are treated as the minimum standard for design and construction, unless more stringent requirements are enacted or promulgated.Project engineers will provide all draft and final project facility designs to the Authority for review. A seismic monitoring array will be designed and implemented as part of the Project to monitor site seismic activity, including identifying any increase in seismicity rate that could be attributed to potential reservoir triggered seismicity (RTS) | Department of Water Resources, Division of Safety of DamsU.S. Army Corps of EngineersCentral Valley Flood Protection Board |
| Siting of Recreational Structures | The downslope portion of the recreation facilities within the recreation areas will be designed above the predicted wave run-up elevation. The determination for location will be based on project design studies. If the predicted seiche wave run-up level would extend into a recreation area and inundate a facility, the Authority will relocate the recreation facility accordingly during final design. | Authority | Prior to Construction and during final design | None | County |
|  Pre-Construction Geotechnical Evaluations Data Reports | In order to develop final construction contract documents pre construction geotechnical evaluations and data reports will be prepared as follows:Geotechnical Data Reports: Perform geotechnical laboratory testing on select samples to evaluate engineering and other properties of collected soils. Prepare geotechnical data reports to document observations and findings of subsurface investigations and tests Geotechnical Interpretive reports to establish parameters for designing the Project.Geotechnical Baseline Report for use by contractors describe expected construction conditions and provide design and construction recommendations.  | Geotechnical engineer | Prior to construction and during final design | The Authority will review and approve all geotechnical reports and implement subsequent measures as required based upon the results of these reports | DSODCountyCaltransRailroadCentral Valley Flood Protection Board USACE |
| Utility and Infrastructure Verification and/or Relocation | Confirm utility/infrastructure locations through consultation with utility service providers, preconstruction field surveys, and services such as Underground Service Alert.Determine exact location of underground utilities by safe and acceptable means, including use of hand and modern techniques as well as customary types of equipment. Confirm the specific location of all high priority utilities (i.e., pipelines carrying petroleum products, oxygen, chlorine, toxic or flammable gases; natural gas in pipelines greater than 6 inches in diameter, or with normal operating measures, greater than 60 pounds per square inch gauge; and underground electric supply lines, conductors, or cables that have a potential to ground more than 300 volts that do not have effectively grounded sheaths) and such locations will be highlighted on all construction drawingsIdentified size, color, and location of existing utilities will be included on all construction drawings and/or in health and safety officer materialsStage utility line modifications and relocations in a manner that minimizes interruption of serviceIn places where utility lines would be relocated, existing corridors will be utilized to the greatest extent possible, in the following order of priority: (1) existing utility corridors; (2) highway and railroad corridors; (3) recreation trails, with limitations; and (4) new corridors.New poles or towers will be erected and cable-pulled prior to being connected to existing systems. Natural gas pipeline relocation will be constructed by one of several methods including cut-and-cover, trenching, or placement on at-grade saddles. Active natural gas wells in the proposed water conveyance facilities area will be abandoned to a depth below construction excavation.Relocate utilities and infrastructure in a way that avoids or minimizes any effect on worker and public health and safety by protecting, supporting, or removing underground utilities as necessary to safeguard employees and notifying local fire departments if a gas utility is damaged causing a leak or suspected leak, or if damage to a utility results in a threat to public safety. Coordinate and provide design plans and construction phasing with railroad; establish communication protocol with railroad and/or have railroad staff person onsite during construction of facilities adjacent to or affecting the railroad line. | AuthorityContractorsConstruction Management Team; Contractor MonitorHealth and Safety Officer | Identify all utilities/ infrastructure prior to start of construction activities associated with any and all facilities During construction the construction contractors will implement measures to avoid utilities/ infrastructure that are not being relocatedPrior to construction relocate utilities/infrastructure if needed | Contractor will consult with utility service providers and cross check preconstruction field surveys to confirm exact location of underground utilities/infrastructureThe Authority or construction contractor monitor will perform regular site inspections to verify contractor compliance and retain inspection records in the project file maintained by the AuthorityContractor-designated health and safety officer will provide written confirmation to the Authority that the utility lines/infrastructure have been adequately located, and excavation will not start until this confirmation has been received by the AuthorityThe Authority and Contractor will coordinate with all appropriate utility providers and local agencies to determine which utility lines will be relocated and the location of the relocated utility lines Construction contractors will monitor the construction site(s) daily to ensure no damage occurs to utilities and if a utility is damaged which causes a threat to worker and public health and safety, construction contractors will notify the Authority and the local fire departments immediately and document the damage for the project file to be maintained by the Authority. | None |
| Natural Gas Well Decommissioning | Follow California Department of Conservation, Division of Oil, Gas and Geothermal Resources (CalGEM) Guidelines, Statutes and Regulations (California Code of Regulations, April 2019), which include:* Prior to plugging and abandoning any oil and gas well or any other well under CalGEM’s jurisdiction, operators must submit a Notice of Intention (NOI) to CalGEM. CalGEM will provide plugging requirements to minimize the potential for subsurface contamination and hazardous surface conditions.
* Comply with applicable plugging guidelines (i.e., Coiled Tubing Plugging Guidelines, Bentonite Plugging Guidelines) (source: https://www.conservation.ca.gov/calgem/for\_operators)
 | Contractor | Site preparation as part of clearing and grubbing | Permit and procedures per regulatory agency. | California Department of Conservation, Geologic Energy Management Division (“CalGEM”) |
| Water Wells Decommissioning | Wells will be decommissioned in the manner required by the local regulating jurisdiction or Department of Conservation and to assure that the ground water supply is protected and preserved for further use and to eliminate the potential for physical hazard. Decommissioning of water wells will consist of the complete filling of the well in accordance with applicable requirements set out by the County that contains the well. Prior to decommissioning of a water well, evaluations will be conducted to assess its condition, details of construction, and whether there are obstructions that will interfere with the process of filling and sealing.Wells situated in unconsolidated material in an unconfirmed groundwater zone shall have the upper 20 feet of the well sealed with suitable sealing material and the remainder shall be filled with suitable fill or sealing material.Fill material or sealing material placement will follow appropriate procedures as required by the applicable County. | Contractor | Site preparation as part of clearing and grubbing | Authority to maintain files on the location condition and fill process for each well filled. | Counties |
| Road abandonment | Roads within the inundation area will be abandoned such that existing asphault does not remain in the reservoir: Removal of asphalt surfacingReuse of asphalt if appropriate | Contractor | Site preparation as part of clearing and grubbing | None. | None |
| Environmental Site Assessments | Environmental site assessments will be performed in accordance with ASTM-Standard 1527-13 or E2247-16 for future development on or near any potentially hazardous or contaminated sites. Such Phase I environmental site assessments will be conducted prior to the purchase, transfer, retirement, or sale in fee or easement for land necessary for the Project. Preconstruction Surveys. The evaluation will assess the potential for hazardous substance contamination in accordance with all applicable federal, state, and local statutes and regulations. Subsequent actions, such as Phase II environmental site assessments in accordance with ASTM E1903-19, , will be taken as necessary and appropriate based on findings of Phase I environmental site assessments. Phase II environmental site assessments would involve sample collection and analysis to identify and characterize contamination as needed. If Phase I and Phase II environmental site assessments reveal releases of hazardous substances that require remediation under applicable laws, a plan for design and implementation of mitigation or remediation (e.g., Remediation Plan), would be developed consistent with applicable laws and under oversight of DTSC and/or the Regional Board. This plan would include, but not be limited to, removal of underground storage tanks, drums, buried waste, or other items potentially associated with contamination, and would identify the proper storage, handling, transport, and disposal of designated and hazardous waste.Perform pre-demolition surveys for structures to be demolished within the construction footprint, characterize hazardous materials (including asbestos-containing material and lead-based paint), and dispose of them in accordance with applicable regulations. | AuthorityHazardous waste contractors, as needed | Prior to and during construction | The Authority will follow applicable ASTM procedures to ensure that concentrations of hazardous constituents, if present, have been identified and treated or removed as appropriate for their concentration and in compliance with applicable state and federal laws and regulations. An Authority-appointed qualified monitor will monitor the preconstruction and pre-demolition investigations to ensure surveys and characterization and disposal of hazardous materials are conducted according to the established procedure. The Authority will be responsible for the disposal and handling of hazardous materials in accordance with applicable laws. The Authority will be responsible for coordination of monitoring data from the qualified monitor to determine areas which contain hazardous materials. If hazardous materials are encountered, the Authority will determine whether the area can be avoided, soil and/or groundwater removed from the contaminated area can be remediated and contained in compliance with applicable state and federal laws and regulations, or if consultation with the regional DTSC office is required.The qualified monitor will be responsible for reporting monitoring data from the preconstruction surveys to the Authority. In the event that a hazardous materials area cannot be avoided or removed and remediated and contained, the Authority will initiate consultation with the regional DTSC office to establish which permit and subsequent action will be required. Site-specific asbestos abatement work will meet the requirements of both the federal Clean Air Act and California Division of Occupational Safety and Health (Cal-OSHA) (CCR Title 8, Subchapter 4, Article 4, Section 1529). The applicable AQMD(s) will be notified 10 days prior to initiation of demolition activities of asbestos-containing materials. | State Water Resources Control Board (State Water Board)Department of Toxic Substances Control (DTSC)Air Quality Management Districts (AQMDs) |
| Onsite Wastewater Disposal Systems | Soil testing at locations of habitable structures will occur as part of final design. Final design of these structures will use an alternative wastewater disposal system, such as a mound system or pressure dose system, if needed, to overcome potential limiting soil and groundwater conditions at Funks Reservoir, such that wastewater is appropriately disposed without contaminating groundwater.  | Authority | Prior to construction and during final design | None | County |
| Salvage, Stockpile, and Replace Topsoil and Prepare a Topsoil Storage and Handling Plan | Depending on the thickness of the topsoil at a given construction site, topsoil may be salvaged from construction work areas, stockpiled, and then applied over the surface of spoil and borrow areas to the maximum extent practicable. Exceptions to this measure are the Sites Reservoir inundation area; the inundation area of the TRR; areas smaller than 0.1 acre; areas of nonnative soil material where the top layer of soil does not consist of native topsoil; where the soil would be detrimental to plant growth; and any other areas identified by the soil scientist in evaluating topsoil characteristics. The detailed design of the proposed project-related construction activities will incorporate an evaluation, based on review of soil survey maps supplemented by field investigations and prepared by a qualified soil scientist, that documents existing soil properties, specifies the thickness of the topsoil that should be salvaged, and that identifies areas in which no topsoil should be salvaged. The soil scientist will use the exceptions listed above as the basis for identifying areas in which no topsoil should be salvaged.A qualified soil scientist will also prepare topsoil stockpiling and handling plans for the individual project components, establishing such guidelines as the maximum allowable thickness of soil stockpiles, temporary stockpile stabilization/revegetation measures, and procedures for topsoil handling during salvaging and reapplication.The plans will also specify that, where practicable, the topsoil be salvaged, transported, and applied to its destination area in one operation (i.e., without stockpiling) to minimize degradation of soil structure and the increase in bulk density as a result of excessive handling.The stockpiling and handling plans will also specify maximum allowable stockpile sideslope gradients, seed mixes to control wind and water erosion, cover crop seed mixes to maintain soil organic matter and nutrient levels, and all other measures to avoid soil degradation and soil erosional losses caused by excavating, stockpiling, and transporting topsoil. For staging areas and similar areas in which topsoil would not be excavated or overcovered, the stockpiling and handling plans will describe how the soil will be decompacted or otherwise remediated after demobilization. | AuthorityContractorsSoil monitor | Development of topsoil storage and handling plans will be completed before construction begins. Salvaging, stockpiling, and reapplying of topsoil will occur throughout construction.  | The Authority will ensure that each plan is prepared by a qualified individual, that it adequately addresses all relevant activities and facilities, and that its specifications are properly executed during construction by the contractors.The qualified soil scientist will monitor excavation sites daily to determine the correct amount of topsoil to be removed. Additionally, they will monitor stockpile health and oversee reapplication and revegetation. Construction contractors will perform the salvaging, stockpiling, and replacing of topsoil during construction. The Authority will perform regular site inspections to verify contractor compliance with topsoil storage and handling plans. The Authority will incorporate reporting requirements into the topsoil storage and handling plans to be adhered to by the construction contractor. The qualified soil scientist will report results of excavation site and stockpile health monitoring to the Authority and report construction contractor adherence to storage and handling plans in a report delivered to Authority technical staff for analysis.  | None |
| Dredged Material Management | Prior to dredging, a chemical evaluation of Funks Reservoir water and sediment will be conducted to determine contaminant concentrations. This will help evaluate the suitability of dredged material for beneficial use and determine compliance with water quality standards. Based on the chemical characterization of Funks Reservoir sediment and water, onsite water treatment for contaminant removal may be required in the dredged material containment/dewatering areas. The type of treatment required would be specific to the characteristics of the dredged material and dredged material effluent. For example, treatment could include removing the material from the site and hauling it to a certified landfill for appropriate disposal. Following characterization of Funks Reservoir sediment and water quality, site investigations will be conducted to further inform the design and construction of the dredged material containment/dewatering areas (e.g., dike design) for containment of dredged material during dewatering and in storage areas, and evaluation of potential foundation settlement, groundwater levels, flow and direction, runoff patterns and adjacent drainage, will be considered in the investigations.The following general best management practices (or equally effective measures) for dredged material containment/dewatering areas will be implemented to avoid adverse effects on water quality through the discharge of dredged material or dredged material effluent to surface waters or surface water drainage courses:* In siting the containment/dewatering facilities, sufficient surface area and dike/berm height with freeboard will be made available for retention of fine-grained material to maintain effluent water quality. The facilities will be designed with adequate volume to contain the total volume of sediment to be dredged,
* Wet dredged material within the containment/dewatering areas will not exceed the elevation of the berms, dikes or similar containment feature of the dewatering area.
* If dewatering basins are used, a containment berm will be placed around the basin to prevent runoff of dredged material. A silt fence will be installed around the perimeter of the berm to further contain any runoff.
* Dredged material containment/dewatering areas will be returned to their pre-existing condition.
* If dredged material effluent from dewatering or sedimentation basins is discharged back into Funks Reservoir, the effluent discharge will be monitored and analyzed for water quality constituents including, but not limited to, suspended solids, turbidity, dissolved oxygen, and temperature pursuant to 401 Water Quality Certification or Waste Discharge Requirements.
* Dredged material will be screened prior to dewatering to remove debris and trash, which will be disposed of at an appropriate solid waste disposal facility.
* Dredged material not suitable for reuse will be disposed of at a permitted landfill site.
 | AuthorityContractors | Before, during and following dredging of Funks Reservoir | The Authority will incorporate monitoring/management requirements for operating the upland confined disposal areas. Effluent monitoring may be specified as a requirement under the Section 401 water quality certification or the State’s Porter Cologne Water Quality Act. | U.S. Army Corps of Engineers (USACE) Sacramento DistrictState Water Resources Control BoardRegional Water Quality Control Board |
| Develop and Implement Stormwater Pollution Prevention Plan(s) (SWPPP) and Gain Coverage under Stormwater Construction General Permit(Stormwater and Non-stormwater)  | For work areas that will be inundated or otherwise temporarily or permanently isolated from receiving waters, prepare and implement SWPPP(s) per State Water Board Stormwater Construction General Permit, which will include erosion control measures, sediment control measures, post-construction erosion control measures, waste management measures, and non-stormwater management measures as described below. **Erosion Control Measures** (e.g., silt fencing, weed-free straw bale barriers, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrances)* No disturbed surfaces will be left without erosion control measures in place during the winter and spring months.
* Keep emergency erosion-control supplies onsite at all times during construction and have the contractor(s) use these emergency stockpiles as needed.
* Divert runoff away from steep, denuded slopes, or other critical areas with barriers, berms, ditches, or other facilities.
* To the extent feasible, retain native trees and vegetation to help stabilize hillsides, retain moisture, and reduce erosion.
* Plastic monofilament netting or similar material will not be used for erosion control. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds. Materials used for erosion and silt control such as fencing, coir logs, coir rolls, etc., will be monitored to ensure they do not pass downstream, and the materials composing the barriers should not pose an entanglement risk to fish or wildlife. These limitations and monitoring requirements will be communicated to the contractor through specifications or special provisions included in the construction bid solicitation package.

**Sediment Control Measures*** Sediment would be retained on site by a system of sediment basins, traps, or other appropriate measures.
* Reduce runoff velocity on exposed slopes. Collect and direct surface run-on and runoff at non-erosive velocities to controlled drainage courses.
* When ground-disturbing activities are required adjacent to surface water, wetlands, or aquatic habitat, the use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces.
* Reduce off-site sediment tracking by installing gravel on primary construction ingress/egress points, rumble plates, and/or truck tire washing.
* Deposit or store excavated soil materials and tunnel muck away from drainage courses and protect from erosion by constructing berms along the downslope perimeter if rain events are forecast within 48 hours.

**Management Measures for Construction Materials*** Protect stockpiled construction materials that are not scheduled to be re-disturbed for at least 14 days or in advance of forecasted rain events by constructing berms along the downslope perimeter or by covering the stockpile.
* Store chemicals in watertight containers.
* Minimize exposure of construction materials to stormwater.
* Designate refueling and equipment inspection/maintenance locations per SPCCP (i.e., located 150 feet from surface waters and sensitive habitats such as wetlands).

**Waste Management Measures*** Prevent off-site disposal or runoff of any rinse or wash waters.
* Implement concrete and truck washout facilities and appropriately sized storage, treatment, and disposal practices.
* Ensure the containment of sanitation facilities (e.g., portable toilets).
* Clean or replace sanitation facilities (as necessary) and inspect regularly for leaks/spills.
* Cover waste disposal containers during rain events and at end of every day.

**Non-Stormwater Management Measures*** Control all non-stormwater discharges during construction.
* Wash vehicles in such a manner as to prevent non-stormwater discharges to surface waters.
* Clean streets in such a manner as to prevent non-stormwater discharges from reaching surface water.
* Discontinue the application of any erodible landscape material during rain, or within 2 days before a forecasted rain event.

**Post-construction Stormwater Management Measures*** The Stormwater Construction General Permit requires that the SWPPP specify post-construction stormwater management measures and runoff reduction measures that provide for a post-project time of runoff concentration that is equal or greater than pre-project time of concentration.
* The post-construction stormwater management measures must specify that BMPs be implemented to reduce pollutants in stormwater discharges that are reasonably foreseeable after all construction phases have been completed at the site.
* A long-term maintenance plan for the post-construction stormwater management measures must be described in the SWPPP and implemented for a minimum of 5 years following completion of construction. The plan must describe the procedures to ensure that the post-construction stormwater management measures are adequately maintained.
* During operations and maintenance, project facilities including, but not limited to, roads (including access roads), other paved and unpaved surfaces, structures, and equipment, will be properly maintained so as to avoid the potential for erosion and sediment/siltation into local waterbodies and in compliance with all applicable federal, state, and local regulations.
* Project operation and maintenance erosion and sediment control plans will be prepared and implemented as determined necessary, depending on the specific activity and potential for erosion or other impacts.

Drift and runoff from areas treated with herbicides, pesticides, and other chemicals that may be harmful to aquatic habitats will be controlled.Sediment control measures will include retaining sediment onsite by a system of sediment basins, traps, or other appropriate measures; reducing runoff velocity on exposed slopes; and collecting and directing surface run-on and runoff at non-erosive velocities to controlled drainage courses.Post-construction erosion control measures will be implemented (such as silt fencing, fiber rolls, hydraulic mulch/seeding, and vegetative plantings) and monitored to minimize effects on water quality.Revegetation treatments will be integrated into grading plans to create favorable planting environments that will aid plant establishment and natural regeneration. To the extent feasible and practicable, local native plants that require little or no maintenance and do not create an extreme fire hazard will be used. | AuthorityContractors | Prior to any ground-disturbing activityBefore and during constructionMinimum of 5 years following completion of construction (for postconstruction stormwater management measures) | The Authority and Contractors will prepare SWPPP(s)During construction, Contractors will be responsible for implementation of the SWPPP(s).Contractors will report to the Authority any deficiencies in compliance with the SWPPP(s) as well as any warnings or violations of the Construction General Permit received from the SWRCB. The Authority will evaluate these events as needed on a site-by-site basis to require the contractor to amend SWPPP(s) as needed to reduce the severity of and/or avoid the potentially significant impacts on the environment.  | State Water BoardRegional Water Quality Control Board (RWQCB) |
| Develop and Implement Spill Prevention and Hazardous Materials Management / Accidental Spill Prevention, Containment, and Countermeasure Plans (SPCCPs) and Response Measures | As part of the SWPPP, SPCCPs will be developed and implemented to minimize effects from spills of hazardous or petroleum substances during construction and operation/maintenance.Multiple SPCCPs may be prepared for project construction activities, each taking into account site-specific conditions.Spill prevention kits will always be in proximity when hazardous materials would be used (e.g., crew trucks and other logical locations).* Measures to ensure that hazardous materials will be properly handled by all reasonable means will be implemented when working in or near any waterway.

For all fueling of stationary equipment at the construction sites, containments will be provided to the degree that any spill would not enter the channel or damage wetland or riparian vegetation. Refueling of construction equipment will occur only in designated areas that will be a minimum of 150 feet from surface waters and other sensitive habitats, such as wetlands.Equipment used in direct contact with water will be inspected daily for oil, grease, and other petroleum products prior to use. All equipment will be cleaned of external petroleum products prior to beginning work where contact with water may occur in order to prevent the release of such products to surface waters. Equipment will not be serviced within the ordinary high-water mark or immediate floodplain of existing waterways (e.g., Funks Creek, Stone Corral Creek), unless the equipment stationed in these locations could not be readily relocated (e.g., pumps and generators).Store hazardous materials in double containment. Dispose of all hazardous and nonhazardous products following instructions and Material Safety Data Sheets and placed in nonleaking sealed containers until transport to an appropriate disposal facility. Monitor onsite vehicles for fluid leaks and regular maintenance to reduce the chance of leakage. Provide secondary containment (a prefabricated temporary containment mat, a temporary earthen berm, or other measure can provide containment) of bulk storage tanks having a capacity of more than 55 gallons.The contractor will conduct sampling of runoff effluent when a leak, spill, or other discharge of non-visible pollutants is detected.Provide equipment and materials necessary for cleanup of accidental spills onsite. Clean up accidental spills and leaks immediately and dispose of properly. The designated health and safety staff people will be trained in state and federal emergency response and spill containment techniques and will also be made aware of the state and federal pollution control laws, rules, and regulations applicable to their work.Petroleum products will be stored in nonleaking containers at impervious storage sites from which an accidental spill cannot escape.Absorbent pads, pillows, socks, booms, and other spill containment materials will be stored and maintained at the hazardous materials storage sites for use in the event of an accidental spill. Contaminated absorbent pads, pillows, socks, booms, and other spill containment materials will be placed in nonleaking sealed containers until transport to an appropriate disposal facility.When transferring oil or other hazardous materials from trucks to storage containers, absorbent pads, pillows, socks, booms or other spill containment material will be placed under the transfer area.Oil-absorbent booms will be used when equipment is used in or immediately adjacent to waters.All reserve fuel supplies will be stored only within the confines of a designated staging area, to be located a minimum of 150 feet from surface waters and other sensitive habitats, such as wetlands.Fuel transfers will take place a minimum of 150 feet from surface waters and other sensitive habitats, such as wetlands, and absorbent pads will be placed under the fuel transfer operation.Staging areas will be designed to contain contaminants such as oil, grease, fuel, and other petroleum products so that should an accidental spill occur, contaminants do not drain toward receiving waters or storm drain inlets.All stationary equipment will be staged in staging areas and positioned over drip pans. In the event of an accidental spill, personnel will identify and secure the source of the discharge and contain the discharge with sorbents, sandbags, or other material from spill kits and will contact appropriate regulatory authorities (e.g., National Response Center will be contacted if the spill threatens navigable waters of the United States or adjoining shorelines, as well as other appropriate response personnel). | Authority Contractors  | Before, during, and throughout construction | The Authority will monitor the development and implementation of the SPCCPs to minimize effects from spills of oil or oil-containing products during project construction and operation.Colusa, Glenn, and Yolo Counties (reporting of unforeseen hazardous conditions)As part of each SPCCP, an inspection program which includes regularly scheduled inspections, evaluations, and testing by qualified personnel will be developed in accordance with USEPA’s SPCC Guidance for Regional Inspectors. The Authority will review and approve all SPCCPs to ensure the above measures and practices are included and the SPCCPs are prepared in accordance with 40 CFR Part 112. During construction, the contractors will be responsible implementation of the SPCCP as well as conducting inspections, evaluation, and testing required in each site-specific SPCCP. The inspection program personnel will report to the Authority any deficiencies in compliance with the SPCCP as well as any spills of gasoline, diesel fuel, oil, or other related substance. The Authority will evaluate these events as needed on a site-by-site basis to amend SPCCPs as needed to reduce the severity of and/or avoid the potentially significant impacts on the public and environment.  | RWQCBCal-OSHA |
| Gain Coverage Under and Comply with Requirements of Central Valley Regional Water Quality Control Board Order R5-2016-0076-01 (NPDES No. CAG995002 for Limited Threat Discharges to Surface Water) | Discharged surface water and groundwater from dewatering activities will meet permit water quality requirements. Treatment for sediment or other pollutants may be required. Pre-discharge testing, monitoring, and reporting will be conducted in accordance with the permit.If treatment of dewatered surface water is necessary to meet permit effluent limitations, the appropriate treatment technology will be implemented. * + Treatment for reducing total suspended solids, settleable solids, and turbidity could include the following options, which are representative of typical sediment treatment methods: desilting basin; sediment trap; weir tank; dewatering tank; gravity bag filter; sand media filter.
	+ Pre-discharge testing may be required if contamination is suspected. In this case, water collected during dewatering will be tested for contamination prior to disposal in accordance with permit requirements.

Discharge of dewatered surface water and groundwater to receiving waters will be done in manner that avoids causing erosion and scouring. Energy dissipation BMPs, such as riprap, plastic sheeting, or sand bags, will be installed at the discharge points of the dewatering system(s).Groundwater pumped as part of construction-related dewatering will be contained onsite during construction within bermed areas adjacent to construction areas to avoid impacts to surface waters. As necessary, the Authority will ensure that the water is pumped into Baker tanks or approved equivalent with either a filter or gel coagulant system or other containment to remove sediment as required. BMPs, as described in the SWPPP, will also be implemented to retain, treat, and dispose of groundwater. Measures will include, but are not limited to: * Directly conveying pumped groundwater to a suitable land disposal area capable of percolating flows
* Retaining pumped groundwater in surface facilities to reduce turbidity and suspended sediment concentrations
* If contamination is suspected, testing water collected during dewatering for contamination prior to disposal

Treating (i.e., flocculating) pumped groundwater to reduce turbidity and concentrations of suspended sediments if turbidity exceeds Central Valley RWQCB Order R5-2016-0076-01 | AuthorityContractors | Before and during construction | The Authority will comply with monitoring and reporting requirements of the permit.  | State Water BoardRWQCB |
| Drainage Evaluations, Design, and Implementation | During project design (35% completion or greater), project civil engineers and professional hydrologists will coordinate with owners and operators of local drainage systems (e.g., Counties) and/or landowners served by existing drainage systems to evaluate pre- and post-project drainage needs and design features to ensure local drainage infrastructure (e.g., ditches, pipes, culverts) will not be disrupted by project facilities. Site-specific drainage evaluations or studies will be prepared as part of final project design. The drainage evaluations/studies will consider the design flows of any existing facilities that would be crossed by project features and develop strategies to ensure equivalent functioning of the existing drainage system during and after construction. These evaluations/studies will be applicable to aboveground facilities ultimately resulting in impervious surfaces, including Funks and its PGP, TRR and its PGP, the administration and operations building, the maintenance and storage building, the Dunnigan Pipeline, Sacramento River discharge site, all roads (including the South Road) and impervious areas that might result due to recreation area construction. The drainage evaluations will demonstrate stormwater runoff detention or retention on site and/or conveyed to the nearest existing drainage facility. The drainage study will demonstrate that project implementation will not result in increases in the peak flow runoff to adjacent lands or existing drainage facilities. Requirements of the study include: * + Identification of pre-development hydrology based on site-specific conditions and local meteorology by using continuous simulation modeling techniques, published data or studies, or other established tools.
	+ Quantification of post-development runoff volume and peak flow discharges.
	+ The post-construction rate, volume, and duration of runoff will not substantially exceed the pre-development rates and the pre-development hydrologic conditions will be replicated through site design, configuration, and other appropriate practices to the maximum extent technically feasible.
	+ Strategies and other appropriate practices (based on the pre-development hydrology) include potential relocation of facilities within the existing footprints, reduction in footprint sizes, and use of appropriate drainage systems and practices that mimic natural processes to infiltrate and recharge (e.g., green infrastructure or low impact development practices, bioswales, infiltration basins).

The drainage evaluations/studies will ensure any strategies and other appropriate practices identified will result in equivalent functioning of the existing drainage system during and after construction.Professional hydrologists and civil engineers will evaluate and design water conveyance systems (e.g., ditches, curb and gutters, culverts) that are within 250 feet of seasonal wetlands to maintain the existing hydrology of the seasonal wetlands and ensure that contaminants from impervious surfaces are not channeled into seasonal wetlands. | AuthorityContractors | Before construction | None  | RWQCBCounties |
| Develop and Implement Construction Equipment, Truck, and Traffic Management Plan (TMP) | Coordinate haul and access routes with all contractors when multiple facility sites are under construction concurrently, so that Project-generated construction traffic is dispersed to the extent practicable and necessary and as shown in Figure 2-35. Prohibit construction traffic in the community of Maxwell.Install traffic control devices, as specified in Caltrans’ Manual of Traffic Controls for Construction and Maintenance Work Zones, where needed to maintain safe driving conditions, including use of signage to alert motorists and bicyclists of construction activities, potential hazards, and travel detours, and use flaggers when appropriate. During operations and maintenance, truck and other maintenance equipment will be maintained in good working condition and will be used in accordance with all applicable federal, state, and local regulations. The Authority will coordinate with the applicable jurisdictions, including local agencies for local roads, transit providers, and rail operators where applicable.Provide construction notification procedures for Glenn, Colusa, Yolo, and Tehama Counties’ police, public works, fire departments, and other public service providers, and cycling organizations, bike shops, and schools.Inform contractors and subcontractors of work hours, modes and locations of transportation, and parking for construction workers. Describe the procedures for construction area evacuation in the case of an emergency declared by county or other local authorities.Identification of emergency routes available and open for county and other public emergency personnel. Designate areas where nighttime construction will occur, if needed.Posted information for contact in case of emergency or complaint.  | AuthorityConstruction Management Team; Contractor construction monitor(s) | Prior to, during, after construction | The Authority will appoint a construction monitor to perform site inspections to verify contractor compliance with the TMP.Contractor should ensure that all TMP requirements are addressed; contractor will ensure that inspectors monitor traffic conditions while work is being performed to avoid impacts in excess of what was identified in the TMP. | Counties |
| Visual/Aesthetic Design, Construction, and Operation Practices | Use native trees and shrubs for screening at the project facilities that may substantially degrade the existing visual character of the site(s) in a manner that does not compromise facility access or safety and does not conflict with existing safety requirements of agencies (e.g., DSOD).Incorporate high-quality site design that does not detract from the rural nature of the surroundings. New structures will be painted in a shade that is visually cohesive with the general surrounding area. Color selection will be made for the coloring of the most prevalent season. If the color selection is between two or three colors, one of the darker shades be selected. This is because choosing a darker shade will allow the surface to recede and blend within the visual landscape, whereas lighter colors advance, or are more apparent, within the visual landscape. Choosing a darker color will also reduce the potential for glare. Therefore, coloring will be slightly darker unless aesthetic design treatments indicate another color selection is appropriate with the intent to specifically improve aesthetics. Paints will be of a dull, flat, or satin finish only. Appropriate paint type will be selected for the finished structures to ensure long-term durability of the painted surfaces.If any concrete entrance signs, barriers, or landscape accents are to be located along public roadway, then such features will receive aesthetic treatments to ensure they enhance views associated with the Project. Aesthetic treatments may include mimicking natural material (e.g., stone or rock surfacing) and using integral color to reduce visibility, improve aesthetics, and to ensure that features blend with the landscape rather than creating a utilitarian-looking concrete element.All required lighting during construction will be directional to minimize glare impacts to humans and wildlife.All artificial outdoor lighting associated with project alternatives will be limited to safety and security requirements, designed using Illuminating Engineering Society’s design guidelines and in compliance with International Dark-Sky Association approved fixtures. Light emitting diode (LED) lighting will avoid the use of blue-rich white light lamps and use a correlated color temperature that is no higher than 3,000 Kelvin. Wherever possible and pragmatic, the lighting designer will select fixtures and lighting control systems that conform to International Dark-Sky Association’s Fixture Seal of Approval program. In addition, LED lights will use shielding to prevent nuisance glare and ensure that light spill does not affect sensitive residential viewers. Lights along perimeter roadways and pathways, as well as safety lighting at building entrances and loading areas, will employ shielding to minimize off-site light spill and glare and be screened and directed away from residences and adjacent uses to the highest degree possible. The use of nighttime lights along perimeter roadways and pathways will be minimized to the highest degree possible to ensure that spaces are not unnecessarily over lit, while still maintaining minimum adequate lighting to provide necessary visibility for security. For example, the amount of artificial light can be reduced by limiting the number of light posts in higher-use areas and by using hooded wall mounts on pathways that receive primarily pedestrian traffic. Technologies to reduce light pollution evolve over time and design measures that are currently available may help but may not be the most effective means of controlling light pollution once the proposed project is finalized. Therefore, all design measures used to reduce light pollution will employ the technologies available at the time of project design to allow for the highest potential reduction in light pollution. | AuthorityContractors | Before, during, and after construction | Include in construction plans for review and approval by the Authority | None |
| Fire Safety and Suppression/Develop and Implement a Fire Prevention and Control Plan | Prepare a fire safety plan for Glenn, Colusa, and Yolo County review. This plan will include precautions to carry out during high-fire danger, a list of fire-suppression equipment and tools to have on hand, a description of available communications; procedures and policies for controlling any fires that are on the work site, and other related fire prevention and control procedures, specifications for the supply of water to have on hand, and descriptions of other actions that would reduce the risk of ignition and facilitate immediate control of an accidental fire. Maintain fire-suppression equipment (e.g., fire extinguishers, fire blankets) at work locations. If a fire should start, the appropriate fire protection agencies responsible will be contacted immediately.Maintain a list of all major potential fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each potential major hazard.Smoking will be allowed only in areas designated for smoking.Gasoline-powered construction equipment with catalytic converters will be equipped with shielding or other acceptable fire prevention features. Internal combustion engines will be equipped with spark arrestors.Construction personnel will have fire suppression equipment on all construction vehicles and will be required to park vehicles away from dry vegetation. Contractors will coordinate with applicable local fire departments prior to construction activities to determine the appropriate amounts of fire equipment to be carried on vehicles and, should a fire occur, to coordinate fire suppression activities. Welding sites will include fire prevention provisions.The contractor will maintain contact with local firefighting agencies throughout the fire season for updates on fire conditions, and such fire conditions will be communicated daily to the on-site employees of the contractor and subcontractors daily.Red Flag Warning events from the National Weather Service will be monitored daily, wherein all construction activities will cease when an event occurs, with an exception for specific activities that would create an increased fire risk if they were forced to stop.Operational radios or telephones will be provided to all construction crews and monitors to report fires. The equipment will be confirmed operational each day prior to initiating construction activities at each work site. All fires will be reported to the appropriate fire agency with immediately (PG&E 2020b).Water tanks and/or water trucks will be made available at active project sites for fire protection during construction . | AuthorityFire suppression agencies Contractors | Prior to and during construction | Authority (monitoring)Fire protection agencies (report to them in the event of a fire)Contractors (report fire incidents to the Authority) | State Fire MarshalLocal fire suppression agencies (Counties) |
| Worker Health and Safety Awareness | The Authority and Contractors will follow all required federal, state, and local occupational health and safety laws on the construction site(s) at all times.Develop and implement a construction emergency action plan, which will include emergency notification flowcharts, notification procedures, and a variety of other important emergency response protocols for different types of emergencies that could occur during the construction of facilities, including injuries to construction workers, and fires.  | AuthorityConstruction Contractors | During construction | Construction monitors for each site will monitor construction operations to ensure the California Occupational Safety and Health Act of 1973, as administered by Cal-OSHA, will be followed as a minimum standard to protect workers.The construction monitors will report any deficiency in compliance by the construction contractor with the California Occupational Safety and Health Act of 1973 to the Authority immediately. | Cal-OSHA |
| Worker Health and Safety Plan Blasting | Comply with all federal, state and local requirements for blasting, including handling, transport, and storage of explosive blasting materials. These include, but may not be limited to the following A county explosive permitCalifornia Highway Patrol (CHP) Hazardous Materials Transport LicenseCounty Sheriff or Police or fire department for site specific permitsU.S. Department of Transportation and California Department of Motor Vehicles (CA DMV) Motor Carry PermitState of California Department of Justice Bureau of Firearms Licenses for each blasterA Blast Plan will be prepared for every blast performed at the quarries and will include: appropriate handling of blasting materials; appropriate timing for clearing the quarry; redundant communications; anddistances for safely distancing from the blast location | Contractor(s) | Prior to constructionImplemented during construction | Authority (Monitoring)Contractors | * Bureau of Alcohol Tobacco, Firearms and Explosives

CountiesCA DMVCHPCal-OSHA |
| Mosquito and Vector Control During Construction | Coordinate with Glenn County Mosquito and Vector Control District (MVCD) and the Colusa County Environmental Health Department (including the Colusa County Mosquito Abatement District) and Yolo County (Sacramento-Yolo Mosquito and Vector Control) related to implementation of standard local, state, and federal vector control requirements during construction of all facilities. Best management practices during construction include: Utilize water sources with mosquito predators for floodingDrain irrigation water into ditches or other water bodies with abundant mosquito predatorsImplement monitoring and sampling programs to detect early signs of mosquito population problemsUse biological agents such as mosquito fish to limit larval mosquito populationsUse larvicides and adulticides, as necessary. If larvicides and adulticides are required, the project proponent will evaluate the effects of the chemicals and, if required, prepare a monitoring program for review by fish and wildlife agencies to evaluate effects, if any, application would have on macroinvertebrate and associated covered fish species | AuthorityContractorsMosquito and Vector Control Districts | Before and during construction | Contractors (during construction) – Actions TBD | Colusa County Environmental Health Department (including the Colusa County Mosquito Abatement District)Glenn County MVCDYolo County (Sacramento-Yolo Mosquito and Vector Control) |
| Construction Noise Abatement Plan | Develop and implement a noise abatement plan to avoid or reduce construction-related noise impacts. This plan will incorporate the following of best noise control practices and measures during construction depending on site-specific conditions, construction activity, and location of nearest sensitive receptor: * Prior to construction, designate a noise control coordinator and initiate a complaint/response tracking program.
* Limit use of heavy equipment to daytime hours of 7:00 a.m. to 7:00 p.m. wherever possible.
* Limit all vibratory and impact pile driving to daytime hours of 7:00 a.m. to 7:00 p.m.
* Notify residents of nighttime work, if located within one mile of nighttime work areas.
* Prohibit gasoline or diesel engines from having unmuffled exhaust.
* Require that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.
* Prevent excessive noise by shutting down idle vehicles or equipment.
* Locate, store, and maintain portable and stationary equipment as far as feasible from nearby residents to ensure that such residents are not exposed to on-site construction noise at unacceptable levels.

The following measures will be implemented on a site-specific basis, as applicable.* Use noise-reducing enclosures around stationary noise-generating equipment.
* Construct barriers between noise sources and noise-sensitive land uses or take advantage of existing barrier features (e.g., terrain, structures) to block sound transmission to noise-sensitive land uses. The barriers shall be designed to obstruct the line of sight between the noise-sensitive land use and on-site construction equipment.
* Use shrouds to reduce noise from pile driving.
* Blasting at excavation sites will be conducted at a distance of at least 1,000 feet from the nearest noise-sensitive land use.
* Select haul routes that affect the fewest number of people and implement the TMP, which avoids the community of Maxwell.
*
 | AuthorityContractors | During constructionDuring operations | In the event of complaints by affected residents due to on-site construction noise generated during nighttime hours, the contractor will monitor noise levels intermittently (between 10:00 p.m. and 7:00 a.m.) at the dwelling unit of the person lodging the complaint. If measured construction noise during nighttime hours exceeds 45 dBA interior Lmax or 5 dB above ambient noise, whichever is greater, at the dwelling unit, the construction contractor will implement additional sound-attenuating mitigation measures where feasible, such as limitations on the use of noise-generating equipment, or installation of additional temporary barriers or enclosures. Where the above-described strategies are ineffective in reducing noise to the identified levels or where it is infeasible to do so, the affected residents may be offered short-term relocation assistance for the duration of the time that nighttime noise levels are expected to exceed the specified levels. Exceptions to this commitment can be made for legally mandated warning devices, such as back-up alarms and warning horns. | Counties |
|  |  |  |  |
| Underwater Construction Noise Abatement for  | Develop and implement an underwater sound control, abatement, and monitoring plan to avoid and minimize the effects of underwater construction noise on fish, particularly underwater noise effects associated with impact pile driving activities in the Sacramento River for Alternative 2. The plan will incorporate the following types of measures:* + Restrict in-water work and bank work within 200 feet of the shoreline to the in-water work windows specified in construction BMPs.
	+ Employ underwater noise-reducing methods using the best available and practicable technologies, such as use of vibratory rather than impact pile driving equipment when appropriate; using an impact pile driver to proof piles initially placed with a vibratory pile driver; employing noise attenuation using bubble curtains, air-filled fabric barriers, or isolation piles. Specific techniques to be used will be based on site-specific conditions.
	+ Restricting in-water and near-shore impact pile driving to daytime hours (30 minitues afet sunrise and 30 minutes before sunset)
	+ Monitoring underwater noise levels during all pile-driving activities on land (within 200 feet of shore) and in water to ensure that peak and cumulative sound exposure levels during pile driving do not exceed the values that were estimated (using the NMFS spreadsheet model) in support of the environmental permitting process.
	+ Stopping pile driving for the day if underwater noise monitoring indicates that daily peak and cumulative sound exposure levels are being exceeded, and taking corrective actions (e.g., reducing the total number of strikes per day on subsequent days) until monitoring shows that daily peak and cumulative sound exposure levels are no longer being exceeded.

Monitoring the in-water work area for fish that may be showing signs of distress or injury as a result of pile driving activities. and stopping work when distressed or injured fish are observed. If stressed, injured, or dead fish are observed during pile driving, the project proponent or their contractor will reduce the number of strikes per day to ensure that fish are no longer showing signs of stress, injury, or mortality. | AuthorityContractors | Prior to and During construction | Daily summaries of the hydroacoustic monitoring results.Daily reporting of any occurrences of stressed, injured, or dead fish. | CDFWNMFS |
| Operation and Maintenance Noise Design and Practices | Pump station buildings and turbine housing will be designed and constructed such that operation noise levels at neighboring residential receptors do not exceed 45 dBA Leq. Acoustical measures such as terrain shielding, enclosures, exhaust silencers, sound barriers, and acoustical building treatments will be incorporated into the facility design in order to meet this performance standard.In regard to maintenance equipment, the following best noise control practices would be followed:* Limit use of heavy equipment to daytime hours of 7:00 a.m. to 7:00 p.m. wherever possible.
* Prohibit gasoline or diesel engines from having unmuffled exhaust.
* Require that all construction equipment powered by gasoline or diesel engines have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.
* Prevent excessive noise by shutting down idle vehicles or equipment.
* Use noise-reducing enclosures around noise-generating equipment.
 | AuthorityContractors | Prior to construction (design of pumping plants)Operations and maintenance | None | Counties |
| Emergency Action Plan for Reservoir Operations | An Emergency Action Plan for Reservoir Operations will be prepared pursuant to the California Office of Emergency Services and include: emergency notification flowcharts, notification procedures, inundation maps, and response protocols for notifying downstream entities if an emergency release was anticipated to occur. Content of this plan would include but not be limited to: Specification of the dam owner’s responsibilities to ensure timely and effective action. Responsibilities of dam owners include: surveillance (monitoring the condition of the dam) and notification (phoning local or state emergency management agency officials in charge of emergency response).Inundation maps. Inundation maps show areas that may have to be evacuated in a dam emergency. The maps facilitate notification by displaying flood areas and estimated travel times for the floodwaters. Definition of events that trigger emergency action | Authority | Prior to and during operations; reviewed annually | These plans are typically reviewed annually and periodically tested through tabletop and functional exercises and drills | California Office of Emergency ServicesDSOD |
| Electrical Power Guidelines and EMF Field Management Plan | * The Authority will specify that design and construction of power facilities be in accordance with electric and magnetic field (EMF) guidance adopted by the California Public Utility Commission, EMF Design Guidelines for Electrical Facilities (2006).

Prepare a Field Management Plan that indicates the no-cost and low-cost EMF measures that will be installed as part of the final engineering design for the project. (Required under CPUC Decision No. D. 06-01-042 (January 26, 2006) and CPUC General Order 131-D, Section X(A) (June 8, 1994). | Authority | Prior to and during construction | A Construction Monitor will regularly inspect construction activities to ensure design and construction of power facilities are in accordance with electric and magnetic field (EMF) guidance adopted by the California Public Utility Commission.The Field Management Plan typically evaluates the no-cost and low-cost measures considered for the project, the measures adopted, and reasons that certain measures were not adopted, and will be prepared during detailed project design. | CPUCCalifornia Independent System Operators |
| Construction Equipment Exhaust Reduction Plan | Prior to construction, the Authority will develop a construction equipment exhaust reduction plan to reduce criteria air pollutants from construction equipment.Control technology that achieves equivalent or greater reductions than those identified below may be specified as new emissions reduction technologies become available and cost-effective.Equipment used to construct project facilities is equivalent to Tier 4 standards as follows:* For conveyance facilities, all equipment less than 120 horsepower will be equivalent to Tier 4 final standards.
* For reservoir facilities, all equipment will be equivalent to Tier 4 final standards except mast rotary percussion drills, the auger drill rigs, and grouting drill rigs.

To achieve the criteria pollutant emissions rates equivalent to the usage as indicated above, contractors may utilize a combination of newer engines, aftermarket controls, and retrofits to achieve the performance standard noted above. Potential strategies for achieving this standard may also include the following: * Electrification of equipment
* Use of diesel particulate filters on non-electrified equipment.
* Use of compressed natural gas (CNG).

The Authority will quantitatively demonstrate, through equipment-specific modeling, that the fleet-wide average achieves criteria pollutant emissions rates equivalent to the use of Tier 4 final standards as noted above In addition to Tier 4 final standards, the following best management practices will be incorporated into the reduction plan. Minimize idling time either by shutting equipment off when not in use or limiting the time of idling to 3 minutes (5 minutes required by 13 CCR 2449[d][3], 2485). Provide clear signage that posts this requirement for workers at the entrances to the site.Maintain all construction equipment in proper working condition according to manufacturer’s specifications. The equipment must be checked by an ASE-certified mechanic and determined to be running in proper condition before it is placed in operation.**Heavy-Duty Haul Trucks:** Prior to construction start for each major project feature, the Authority will ensure that all on-road heavy-duty diesel trucks shall be operated in compliance with the emission standards per CCR Title 13, Section 2025. The Authority will also ensure that its construction contractor will operate on road trucks with engines certified to the 2010 model year or newer heavy-duty diesel engine emissions standards. | AuthorityContractorsProject-Area air districts | Prior to and during construction | The Authority will submit the reduction plan to the appropriate air district for review prior to construction. Ensure that emissions from all off-road diesel-powered equipment used on the project site do not exceed 40% opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40% opacity (or Ringelmann [Based on the Ringelmann scale, which measures the density of smoke in the air]) will be repaired immediately. Non-compliant equipment will be documented, and a summary provided annually to the Authority and air district with jurisdiction over the construction site. A visual inspection of all in-operation equipment will be made at least weekly by the contractor and witnessed monthly or more frequently by the Authority and a periodic summary of the visual survey results will be submitted by the contractor throughout the duration of the proposed project, except that the summary will not be required for any 30-day period in which no construction activity occurs. The summary will include the quantity and type of vehicles inspected, as well as the dates of each survey. The air districts or other officials may conduct periodic site inspections to determine compliance. Nothing in this measure will supersede other air district or state rules or regulations. | AQMDs /Air Pollution Control Districts (APCDs) |
| Fugitive Dust Control Plans | The following measures are based on the Tehama County APCD fugitive PM10 mitigation measures from the 2015 Air Quality Planning and Permitting Handbook. **Land Clearing/Earth Moving:**Water shall be applied by means of truck(s), hoses, and/or sprinklers as needed prior to any land clearing or earth movement to minimize dust emissions. Haul vehicles transporting soil into or out of the property shall be covered. A publicly visible sign shall be posted with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 24 hours. The telephone number of the local air district shall also be included and visible on the sign. All excavation, grading, and/or earth moving activities shall be suspended when average wind speeds exceed 25 mph. **Visibly Dry Disturbed Soil Surface Areas:** All visibly dry disturbed soil surface areas of operation shall be treated with a dust palliative agent and/or watered to minimize dust emissions. **Paved Road Track out:**Existing roads and streets adjacent to the Project where there are Project construction vehicles actively entering from unpaved roads, shall be cleaned at least once per day unless conditions warrant a greater frequency. **Visibly Dry Disturbed Unpaved Roads:**All visibly dry disturbed unpaved road surface areas of operation shall be watered to minimize dust emissions. Unpaved roads shall be treated with soil stabilizers or surfactants to reduce dust emissions.  On‑site vehicles shall be limited to a speed of 15-20 miles per hour on unpaved roads. Haul roads shall be sprayed down at the end of the work shift to form a thin crust. This application of water shall be in addition to the minimum rate of application. **Vehicles Entering/Exiting Construction Area:**Vehicles entering or exiting the construction area shall travel at a speed which minimizes dust emissions. **Employee Vehicles:**Construction workers shall park in designated parking areas(s) to help reduce dust emissions. **Soil Piles:**Soil pile surfaces shall be moistened if dust is being emitted from the pile(s). Adequately secured tarps, plastic, or other material may be required to further reduce dust emissions. This includes materials stored in piles for use in the concrete batch plant. | AuthorityContractor(s) | Prior to final design plans and bid documents.Prior to and during construction. | *Insert* | AQMDs /APCDs |
| Asphalt and Concrete Batching Odors and GHG Emission Minimization  | * The Authority will ensure that the project contractor establishes a 1-mile buffer for onsite asphalt batch plant operations during construction
	+ To ensure that the temporary asphalt batch plants do not generate odors that adversely affect existing sensitive receptors, the Authority or its construction contractor will locate onsite asphalt batch plants at least 1 mile from the nearest sensitive receptors. A 1-mile buffer is the screening distance established by TCAPCD.
	+ If asphalt is obtained from off-site commercial sources instead of on-site batch plants, this measure would not be required.
* Minimize the amount of cement in concrete by specifying higher levels of cementitious material alternatives, larger aggregate, longer final set times, or lower maximum strength where appropriate.
 | AuthorityContractor(s) | Prior to final design plans and bid documents.Prior to and during construction. |  | AQMDs /APCDs |
| Develop and Implement Hazardous Materials Management Plans | The Authority will ensure that each project contractor will develop and implement a hazardous materials management plan (HMMP) before beginning construction.It is anticipated that multiple HMMPs will be prepared for the overall project construction activities, each considering site-specific conditions such as hazardous materials present on site and known historic site contamination.The HMMP will include, but not be limited to, the following measures or practices.Fuel, oil, and other petroleum products will be stored only at designated sites.Hazardous materials containment containers will be clearly labeled with the identity of the hazardous materials contained therein, handling and safety instructions, and emergency contact information. Storage, use, or transfer of hazardous materials in or near wet or dry streams will be consistent with the Fish and Game Code (Section 5650) and/or with the permission of California Department of Fish and Wildlife (CDFW). Material Safety Data Sheets (MSDS) will be made readily available to the contractor’s employees and other personnel at the work site.The accumulation and temporary storage of hazardous wastes will not exceed 90 days. Soils contaminated by spills or cleaning wastes will be contained and removed to an approved disposal site by an appropriately certified hazardous waste disposal contractor.Hazardous waste generated at work sites, such as contaminated soil, will be segregated from other construction spoils and properly handled, hauled, and disposed of at an approved disposal facility by a licensed hazardous waste hauler in accordance with applicable law and regulations. The contractor will obtain permits required for such disposal.Emergency spill containment and cleanup kits will be located at the work site. The contents of the kit will be appropriate to the type and quantities of chemical or goods stored at the work site.  | AuthorityContractorsConstruction Monitor | Prior to and during construction Post construction for substances used during operation and maintenance | The construction contractors will provide all HMMPs to the Authority for review and approval prior to commencing construction activities.Maintain a database on known historic instances of contamination and results of any field inspections regarding the presence of hazardous chemicals.The contractor will obtain permits required for hazardous waste generated at work sites to be disposed of at an approved facility by a licensed hazardous waste hauler in accordance with applicable law and regulations.The Authority will monitor contractor development of HMMPs by including this requirement in construction contracts. The Authority will review all HMMPs developed by the construction contractor to ensure compliance with this environmental commitment and inclusion of the measures and practices listed above. During construction, the Construction Monitor will monitor implementation of specific protocol for the proper handling and disposal of hazardous materials of the measures and practices included in each HMMP by the construction contractor. The Construction Monitor will immediately report any deficiencies in compliance with the HMMP to the Authority.The construction contractor will report any inability to comply with the HMMP and any spills of hazardous waste to the Authority immediately.  | City, county, state, and federal emergency response agencies.Storage, use, or transfer of hazardous materials in or near wet or dry streams will be consistent with the Fish and Game Code (Section 5650) and/or with the permission of CDFW. |
| Provide Construction Site Security | As appropriate, provide 24-hour onsite security either through technological means or personnel. Monitor construction sites, including staging and equipment storage areas. If private patrol security operators are hired to provide site security, these personnel will have appropriate licenses from the California Bureau of Security and Investigative Services. Individual security personnel will have a minimum-security guard registration license that meets the California Bureau of Security and Investigative Services requirements for training and continuation training as required for that license. All security personnel will also receive environmental training similar to that of onsite construction workers so that they understand the environmental conditions and issues associated with the various areas for which they are responsible at a given time. | Contractor(s) | Before and during, construction.  |  None. | None |
| Notification of Construction Activities in Waterways | Before work begins in the Sacramento River for Alternative 2, post information at nearby marinas, public launch ramps. Specific locations of these notices will be determined by informed stakeholders.This information will include maintenance site location(s), maintenance schedules, speed limits, and identification of no-wake zone and/or detours, where applicable. Information on detours will include site-specific details regarding any temporary partial channel closures, including contacting boating organizations, marina operators, city or county parks departments, and California Department of Parks and Recreation (DPR), where applicable. | AuthorityContractors | At least 30 days prior to any work in waterways during construction, operations, and maintenance. | The Authority will determine specific location and types of notices to be provided. Once these are determined, the Authority will contract with the appropriate construction contractor to implement notification and will then monitor implementation and ensure that posting of information is complete 30 days prior to in-water activities.  | Boating organizationsmarina operatorscity or county parks departmentsDPRU.S. Coast Guard or USACE |
| Worker Environmental Awareness Program (WEAP) | All construction crews and contractors will attend WEAP training prior to working in the project area. The WEAP training will include documentation and a review by qualified resource specialists of the special-status species and tribal, archaeological, historic built, paleontological, and other sensitive resources and areas within the area of disturbance for a particular facility; the locations of sensitive biological resources and their legal status and protections; measures to be implemented for avoidance of these sensitive resources; and review of other required environmentally related resources for all construction personnel working on site at a particular facility footprint. | AuthorityContractors | Prior to the onset of construction, including mobilization and vegetation clearing, and when new personnel are added to the project.Construction tailgate briefings | A record of all personnel trained will be maintained by each contractor and submitted to the AuthorityThe Authority will present WEAP training documentation upon request by regulating or permitting agencies | CDFWU.S. Fish and Wildlife Service (USFWS)Authority |
| Develop and Implement Fish Rescue and Salvage Plans for Funks Reservoir, Stone Corral Creek, Funks Creek, and CBD for Alternatives 1, 2 and 3; for Sacramento River for Alternative 2 | Fish herding and/or rescue operations will occur at any in-water construction site where dewatering and resulting isolation of fish may occur (e.g., when dewatering creates isolated pools within the stream channel).The plans will identify the appropriate procedures (i.e., detailed fish collection, holding, handling, release, and relocation procedures and methods; and equipment) for herding and removing fish from the construction zone and preventing fish from re-entering the construction zone during construction, or prior to dewatering. Capture, handling, holding, release, and relocation measures will be consistent with the general guidelines and procedures set forth in Chapter 9 of the most recent edition of the CDFW California Salmonid Stream Habitat Restoration Manual (California Department of Fish and Game 2010) to minimize impacts to species.The appropriate fish collection method will be determined by a qualified fish biologist for all species of interest, in consultation with the designated resource agency biologist, and based on site-specific conditions prior to dewatering and other in-water construction activities.Prior to construction site dewatering, fish will be herded and/or captured and relocated to minimize direct mortality and other forms of take. All fish rescue and salvage operations will be conducted under the guidance of a qualified fish biologist. These activities will occur as soon as possible after completion of the activity which results in fish being trapped.Unless otherwise required by these permits, the project proponents, in undertaking construction at the construction sites, will provide the following.A minimum 7-day notice to the appropriate fish regulatory agencies, prior to an anticipated activity that could result in isolating fish, such as installation of a coffer dam.A minimum 48-hour notice to the appropriate fish regulatory agencies of dewatering activities that are expected to require fish rescue.Safe working access for the appropriate fish regulatory agency personnel to the construction site for the duration of implementation of the fish rescue plan.Temporary cessation of dewatering if fish rescue workers determine that water levels may drop too quickly to allow successful rescue of fish.A work site that is accessible and safe for fish-rescue workers. | AuthorityQualified fish biologist | Prior to and during construction | The Authority will oversee development of the Plans in coordination with the Agencies.The Authority will submit plans to the appropriate resource agencies (CDFW, USFWS, and the National Marine Fisheries Service [NMFS]) for their review and acceptance.The fish rescue team will notify the contractor when the fish rescue has been completed and that dewatering can recommence. The results of the fish rescue and salvage operations (including date, time, location, comments, method of capture, fish species, number of fish, approximate age, condition, release location, and release time) will be reported to the appropriate resource agencies, as specified in the pertinent permits. Monitoring the implementation of the Fish Rescue and Salvage Plans and effectiveness of fish salvage and rescue will be species-, site-, and method-specific, and will be established within each Plan in coordination with the appropriate agencies.  | CDFWUSFWSNMFS |
| Construction Best Management Practices and Monitoring for Fish, Wildlife, and Plant Species Habitats, and Natural Communities | Prepare a construction monitoring plan for the protection of fish, wildlife, and plant species. The plan will include, but not be limited to the following elements.Reference to applicable items in the SWPPP.A summary of preconstruction surveys required for special-status species.Descriptions of measures to be implemented.Descriptions of monitoring parameters (e.g., turbidity), including the specific activities to be monitored (e.g., dredging, grading activities) and monitoring frequency and duration (e.g., once per hour during all in-water construction activities), as well as parameters and reporting criteria.All in-water construction activities within the Sacramento River under Alternative 2 will be conducted during the allowable in-water work window of September 1 through October 15 and within non-anadromous waters (e.g., Funks Creek, Stone Corral Creek, CBD) from June 1 through October 15 for the protection of fish species. Qualified biologists will monitor construction activities in sensitive natural communities and in areas identified as suitable habitat for special-status species. The biological monitors will have the authority to temporarily stop work in any area where a special-status species has been observed until that individual has passively or physically been moved outside of the work area, or if any measures are not functioning appropriately for the protection of fish, wildlife, or plant species.Biological monitors will be professional biologists selected for their knowledge of the special-status species and natural communities that may be affected by construction activities. The qualifications of the biologist(s) will be submitted to the fish and wildlife agencies for review and written approval prior to initiating construction.High-visibility temporary fencing, temporary signs, staking and flagging, or other visual barriers (pylons and flagging) will be used to identify sensitive biological resources and project personnel will be advised to avoid disturbance of these areas. These areas will be identified during pre-activity surveys. Signs, staking/pylons, and flagging will be inspected by the biological monitor in accordance with permit conditions and mitigation measures and maintained as necessary.On‑site vehicles will be limited to a speed of 15-20 miles per hour on unpaved roads. Personnel driving vehicles in the project area will observe the posted speed limit of 20 miles per hour (mph) on paved roads. All ingress/egress at the project site will be restricted to those routes identified in the project plans and description. Construction vehicles and equipment will restrict off-road travel to the designated construction areasAll vehicle parking will be restricted to established areas, existing roads, or other suitable areas. All food-related trash will be disposed of in closed containers and removed from the work area daily during the work period. Personnel will not feed or otherwise attract fish or wildlife to the work site. No firearms will be allowed on the project site except for those carried by authorized security personnel or local, state, or federal law enforcement officials.To prevent harassment, injury, or mortality of sensitive wildlife, pets will not be permitted in the active construction area.To prevent inadvertent entrapment of wildlife during construction, all excavated, steep-walled holes, trenches, or pits more than 1 foot deep will be covered at the close of each working day with plywood or similar material. Dirt will be shoveled around all the edges of the plywood or other material to prevent animals from crawling under it. In cases where trenches or pits cannot be covered, a section of the trench or pit will be partially backfilled to create an earthen ramp with a 3:1 slope. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals. If a special-status species is encountered during construction work, construction activities will be diverted away from the animal until it can be moved by a USFWS- or CDFW-approved biologist.Plastic monofilament netting or similar material will not be used for erosion control, because smaller wildlife may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds. This limitation will be communicated to the contractor through specifications or special provisions included in the construction bid solicitation package.All construction pipes, culverts, or similar structures; construction equipment; or construction debris left overnight in areas that may be occupied by wildlife will be inspected by the biological monitor prior to being used for construction. Such inspections will occur at the beginning of each day’s activities, for those materials to be used or moved that day. | Authority | Prior to constructionImplementation of plan during construction | The Authority will appoint construction biological monitor(s) to oversee implementation of BMPs, mitigation measures, and requirements in permits and approvals by the agencies. The construction monitor will also perform inspections as necessary to ensure compliance by construction contractors with these measures and coordinate inspections by other appointed monitors and inspectors. Prior to construction, the construction monitor will report to the Authority on the status of the monitoring plans. During construction, the construction monitor will report to the Authority periodically or as agreed upon on the results of construction inspections related to the measures and compliance with wildlife agency requirements.Water quality monitoring per SWPPPConstruction monitor to maintain a daily log of construction activities, notes any problems identified and solutions implemented to rectify those problems, and notifications to the construction superintendent and/or the fish and wildlife agencies regarding any exceedances of specific parameters (i.e., turbidity) or observations of special-status species. The monitoring log will also document construction start/end times, weather and general site conditions, and any other relevant information. | USFWSNMFSCDFW |
| Control of Invasive Plant Species during Construction  | All construction crews and contractors will be educated during the WEAP training about the importance of not spreading invasive plants. Localized infestations of invasive plants with a California Invasive Plant Council rating of moderate or high will be identified and mapped during the botanical surveys. These areas will be flagged and avoided during construction. If these areas cannot be avoided, vegetation will be removed and bagged for disposal at a waste facility prior to work in these areas.If areas to be cleared contain invasive plants, then chipped vegetation material from those areas will not be used for erosion control; in these cases, the material will be disposed of to minimize the spread of invasive plant propagules (e.g., burning, composting).Upon completion of the project, all areas subject to temporary ground disturbances will be recontoured to preproject elevations, as appropriate and necessary, and revegetated with native vegetation to promote restoration of the area to pre-project or better conditions. An area subject to “temporary” disturbance is any area that is disturbed to allow for construction of the project, but is not required for operation or maintenance of any project-related infrastructure, will not be subject to further disturbance after project completion, and has the potential to be revegetated. Infestations of invasive plant species will be targeted for control or eradication as part of the revegetation of temporarily disturbed construction areas.Appropriate methods and native plant species used to revegetate such areas will be determined on a site-specific basis in consultation with qualified biologists; site-specific characterization will include slope, soil, drainage, and exposure to determine appropriate plants. | AuthorityQualified construction biological monitor(s) orbiologists | Prior to constructionDuring construction | The Authority will monitor and manage invasive species locations throughout constructionThis information will be compiled into a report and used to inform the management of invasive species during operation and maintenance | None |
| Nighttime Work (Alternative 2 Discharge Location on Sacramento River) | If any nighttime construction work would be necessary, work lights will be shaded to minimize illumination of water in order to minimize disturbance to fish and wildlife species. | Authority | Before construction | Included on construction design requirements | None |

## Initial Sites Reservoir Fill Plan

 Purpose: The Authority will prepare an Initial Reservoir Fill Plan to describe the initial filling of the reservoir and the monitoring program for the Sites and Golden Gate Dams, saddle dams, saddle dikes, and areas around the reservoir during its initial filling. This document is required by the DSOD.

Outcomes: Implementing the Initial Reservoir Fill Plan will allow the Authority to fill the reservoir safely..

Content: The Initial Reservoir Fill Plan will describe:

* Initial filling rates and hold points.
* Visual monitoring and inspection paths and frequency.
* Instrumentation monitoring frequency, initial thresholds and actions.
* Roles and responsibilities.

Timing: The Authority will complete preparation of the Initial Reservoir Fill Plan approximately one1 year prior to beginning to fill Sites Reservoir and submit the plan to DSOD for review and approval.

## Reservoir Management Plan

Purpose: The Authority will prepare a Reservoir Management Plan (RMP) to protect and maintain water quality during the operation of the reservoir. This plan will describe the management of water resources in Sites Reservoir, including monitoring water quality, fisheries management (i.e., managing reservoir to minimize accumulation of mercury and other metals in stocked fish), and vector management, including invasive aquatic plant species.

Outcomes: Implementing the RMP will ensure the Authority identifies and implements water quality metrics, standards, testing and monitoring protocols, and actions to respond to water quality concerns (depending on monitoring results) to maintain and protect water quality. The RMP will also protect downstream habitats from spread of invasive aquatic plant species.

Content: The RMP will contain protocols for water quality measurements including the frequency and location of measurements in the reservoir, the source water, and the reservoir discharge for certain water quality constituents. Water quality metrics, standards, testing, and protocols will follow information and guidance available from the Central Valley Regional Water Quality Control Board. The RMP will include measures to address emerging water quality concerns, such as protocols for invasive aquatic weed control, potential adjustments to inflow and release volumes, minimum reservoir storage levels, and inlet/outlet (I/O) port selection. The final RMP will be established after meetings and consultation with regulatory agencies and other stakeholders. The Authority has already developed testing and monitoring protocols for several water quality constituents, which are described in Sections 2D.3.1 through 2D.3.5 and incorporated into the impact analysis for Chapter 6, *Surface Water Quality*.

Timing: The timing of testing and monitoring will vary depending on the constituent analyzed, as described below.

### Harmful Algal Blooms

Water quality management in Sites Reservoir as it relates to harmful algal blooms (HABs) will include implementation of a water quality monitoring program and a HABs action plan (below) to minimize the potential for adverse effects on beneficial uses of water in Sites Reservoir and downstream.

1. **Water Quality Monitoring**
2. Annual seasonal monitoring for benthic and planktonic HABs will occur monthly, at a minimum, beginning April 15 and continuing through October. Seasonal monitoring will commence with the initial filling of Sites Reservoir. Monitoring will begin earlier than April 15 if blooms are suspected. Initial early-season monitoring will consist of visual inspection and water sampling. Visual monitoring will be implemented consistent with the Surface Water Ambient Monitoring Program’s (SWAMP’s) *Visual Guide to Observing Blooms* (California Water Quality Monitoring Council 2017a)in the *California Freshwater Harmful Algal Bloom Field Guide* (SWAMP HAB Field Guide) (California Water Quality Monitoring Council 2018). Visual inspection will be made at several locations along the perimeter of the reservoir, including near the I/O tower.
3. It may be necessary to confirm that a suspected bloom is a cyanobacteria bloom rather than a non-toxic algal bloom. In this case, field microscopy will used to identify if cyanobacteria are present; water samples will be collected for microscopic visualization consistent with standard operating procedures in the SWAMP HAB Field Guide, which are currently under development. A qualified water quality specialist familiar with identifying cyanobacteria or otherwise appropriately trained person will be responsible for obtaining grab samples and visualizing the samples with a field microscope. If toxic benthic algal mats are suspected, their presence or absence will be confirmed with microscopy.

Qualified personnel conducting water sampling will follow all applicable steps in the *Standard Operating Procedures – Site Reconnaissance* section of the SWAMP HAB Field Guide(California Water Quality Monitoring Council 2017b) or develop a similar protocol to maintain consistency in sampling and record keeping. This standard operating procedure is intended to describe general and specific methods, procedures, and considerations on documenting the spatial and logistical aspects of each sampling site.

1. If the presence of cyanobacteria is confirmed, additional water samples will be taken for the purpose of laboratory analysis for cell density and the presence of cyanotoxins (specifically microcystins, anatoxin-a, and cylindrospermopsin) to determine if the trigger levels for planktonic (water column) HABs have been met (see Table 2D-2).

Table 2D-2: California Cyanobacteria and Harmful Algal Bloom Network Trigger Levels for Posting Planktonic Advisory Signs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Criteria** | **No Advisorya** | **Caution****(Tier 1)** | **Warning****(Tier 2)** | **Danger****(Tier 3)** |
| Total Microcystinsb | < 0.8 µg/L | 0.8 µg/L | 6 µg/L | 20 µg/L |
| Cylindrospermopsin | < 1 µg/L | 1 µg/L | 4 µg/L | 17 µg/L |
| Anatoxin-a | Non-detectc | Detectedc | 20 µg/L | 90 µg/L |
| Cell Density of Potential Toxin Producers | < 4,000 cells/mL | 4,000 cells/mL | \_\_\_\_\_\_ | \_\_\_\_\_\_ |
| Site-Specific Indicators | No site-specific indicators present | Discoloration, scum, algal mats, soupy or paint-like appearance.Suspected illness | \_\_\_\_\_\_ | \_\_\_\_\_\_ |

Source: California Water Quality Monitoring Council 2021.

µg/L = microgram per liter.

a For de-posting, all criteria for no advisory must be met for a minimum of 2 weeks. General awareness sign may remain posted and healthy water habits are still recommended.

b Microcystins refers to the sum of all measured Microcystin congeners.

c Using an analytical method that detects ≤ 1 µg/L anatoxin-a.

1. Visual and water quality monitoring will continue on a regular basis until cell density and cyanotoxin concentrations at any monitored location exceeds the “Caution” action trigger level. When cell density is at or above the caution action trigger level and/or cyanotoxin concentrations are at or above the trigger levels identified in Table 2D-2, the HABs Action Plan will be implemented.
2. **HABs Action Plan**
3. Reservoir monitoring and water sampling frequency will increase from monthly to approximately bi-weekly when the “Caution” action trigger level is reached (per cell density and cyanotoxin concentrations). When the “Caution” trigger level is met or exceeded, the Authority will report this to the HABs Hotline (managed by the State Water Resources Control Board [State Water Board] and the Regional Water Quality Control Boards) as follows:
	* Online: [Freshwater Bloom Incident Form](https://mywaterquality.ca.gov/habs/do/bloomreport.html)
	* phone: 1 (844) 729-6466 (toll free)
	* email: CyanoHAB.Reports@waterboards.ca.gov
4. The Authority will coordinate the State Water Resources Control Board and the Central Valley Regional Water Quality Control Board (Central Valley Board) for posting advisory warning signs corresponding to the “Caution”, “Warning” or “Danger” trigger level (as applicable based on cell density and cyanotoxin concentration). The information displayed on each of these three “types” of signs would be consistent with the Planktonic HAB Advisory Signs available on the California Water Quality Monitoring Council’s website, but would also address boating restrictions as well.[[1]](#footnote-2)
* The “Caution” sign will warn the public that harmful algae may be present in the reservoir and that swimming is allowed but should be avoided near algae and scum in the water. In addition, the sign will note the following:
	+ boaters should exercise caution near visible algae in the water and avoid boating in areas of the reservoir where algae is present;
	+ children should be kept away from algae in the water or onshore;
	+ pets should not be allowed in the water or allowed to drink the water;
	+ fillets from fish caught in the reservoir should be cleaned with tap or bottled water before cooking, and guts thrown away;
	+ shellfish from the reservoir should not be consumed; and
	+ water from the reservoir should not be used for drinking or cooking, and boiling or filtering will not make the water safe.
* The “Warning” sign will warn that toxins from algae in the reservoir can harm people and kill animals. Further, the sign will note the following:
	+ no boating is allowed;
	+ no swimming is allowed;
	+ stay away from scum, and cloudy or discolored areas in the reservoir;
	+ pets should not be allowed to go into or drink the water, or go near scum;
	+ fillets from fish caught in the reservoir should be cleaned with tap or bottled water before cooking, and guts thrown away;
	+ shellfish from the reservoir should not be consumed; and
	+ water from the reservoir should not be used for drinking or cooking, and boiling or filtering will not make the water safe.
* The “Danger” sign will sign will warn that toxins from algae in the reservoir can harm people and kill animals. Further, the sign will note that the following:
	+ no boating is allowed;
	+ stay out of the water until further notice;
	+ do not touch scum in the water or onshore;
	+ pets should not be allowed to go into or drink the water, or go near scum;
	+ fillets from fish caught in the reservoir should be cleaned with tap or bottled water before cooking, and guts thrown away;
	+ shellfish from the reservoir should not be consumed; and
	+ water from the reservoir should not be used for drinking or cooking, and boiling or filtering will not make the water safe.

Advisory warning signs will be placed in visible locations around the reservoir, and at Peninsula Hills Recreation Area, Stone Corral Creek Recreation Area, boating kiosks, the day-use boat ramp and parking areas. In addition, reservoir operations staff will be notified and informed of the potential health risks associated with cyanobacteria and cyanotoxins.

1. If cyanobacteria and cyanotoxins are confirmed near the I/O tower at a level at or exceeding the “Caution” action trigger level, reservoir releases will be made from deeper in the reservoir, while still considering other water quality objectives (e.g., water temperature for rice).
2. If toxic benthic algal mats are confirmed, the Authority will coordinate with the State Water Board and the Central Valley Board for posting benthic HABs signs.
3. Caution and safety procedures will be used to prevent direct human contact with a bloom. The SWAMP *Health and Safety Guide* (California Water Quality Monitoring Council 2017c) from the SWAMP HAB Field Guide will be consulted to provide information for personnel protection to minimize risks during water sampling.
4. Once the visual indicators and/or cyanotoxin concentrations in the reservoir are below the posting criteria for planktonic HABs or benthic HABs for a minimum of 2 consecutive weeks, advisory warning signs will be removed in coordination with the State Water Board and/or the Central Valley Water Board.
5. If HABs become a consistent problem near the I/O tower, additional measures may be implemented, such as oxygenation of the hypolimnion to reduce the release of bottom-sediment nutrients. Reducing reservoir nutrients may help reduce the potential for the formation of HABs and/or the production of cyanotoxins at concentrations exceeding the trigger levels identified in Table 2D-2.

### Methylmercury

The Authority will implement the following actions as part of the RMP to minimize reservoir methylmercury production and bioaccumulation of methylmercury in reservoir fish so that the average methylmercury concentrations in Sites Reservoir fish do not exceed 0.2 mg/kg sport fish objective[[2]](#footnote-3). Most of these actions are recommended actions for new reservoirs as part of the Statewide Mercury Control Program for Reservoirs, as identified in the *Draft Staff Report for Scientific Peer Review for the Amendment to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California, Mercury Reservoir Provisions – Mercury TMDL and Implementation Program for Reservoirs* (State Water Resources Control Board 2017). The potential effectiveness of these recommended methylmercury reduction actions is supported by current research (State Water Resources Control Board 2017). Methylmercury reduction actions will be implemented in coordination with the State Water Board and Central Valley Board, as required.

1. Remove vegetation (e.g., brush, trees) in the inundation area prior to initial reservoir filling.
2. Do not stock Sites Reservoir with fish for the first 10 years following its initial filling.
3. Monitor Sites Reservoir fish tissue methylmercury concentration in high trophic level species via annual tissue sampling beginning the first year of reservoir stocking for a minimum of 10 years to monitor fish tissue concentrations of methylmercury. Based on results from fish tissue monitoring, and in coordination with the State Water Board, Central Valley Water Board, and the Office of Environmental Health Hazards Assessment, fish consumption warning signs will be posted in several visible locations around the reservoir if fish tissue concentrations exceed the 0.20 mg/kg wet weight (ww) sport fish objective[[3]](#footnote-4). Fish tissue will be sampled in accordance with the U.S. Environmental Protection Agency’s Standard Method 743 (U.S. Environmental Protection Agency 2007) and the State Water Resources Control Board’s Surface Water Ambient Monitoring Program, Bioaccumulation Oversight Group protocol (Bonnema 2014).
4. Monitor and manage reservoir water chemistry according to methods proven feasible and effective at reducing mercury methylation by pilot tests undertaken in other mercury-impaired reservoirs, as determined by the State Water Board’s program review at the conclusion of the Phase 1 pilot tests for the Statewide Mercury Control Program for Reservoirs. Water chemistry management actions may include the addition of an oxidant (e.g., dissolved oxygen, ozone, nitrate) to the reservoir bottom waters (near the sediment-water interface) to reduce anoxia or adjust redox potential when the reservoir is stratified. If this method is employed, reservoir releases will be made from a higher tier (i.e., higher elevation) in the I/O tower to avoid discharging bottom waters. Methylmercury concentrations in the reservoir would be assessed prior to oxidant addition to establish baseline levels and following reservoir treatment to assess effectiveness of the methylmercury management action at reducing bioaccumulation and fish methylmercury concentrations. Further, if nitrate is added to the reservoir, monitoring of reservoir releases will be implemented to ensure nitrate concentrations in the releases are not substantially increased to avoid potentially affecting downstream surface water quality.
5. Manage reservoir fisheries according to methods proven feasible and effective at reducing methylmercury bioaccumulation by pilot tests undertaken in other mercury-impaired reservoirs. Fisheries management actions could include the following.
	1. Intensive fishing to reduce fish populations to provide more food resources for remaining fish. This would increase the growth rate in the remaining fish and reduce their methylmercury body burdens through somatic growth dilution.
	2. Stock the reservoir with low-methylmercury prey fish for stocked predator fish to consume.
	3. Stock more or different sport fish species, including lower trophic level sport fish.
	4. Stock large, old predator fish from hatcheries that supply fish with low methylmercury concentrations.

To assess the effectiveness of methylmercury reduction actions after initial implementation, fish tissue methylmercury concentrations will be monitored. Young fish will be sampled because they have accumulated methylmercury for a shorter time period relative to older, larger sport fish and therefore would better reflect recent mercury exposure (State Water Resources Control Board 2017). Fish tissue methylmercury concentrations in young fish will be assessed prior to implementation of any methylmercury reduction action to establish baseline concentrations. The timing and frequency of tissue sampling following implementation of reduction actions will be informed by Phase 1 pilot tests.

Ongoing monitoring of aqueous and fish tissue methylmercury in Sites Reservoir will be implemented per permit conditions, to assess the effectiveness of fisheries management actions over the long-term.

Prior to the construction of Sites Reservoir, the State Water Board and/or the Central Valley Water Board will include conditions or requirements in a Clean Water Act Section 401 water quality certification, a California Water Code water right order, or other applicable order for implementing the Project. Sites Authority will coordinate with the Central Valley Regional Water Board to implement mercury/methylmercury control or reduction measures pursuant to the mercury total maximum daily load and implementation program for reservoirs (State Water Resources Control Board 2017), once adopted.

### Metals

The metals evaluation will focus on metals that may be affected by flow in the Sacramento River and that have concentrations that are close to or above water quality standards. These include aluminum, copper, iron, and lead. Hexavalent chromium will also be measured, at least for the first year, due to limited existing data for the Sacramento River. Measurements of metal concentrations will be accompanied by measurements of pH, DOC, and hardness because these parameters influence water quality standards for aquatic life protection for some metals.

Past studies of metal concentrations in the Sacramento River have not focused on high flows that would be the source water for Sites Reservoir. To better understand the concentration of metals entering Sites Reservoir, metal concentrations at the diversion(s) will be measured within 24 hours of the start of diversions at Red Bluff Pumping Plant and every 2 weeks during continuous diversions. Eventually these data will improve understanding of the circumstances that cause elevated concentrations and may allow some metal measurements to serve as surrogates for others. After 2 years of measuring metal concentrations in the diversions, the frequency of measurements will decrease to monthly.

Metal concentrations will also be measured at Golden Gate Dam every other month on the surface, at mid-depth, and bottom third of the reservoir and in Stone Corral Creek approximately half a mile downstream from Sites Dam. For Stone Corral Creek, these measurements will also occur for a year prior to construction to better establish existing conditions. In addition, metal concentrations in the main Sites Reservoir release, the Dunnigan Pipeline, and the Sacramento River upstream of the Sites discharge will be measured every other month when water from Sites Reservoir is being discharged to the Sacramento River. If Sites water is released to the Colusa Basin Drain (CBD), metal concentrations will also be measured in CBD upstream of the Dunnigan Pipeline.

To evaluate the potential metal effects in Yolo Bypass, metal concentrations will be measured in samples collected at the downstream end of the CBD and at two locations in the Yolo Bypass, one in the Tule Canal and the other in the Toe Drain. Samples will be collected monthly during June – October to evaluate concentrations before and during the period of CBD discharge to the Yolo Bypass.

The metal measurements will be used to understand differences between intake and release concentrations and the effects of in-reservoir processes such as settling of suspended sediment and actions such as selection of I/O tower tier for releases. Measurements will also be used to determine if there are vertical differences in concentration, to understand the effect of TC Canal operations and conveyance volumes on metals concentrations, and to inform actions to be taken under Mitigation Measures WQ-2.1 and WQ-2.2.

As understanding of metal processes is refined over time and if concerns regarding metals are diminished, monitoring intensity may be reduced.

### Water Temperature

The I/O tower ports/tiers will be operated to meet a rice-growing temperature objective of 65°F or higher during the rice growing season (May through September). Warm releases will also benefit native fish in Funks Creek, which are accustomed to the warm temperatures present in this creek under existing conditions. During March through October, vertical water temperature profiles will be measured once every two weeks at 5-foot intervals to inform decisions about which tiers of the I/O tower to use.

### Salt Pond

Data regarding the Salt Pond is limited regarding the flow and water quality of the salt springs that feed it, and this lack of information represents a high level of uncertainty. Prior to initial filling of Sites Reservoir, after land has been acquired, and during the construction phase, there will be monthly measurements of flow, electrical conductivity (EC), and metals (aluminum, copper, iron, lead, manganese, and nickel) for up to 1 year at the salt springs. These measurements will be collected in accordance with standard procedures and will provide a better understanding of the potential salt and mineral load from the salt springs. Water samples for these measurements will be taken from locations where water is emanating from these springs. One to three springs with the most discharge will be selected for sampling. Measurements will also be taken at a location in the pond distant from the springs to understand whether evapoconcentration or other spring input may be affecting water quality.

The amount of mixing of spring water with reservoir water is uncertain and will depend on EC, temperature, reservoir inflows, and reservoir releases. To determine whether saline spring water is accumulating at the bottom of the reservoir near Golden Gate Dam, EC measurements will be taken at the same times and locations in Sites Reservoir as the metal concentrations measurements in Section 2D.3.3.

If monitoring indicates the possibility of substantial increases in EC in the reservoir release due to temporary entrainment of accumulated salt spring water, reservoir operations will be modified to prevent this phenomenon by gradually discharging accumulated spring water. Reservoir modifications will be made gradually and may include modifications to discharge volume or selection of I/O tower tiers. For example, releases from lower-level and higher-level tiers may be blended to ensure adequate water quality. As these modifications are made, EC of the reservoir discharge will be measured hourly with a continuous device recorder to ensure that EC remains below 1,000 µmhos/cm.

### Invasive Aquatic Plant and Invertebrate Species

#### Invasive Aquatic Plants

The Authority will implement actions to control the spread of invasive aquatic plants (submerged and floating) in Sites Reservoir. These actions will be consistent with existing control methods employed by the California Department of Boating and Waterways under the Aquatic Invasive Plant Control Program (AIPCP). There are two programs within the AIPCP, Floating Aquatic Vegetation (FAV) and Submersed Aquatic Vegetation (SAV), that include management and control methods and monitoring. Implementation of invasive aquatic vegetation control will minimize potential for adverse effects of invasive aquatic plant species on Sites Reservoir and downstream habitats.

Typical aquatic invasive species targeted using the FAV control methods include water hyacinth (*Eichhornia crassipes*), South American spongeplant (*Limnobium laevigatum*) and Uruguay water primrose (*Ludwigia hexapetala*). Infestations of these plants can alter dissolved oxygen cycles, displace native plant species, shade shallow-water fish habitat, block waterways, and clog water intakes. Control methods for these species can include use of herbicides, mechanical (machine harvesting), biological (natural control agents, such as water hyacinth weevils), and hand picking. Monitoring included in this program includes checking herbicide-treated areas to ensure herbicide concentrations do not exceed allowable limits or have adverse effects on water quality. (California State Parks Division of Boating and Waterways 2021a).

The submersed aquatic invasive plant species targeted by the SAV control methods include Brazilian waterweed (*Egeria densa*), curlyleaf pondweed (Potamogeton crispus), Eurasian watermilfoil (*Myriophyllum spicatum*), coontail (*Ceratophyllum demersum*), and fanwort (*Cabomba caroliniana*). Infestations of submersed invasive plants can have similar effects as the floating invasive species, as well as reducing water flow and trapping sediment. Control of submersed aquatic invasive plants is primarily through the use of herbicides that are approved for aquatic use by the U.S. Environmental Protection Agency and the California Department of Pesticide Regulation. The other FAV control methods, particularly mechanical control, are not applicable for submersed species, because they readily spread by small fragments that can be left behind by machine harvesting. Monitoring included in this program includes checking herbicide-treated areas to ensure herbicide concentrations do not exceed allowable limits or have adverse effects on water quality. (California State Parks Division of Boating and Waterways 2021b).

#### Invasive Aquatic Invertebrates

Aquatic invertebrates including the New Zealand mudsnail (*Potamopyrgus antipodarum*), quagga mussels (*Dreissena rostriformis bugensis*) and zebra mussels (*Dreissena polymorpha*) are invasive, non-native freshwater invertebrates that compete with native and sport fish species for food. These invertebrates can be spread between waterbodies by attaching to boats, trailers, and recreational equipment or via standing water from an infested waterbody trapped in boat bilges or engines, and buckets, for example. (California State Parks Division of Boating and Waterways 2021c; California Department of Fish and Wildlife 2021).

To minimize the potential for adverse effects of invasive aquatic invertebrates on Sites Reservoir and downstream habitats, the Authority will implement watercraft inspections at the reservoir. All watercraft and watercraft trailers intending to enter the reservoir will be inspected prior to launching. Inspection protocols will be consistent with the *Uniform Minimum Protocols and Standards for Watercraft Inspection and Decontamination Program for Dressenid Mussels in the Western United States* (Pacific States Marine Fisheries Commission 2016) and inspectors will be trained to identify invasive aquatic invertebrates as well as trained in the inspection protocol. If watercraft and associated equipment is suspected of having invasive aquatic invertebrates on board, access to the reservoir will be denied. In addition to the inspection program, the Authority will post signage at day-use boat ramp, Peninsula Hills Recreation Area, Stone Corral Creek Recreation Area, and any additional future recreational areas at the reservoir, alerting boaters/recreationists to the harmful effects of invasive mussels on aquatic ecosystems and directing them to clean, drain, dry and inspect their watercraft and equipment after recreating in any waterbody.

## Technical Studies Plan and Adaptive Management for Funks and Stone Corral Creeks

The Authority will prepare a Technical Studies Plan prior to construction activities to guide fisheries technical studies to be conducted prior to and during construction activities, as well as ongoing monitoring during operations. Using information from these field studies, along with currently available information, the Authority would prepare a Funks and Stone Corral Creeks flow schedule that could be incorporated into the Reservoir Operations Plan that would identify the approach for appropriate releases, including release schedules and volumes, a monitoring plan, and an adaptive management plan. The goal of these studies would be to maintain fish in the reach of Funks Creek between Golden Gate Dam and Funks Reservoir, and in the reach of Stone Corral Creek between Sites Dam and where Stone Corral Creek crosses the Glen Colusa Main Canal (approximately 5.3 linear miles east of the dam) in good condition consistent with California Fish and Game Code Section 5937. These reaches were identified for the Technical Studies Plan because they are the section of the creeks that have natural flow as they are between each main dam and downstream infrastructure that under existing conditions regulates, modifies, or otherwise utilizes the creeks for water distribution and drainage. Releases into Funks Creek would be made through the transition manifold at the base of Golden Gate Dam and a new pipeline that terminates at Funks Creek below the dam. These facilities would carry up to 100 cfs with a release range of 0 to 100 cfs into Funks Creek. Releases into Stone Corral Creek would be made through the permanent outlet at Sites Dam. This outlet would have a release range of 0 to 100 cfs, with an emergency release capacity of up to 2,500 cfs.

The technical studies plan will be developed during the permitting and design process and will be adopted prior to land acquisition. Preparers of the plan will be technical experts in consultation with fisheries experts from CDFW, NMFS, and USFWS. The contents of the technical studies, which will gather data ultimately used to adaptively manage flows released into Funks and Stone Corral Creek, are described below.

### Fish Assemblage and Available Habitats

Purpose: Maintain existing fish populations below the Sites and Golden Gate dams in good condition in compliance with Fish and Game Code 5937. Identify and document existing fish assemblage in Stone Corral and Funks creeks, including fish species presence and habitat use; characterization of habitats available (e.g., spawning, rearing, foraging, and sheltering habitats) at varying flow levels.

Outcomes: Quantitative and qualitative monitoring data to fully characterizing the type of fish and habitat available to inform the type of releases that should be made to Funks and Stone Corral Creeks under operating conditions.

Content: Describe and enumerate existing fish assemblages in Stone Corral and Funks creeks in the reaches identified above. Characterize available spawning, rearing, foraging, and refuge habitat for native fishes following methods described in Meador et al. (1993).

Timing: Monitoring will begin a minimum of 5 years before start of reservoir operations to establish the baseline and will continue for 5 years after start of operations. The Authority, in consultation with the permitting fish agencies (NMFS, USFWS, and CDFW), will determine the frequency of the adaptive management report and timing of any adaptive management actions.

### Flow Characterization and Geomorphic Study

Purpose: The purpose of the flow characterization and geomorphic studies would be to characterize historic flows, including baseflow during the summer months, on Funks and Stone Corral Creeks; substrate composition; and flow levels and frquency necessary for channel maintenance.

Outcomes: A hydrogeomorphic technical study with quantitative and qualitative monitoring data to fully characterizing the existing hydrologic regime of Funks and Stone Corral Creeks, as well as the overall type and abundance of existing sediment available for aquatic organisms, would be developed in order to inform the type of releases (frequency, duration and magnitude) that should be made to maintain the existing hydrogeomorphic characteristics of the creeks downstream of Sites an Golden Gate dams under operating conditions as well as potential gravel deficiencies as a result of project operations.

Content: In order to inform the appropriate streamflows for the creeks under inquiry, a geomorphic assessment of the stream reaches between Golden Gate Dam and Funks Reservoir and Sites Dam where it crosses the Tehema Colusa Canal below the proposed dams to ) would constitute the first step in the analysis. The channel segments upstream of the proposed dams would also be examined to provide a greater understanding of the local watershed geomorphic characteristics. The focus of the geomorphic assessment would be to determine the dominant geomorphic processes, document the landforms, and determine how the observed morphology of each creek is influenced by the hydrologic regime and the surrounding land uses. Likewise, collection of geomorphic information would aid in the determination of overall channel stability for each creek. Geomorphic indicators that would be collected could include the following:

* Channel Classification (determining if the reaches of interest are transport-limited or supply-limited)
* Local Watershed Inputs (determining any major inputs of sediment and runoff; identifying any land use changes that could alter the balance of sediment supply and runoff that could lead to future instability; and documenting any other anthropogenic features [such as pipe outfalls, rock slope protection, grade control structures, etc.])
* Hydrologic and Flow Patterns (identifying whether streamflow is perennial, intermittent, or ephemeral)
* Riparian Vegetation Condition (describing the general health of the riparian area, focusing on the amount and type of vegetative cover)
* Bankfull Width and Depth and Wetted Width (determining the hydraulic capacity of the channels by recording the geomorphic or “effective” bankfull surface)
* Bank Instability and Bank Characteristics (identifying areas fluvial erosion [erosion associated with flowing water] and bank failure [erosion associated with gravitational forces and weakening processes], as well as characteristics such as bank height, bank angle, and bank composition).
* Channel Bed Substrate Composition and Embeddedness (determining the size of the substrate materials on the channel bed, and the degree to which these materials are embedded - these conditions indicate how frequently the channel substrate is mobilized)
* Channel Complexity (determining the presence or absence of gravel bar development and evidence of scour and/or deposition; pool and riffle habitats containing in-channel structures [e.g., instream woody material] that create complexity and habitat niches for aquatic organisms)
* Degree of Channel Incision and Stage of Channel Evolution (determining how incised the channels are, providing a template for understanding geomorphic responses and processes within the immediate watershed, and identifying the evolutionary stage of the channels in order to predict future channel change)
* Cross Section and Longitudinal Profile Surveys (conducting topographic surveying as necessary to document existing conditions)

The hydrogeomorphic technical study would also examine the current hydrologic regime of Funks and Stone Corral Creeks. Consideration would be given to when and how flows would be released, whether a portion of these flows are needed to maintain fluvial geomorphic processes (based on the findings from the geomorphic assessment), and what level of variability in base flows would satisfy California Fish and Game Code section 5937 goals consistent with the goals and objectives of the Sites Reservoir Project. Various approaches to estimate minimum streamflows to maintain ecosystem and geomorphic function, such as “the functional flow” approach suggested by Yarnell et al. (2015), the Instream Flow Incremental Methodology (IFIM) (National Biological Service, U.S. Department of the Interior 1995), and the CDFW Instream Flow Program[[4]](#footnote-5) (IFP), would be investigated for their applicability to determine appropriate streamflows on Funks and Stone Corral Creeks. Coordination with the permitting agencies would be required before a chosen method is selected.

Timing: The fieldwork required to complete the hydrogeomorphic surveys would occur prior to construction of dams on Funks and Stone Corral Creeks to establish the (unaltered) hydraulic regime and baseline geomorphic conditions. Post-construction monitoring would occur for 5 years, and if needed, up to 10 years after start of operations. The Authority and the relevant permitting agencies (CDFW and the Regional Board) would review the results of the 5 year monitoring and other relevant technical studies to determine if monitoring would need to occur past 5 years. The specialists responsible for conducting the hydrogeomorphic surveys would coordinate directly with the permitting agencies to develop appropriate performance standards and success criteria for the hydrologic conditions (i.e., flow releases) and geomorphic conditions on both Funks and Stone Corral Creeks. The Authority and the permitting agencies would determine the timing of any adaptive management actions.

### Surface Water Ambient Monitoring Program Technical Study

Purpose: Stream bioassessment monitoring is a method of evaluating and monitoring the environmental health and integrity of freshwater wadeable streams by using benthic macroinvertebrates (BMI), water quality parameters, and physical habitat (PHAB) conditions indicators of stream condition. Bioassessments are especially useful in tracking the aquatic conditions before and after a project is implemented to determine the post-project effects on aquatic communities.

Outcomes: A Surface Water Ambient Monitoring Program (SWAMP) technical study (i.e., bioassessment) that focuses on the relationships between physical habitat, water quality, and benthic macroinvertebrates. The quantitative monitoring data would be used to characterize the relationships between physical habitat, water quality, and benthic macroinvertebrates to inform the type of releases that should be made to Funks and Stone Corral Creeks under operating conditions.

Content: Stream bioassessment monitoring would be conducted using the methods described in the 2016 version of the SWAMP *Standard Operating Procedures for the Collection of Field Data for Bioassessments of California Wadeable Streams: Benthic Macroinvertebrates, Algae, and Physical Habitat* (Ode a al. 2016a) and SWAMP’s *Supplemental Guidance for the SWAMP Bioassessment Field Protocol* (Ode a al. 2016b).

Various metrics are available for scoring the health of both the BMI communities (e.g., the California Stream Condition Index or CSCI) and overall PHAB (e.g., the PHAB Index of Physical Integrity or IPI). The CSCI is a statewide biological scoring tool that translates BMI data into an overall measure of stream health (Rehn et al. 2015). The IPI combines eight Geographic Information Systems-calculated metrics with 12 PHAB metrics to produce one overall IPI value (Rehn et al. 2018).

CSCI and PHAB IPI scores would be included in the reporting effort, as well as a discussion of other relevant BMI metrics (e.g., taxa richness, composition, tolerance, functional feeding groups, and habit measures). A synthesis of BMI, water quality, and PHAB data would be included in the reporting process. The SWAMP Stream Habitat Characterization Form, Full Version field forms, as well as all output data, would be provided in appendix format, along with representative photography of the sampling reaches.

The ultimate goal of the bioassessment study is to evaluate the environmental condition of both the identified sections of Funks Creek and Stone Corral Creek by using the indicators of stream condition, as described above. Along with the other studies described above, a comprehensive picture of baseline watershed conditions would be developed in order to inform the type of releases that should be made to Funks and Stone Corral Creeks under operating conditions. Based on the findings, recommendations of restoration projects for future consideration may also be included in the reporting process.

Timing: The fieldwork required to complete the bioassessment surveys would occur prior to construction of dams on Funks and Stone Corral Creeks to establish the baseline conditions. Post-construction monitoring would occur for 5 years, and if needed, up to 10 years after start of operations. The Authority and the relevant permitting agencies (CDFW and the Regional Board) would review the results of the 5 year monitoring and other relevant technical studies to determine if monitoring would need to occur past 5 years. The bioassessment specialists responsible for conducting the bioassessment surveys would coordinate directly with the permitting agencies to develop appropriate performance standards and success criteria for the BMI communities and PHAB conditions on both Funks and Stone Corral Creeks.

* + 1. **Temperature Study**

**Purpose:** To define temperatures under existing conditions and flow and storage effects on temperature in Stone Corral and Funks Creeks under post-construction conditions.

**Outcomes:** Temperature measurements before and after construction will be evaluated in combination with the flow characterization study (Section 2D.4.2) and Sites Reservoir storage data to evaluate:

* The temperatures that support the aquatic community under existing conditions, and
* Reservoir discharge needed to establish suitable temperatures in Stone Corral Creek downstream of Sites Dam and Funks Creek downstream of Golden Gate Dam after construction.

**Content:**

Once access to Stone Corral Creek is obtained, a temperature probe will be installed in Stone Corral Creek at the location of Sites Dam release, and 4 additional probes will be installed downstream from there by approximately 0.5 mile, 1 mile, 2.4 miles (near where Stone Corral Creek goes under Maxwell Sites Road), and 4.4 miles (near where TC Canal goes under Stone Corral Creek).

Once access to Funks Creek is obtained, a temperature probe will be installed in Funks Creek at the location of the I/O tower release to Funks Creek, and 2 additional probes will be installed downstream from there by approximately 0.5 mile and 1 mile (far enough upstream of Funks Reservoir to not be affected by Funks Reservoir). In addition, probes will be installed at the TC Canal inlet to Funks Reservoir, at the TC Canal outlet from Funks Reservoir, and at the Funks Creek outlet from Funks Reservoir.

As described in the RMP, once construction is complete, water temperature profiles will be measured near Golden Gate Dam once every two weeks at 5-foot depth intervals to inform decisions about which tiers of the I/O tower to use during March through October.

The temperature probes in the creeks will continuously record hourly temperatures. Temperatures recorded prior to reservoir construction will likely be close to the equilibrium values that would be expected based on ambient meteorological conditions. These temperatures will be used along with specific fish requirements to develop target temperature ranges for post-construction conditions.

Temperatures recorded after reservoir construction will be used along with flow and storage data to determine flow and storage effects on creek temperatures. If creek temperatures cannot be accurately estimated with flow, storage, and the reservoir temperature profiles, water temperature modeling will be performed for both Sites Reservoir and Funks and Stone Corral Creeks. If modeling is necessary, models would be calibrated with the measured flow, storage, and temperature data.

Water released into Stone Corral Creek will originate from the bottom of Sites Reservoir and will likely be cooler than equilibrium values during months when the reservoir is stratified. The biggest differential between release temperatures and equilibrium values will occur when the reservoir is full and ambient conditions are hot. If it is determined that flow should be maintained in Stone Corral Creek at times when releases would be relatively cool compared to temperatures under existing conditions, lower flows will allow the water to warm farther upstream than higher flows.

Water released to Funks Creek will originate from the I/O tower and, when the reservoir is stratified, will be warmer than the water released to Stone Corral Creek. The temperatures will be warmer because the withdrawals will come from higher in the reservoir and, as described in the RMP, the I/O tower ports/tiers openings will be chosen to provide 65 F or higher water temperatures during the rice growing season (May to September).

**Timing:** Water temperature measurements will occur before, during, and after construction. Measurements during the initial fill period will be useful for evaluating water temperature under low-storage conditions. Reservoir profile measurements and measurements at the Sites and Funks Creek releases may need to continue long-term. Measurements downstream of the release locations could be discontinued if the following conditions are met:

* Sites Reservoir has made releases for at least two years when the reservoir was at least 75% full.
* Flow and storage effects on creek temperatures are understood well enough that creek temperatures can be estimated within 3 degrees F based on meteorological conditions, flow, reservoir storage, and reservoir temperature profiles.

## Sediment Technical Studies Plan and Adaptive Management for Sacramento River

Purpose: Sediment monitoring and aquatic resource technical studies will be used to further refine the understanding of the effect(s) that entrainment of sediment in diversions has on fish species and potentially necessary adjustments to Project operations to address those effects on fish and provide the means of making those changes.

Outcomes: The sediment monitoring and aquatic resource technical studies would provide data necessary to further understand and refine real-time effects on sediment transport and its subsequent effect on fishery resources; impacts on migration rates, rates of predation, and foraging success. A Sediment Technical Team (STT) will use the results to adjust Project operations to minimize adverse effects on fish and explore whether operations could be implemented to benefit fish. The STT will be a multi-agency team that includes representatives from the Authority, Reclamation, California Department of Water Resources, NMFS, USFWS, CDFW, Central Valley Water Board, and U.S. Army Corps of Engineers (USACE).

Content: The Sediment Technical Studies Plan will consist of sediment monitoring and technical studies to assess the movement of sediment at the RBPP and Hamilton City Pump Station intakes and quantify amounts of entrained sediment. The results of the monitoring will be used to model sediment movement and determine whether sediment management actions are needed (e.g., the need for and feasibility of reintroducing sediment to the river or Delta would be considered).

Timing: Monitoring will begin a minimum of 5 years before start of operations to establish the baseline and will continue for 5 years after start of operations. Modeling will rely on existing sediment transport models and will begin as soon as the SST determines sufficient data are available to inform the models. The Authority and the permitting fish agencies (NMFS, USFWS, and CDFW) will determine the frequency of the sediment management report and timing of any adaptive management actions.

### Sediment Monitoring, Modeling, and Reintroduction

It is estimated that less than 5% of the sediment load in the Sacramento River could be entrained by the RBPP and Hamilton City Pump Station intakes, which may have slight effects on turbidity and therefore on delta smelt habitat (for an example see Chapter 11). However, there is uncertainty in this conclusion and a multi-step process will assess and, if necessary, minimize potential negative effects. The process will include multi-year monitoring and estimation of sediment entrainment during initial operations following Sites Reservoir construction; monitoring and modeling of potential effects relative to performance criteria based on the sediment entrainment estimates; and development and implementation of a sediment reintroduction plan should performance criteria have been exceeded. The process will be implemented by establishing a multi-agency STT of representatives from the Authority, Reclamation, NMFS, USFWS, CDFW, Central Valley Water Board, and USACE. The permitting fish agencies (NMFS, USFWS, and CDFW) will have approval authority for products developed during the process (e.g., monitoring plans and annual reports).

The monitoring program will involve monitoring and estimating sediment entrainment prior to and during the first several years of operations following Sites Reservoir construction. Monitoring duration will be subject to input from the STT and independent peer review but is anticipated to be at least 5 years to account for hydrological variability. Methods for estimating sediment entrainment will be determined during the planning phase and may include measurement of suspended sediment concentration and flow in the Sacramento River upstream and downstream of the RBPP and Hamilton City Pump Station intakes, as well as in the water diverted by each facility. Annual monitoring plans and results reporting will be reviewed by the STT, with initial and periodic independent peer reviews facilitated by the Delta Science Program, and will be subject to approval by NMFS, USFWS, and CDFW.

The second step of the process will involve monitoring and modeling of potential effects relative to performance criteria. The specifics of the performance criteria will be developed with the input of the STT and independent peer review. The performance criteria would confirm assumption that sediment in diversions is proportional to sediment in river and that less than 5% of the sediment load in the Sacramento River could be entrained by the RBPP and Hamilton City Pump Station intakes. These performance criteria are expected to include assessments of habitat indicators such as the percentage of time that turbidity at monitoring stations exceeds an established threshold (e.g., 12 nephelometric turbidity units) (Sommer and Mejia 2013). To account for the likely variability in sediment delivery caused by operations (i.e., sediment entrainment) and other factors (e.g., contribution of sediment from other tributaries), sediment modeling (e.g., using methods from Bever et al. 2018) will be used to approximate the incremental effects of operations given the estimates of sediment entrainment made during the first step of the process. Assessments of achievement of performance criteria will receive independent scientific peer review and will be subject to approval by NMFS, USFWS, and CDFW.

If the monitoring and modeling estimates of the second step indicate exceedance of performance criteria attributable to operations, the third step of the proposed process will be initiated. This step will involve development and implementation of a sediment reintroduction plan within 5 years of the end of step two. This plan will aim to reintroduce sediment to allow performance criteria to be met. Sources of sediment to be reintroduced may include proposed or existing facilities (e.g., forebays and canals) or locations unrelated to the Project and will account for factors such as sediment composition to meet performance criteria (e.g., fine particles for turbidity) and reintroduction location. Subject to approval by NMFS, USFWS, and CDFW, alternative means of achieving performance criteria may also be considered (e.g., restoration of turbid tidal habitat in the vicinity of areas that do not appear to be achieving performance standards). Modeling (e.g., using methods such as those of Bever and MacWilliams 2018, Bever et al. 2018) may be used to optimize sediment reintroduction locations relative to performance criteria to be achieved. The sediment reintroduction plan will be prepared to meet required permitting standards from the Central Valley Water Board and USACE. The sediment reintroduction approach will be consistent with objectives for turbidity in the Central Valley Water Board’s Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. The STT and independent peer review facilitated by the Delta Science Program will review and provide input on the proposed sediment reintroduction plan and annual reports of its implementation and monitoring to assess achievement of performance standards. The sediment reintroduction plan and reports of its implementation and effectiveness will be subject to approval by NMFS, USFWS, and CDFW.

## Fish Monitoring and Technical Studies Plan and Adaptive Management for Diversions

Purpose: The fish monitoring and technical studies plan will be part of an adaptive management process to address potential impacts on fish survival associated with diversion facility operations at the RBPP and Hamilton City Pump Station intakes. The results of the studies will be used in conjunction with existing and new aquatic monitoring to inform real-time operations and further assess impacts of operations.

Outcomes: The technical studies will describe factors such as baseline conditions, including juvenile salmonid migration survival prior to project operations, compliance with protective criteria for screen hydraulics, and changes to baseline conditions as a result of Project operations. The technical studies will inform whether modifications are needed to ensure adequate protection of fish. The studies will provide the data and reports necessary to document compliance with fish screen NMFS and CDFW performance criteria and will be submitted to NMFS, USFWS, and CDFW for review. The studies will also be used to quantify the amount of take of listed species that may occur and to inform any decisions regarding changes in Project operations needed to ensure that take of listed species remains below authorized levels. A Technical Study Technical Team (TSTT) will use the results to determine what actions may be needed (e.g., adjustments in diversion operations timing or limits on amount of flow diverted) to address impacts on fish resources. The TSTT will be a multi-agency team that includes representatives from Reclamation, the Authority, NMFS, USFWS, and CDFW.

Content: The technical studies will meet agency data collection and reporting requirements and will consist of at least four studies: a fish distribution and density study, a juvenile salmonid survival rates study, a predator density and distribution study, and a long-term hydraulic fish screen evaluation study.

Timing: Studies will commence subsequent to approval of the project (expected in October 2023) to collect baseline information and continue for at least 5 years subsequent to the initiation of diversions associated with filling Sites Reservoir. The studies will likely occur periodically thereafter for the life of the Project.

### Technical Studies

The technical studies will be implemented by Reclamation and the Authority with input from the TSTT. Sub-teams may be necessary to address groups of related studies. The permitting fish agencies (NMFS, USFWS, and CDFW) will have approval authority for products developed during the technical studies (e.g., study plans, annual reports, and final reports), with independent peer review of key products facilitated by an entity such as the Delta Science Program. and where possible will integrate into, or include ongoing studies at existing project facilities.If the technical studies anticipate resulting in take of listed species, appropriate permits will be obtained prior to their initiation (e.g., biological opinions from NMFS/USFWS and an state incidental take permit from CDFW) in order to avoid, minimize, and mitigate for take, e.g., by limiting capture methods or handling of listed species to what is necessary to achieve study objectives.

The overarching purpose of these technical studies is to confirm accuracy of anticipated levels of impact, further refine and understand the mechanism(s) by which Project operations affect aquatic resources, identify hypotheses for testing ways to diminish potential adverse effects of the Project on aquatic resources, and explore ways in which the Project operations can further benefit fish populations. Sections 2D.5.1.1 through 2D.5.1.4 discuss the specific objectives and assessment types associated with each technical study. Performance standards would be developed as part of individual study plans, with the approval of the permitting fish agencies, and may consist of assessing factors such as whether diversion operations have resulted in statistically significant changes in monitored outcomes (e.g., fish distribution and migration survival).

#### Technical Study 1: Fish Density and Seasonal Distribution

Objective: Determine densities and seasonal distributions of all key fish species and life stages anticipated to be present during intake operations as identified by TSTT and as described by conceptual models/professional understanding.

Assessments:

* Determine the seasonal and geographic distribution of each life stage of key species in the vicinity of the diversion locations.
* Evaluate the densities of each life stage of key fish species inhabiting the Sacramento River adjacent to the diversion sites.
* Determine the fish length frequency distribution of all life stages of covered fish species observed at each of the proposed diversion sites.
* Determine the spatial distribution of each life stage of covered fish species inhabiting the Sacramento River uniform within the river water column and laterally across the channel width. Evaluate whether or not the spatial distribution varies between day and night.
* Determine the distribution and densities of covered fish species and how they respond to variation in Sacramento River flow and other environmental conditions such as turbidity, water temperature, and dissolved oxygen.

Timing: Pre-construction and Post-Construction monitoring.

#### Technical Study 2: Juvenile Salmonid Survival Rates

Objective: Update baseline survival rates for juvenile Chinook salmon and steelhead in the Sacramento River in the vicinity of the RBPP and Hamilton City Pump Station intakes and compare to survival rates following commencement of Project operations in the same areas.

Assessments:

* Conduct site-specific studies to assess survival of juvenile Chinook salmon and steelhead migrating downstream in the Sacramento River in the vicinity of the diversions and determine how survival rates vary within and among years and by species within biological criteria established from Technical Study 2, *Baseline Juvenile Salmonid Survival Rates*.
* Evaluate whether fish size, season, species, flow, velocity, turbidity, and migration rates predict juvenile salmonid inter-reach or intra-reach survival rates.
* Determine if there is sufficient statistical power to detect if biological criteria are being met for juvenile Chinook salmon and steelhead survival in the vicinity of the Proposed Action intakes.

Timing: Post-construction.

#### Technical Study 3: Predator Habitat Density, and Distribution

Objective: Identify the physical locations and biological characteristics of areas where predatory fish congregate, and develop design and management criteria to reduce predation risk and compare to predator densities and distribution in the same areas following commencement of Project operations.

Assessments:

* Determine the physical locations and biological characteristics of areas where predatory fish congregate at the existing RBPP and Hamilton City Pump Station intakes.
* Determine the appropriate design and management criteria to reduce predation risk given the information obtained from RBPP and Hamilton City Pump Station intakes.
* Collect and update information on densities, species, and size composition of predatory fish (and piscivorous birds and mammals, if deemed appropriate) in the Sacramento River in the reaches containing the diversions and determine how these data vary within and among years and by sampling location.
* Update information on how predator densities vary by season and in response to changes in Sacramento River flow, water temperatures, turbidity, time of day, and other factors (e.g., flow velocity, areas of turbulence, and proximity to shorelines and structures in the river.
* Update studies on diet and selection of prey species of concern for predators inhabiting the Sacramento River and evaluate how diets vary by species, relative sizes of predator and prey, and time of year.
* Determine whether Project operations affect predator populations and predation rates on prey species of concern, and whether adjustments to diversion rates or timing are needed to minimize or mitigate any adverse effects

Timing: Pre-Construction and Post-Construction.

*

#### Technical Study 4: Refugia Field Study

Objective: Evaluate the effectiveness of using refugia as part of intake structures to provide holding habitat for juvenile fish to recover from swimming fatigue and to avoid exposure to predatory fish.[[5]](#footnote-6)

Assessments:

* Determine to what extent do juvenile salmonids use refugia at the RBPP intake.
* Evaluate whether the use of refugia increase the probability of survival past the intakes.
* Determine the screen passage time at the RBPP intake in relation to water velocity, and how is it affected by refugia use.

Timing: Pre-Construction and Post-Construction

#### Technical Study 5: Long-Term Hydraulic Fish Screen Evaluation

Objective: Conduct a long-term evaluation of fish screen hydraulic performance at RBPP and GCID Main Canal at Hamilton City through field hydraulic evaluations to set and confirm fish screen porosity controls for anticipated operations.

Assessments:

* Determine what baffle settings are necessary to control fish screen porosity and confirm compliance with design criteria.
* Evaluate fish screen performance under winter diversion and flow scenarios to verify continuing compliance with state and federal screen performance standards, including assessment of screen approach velocities and sweeping velocities at the screens.
* Update evaluation of flow split at the oxbow containing the Hamilton City Pump Station intake under winter diversion conditions and determine fish response to the flow split.

Timing: Post-Construction.

#### Technical Study 6: Operations and Maintenance Updates

Objective: Identify and refine operations and maintenance requirements associated with the proposed operations, including screen cleaning, sediment/debris handling, pump operations, and project staffing requirements.

Assessments:

* Determine the operations and maintenance requirements associated with the proposed operations.
* Determine what updates are necessary to proposed operations and maintenance requirements over time.

Timing: Post-Construction.

### Aquatic Monitoring

Several aquatic monitoring elements will assist in assessing and limiting potential Project operations effects: rotary screw trapping; entrainment/impingement monitoring; fish attraction to during releases of water from Sites Reservoir; and presence of fish in forebays following fish screen overtopping events. Similar to the technical studies previously described, aquatic monitoring will be implemented by Reclamation and the Authority with input from a multi-agency Aquatic Monitoring Technical Team (AMTT) that includes representatives from Reclamation, the Authority, NMFS, USFWS, and CDFW. Sub-teams may be formed to address different aquatic monitoring elements. The permitting fish agencies (NMFS, USFWS, and CDFW) will have approval authority for products developed during the process (e.g., monitoring plans and annual reports), with independent peer review of products facilitated by an entity such as the Delta Science Program. Below are summaries of the monitoring elements.

#### Rotary Screw Traps

Real-time Project operations will largely be informed by flow criteria and assessment of fish catches at existing, ongoing rotary screw trap monitoring locations at Red Bluff (River Mile [RM] 243), Hamilton City (RM 205), Tisdale (RM 120), and Knights Landing (RM 87.5). Following existing protocols, rotary screw traps will be checked on a daily or near-daily basis, with adjustments to monitoring frequency based on seasonal fish occurrence.

#### Entrainment and Impingement

Entrainment monitoring will be conducted where feasible at the RBPP and GCID Main Canal at Hamilton City Pump Station intakes. The monitoring is anticipated to include use of fyke nets and may also include larval light traps. The feasibility of entrainment monitoring will be assessed based on the available facilities (e.g., structures on which to attach fyke nets or place larval light traps). Impingement monitoring will occur along the face of the fish screens and may include the use of diver surveys or wiper blade-mounted video cameras if feasible. The frequency and extent of entrainment and impingement monitoring will be developed based on input from the AMTT, permitting fish agencies, and independent peer review.

#### Stranding Behind Screens

Very high river flows can result in overtopping of the fish screens at the RBPP and Hamilton City Pump Station intakes. Monitoring (e.g., with seines or trawls in forebays behind the fish screens) will be conducted at the intakes after overtopping events (i.e., when flows are receding) to characterize the extent to which fish are stranded behind the screens. It is anticipated that this monitoring will be required for a limited number of overtopping events and will be subject to input from the AMTT, permitting fish agencies, and independent peer review.

## Land Management Plan

Purpose: The Authority will prepare a Land Management Plan (LMP) to protect wildlife resources during management and maintenance activities on all non-recreation lands held in fee or easement (including the Project buffer) by the Authority. This plan will include management actions for buffer areas and the specific type and frequency of maintenance activities by location. Land management, maintenance, and monitoring actions for any mitigation areas owned by the Authority will also be described in the LMP. These activities will include vegetation maintenance and rodent control.

Outcomes: The LMP will ensure that the Authority and maintenance personnel are aware of the locations where sensitive wildlife resources may be present and what steps will be taken prior to work in these areas. As part of the LMP reporting requirements, annual reports will include recommendations as needed to improve and refine land management procedures for the Project.

Content: The LMP will include the following components.

* A statement of purpose, including the role of the LMP in satisfying regulatory compliance obligations under state and federal laws.
* Land management, maintenance, and monitoring actions for any mitigation areas owned by the Authority.
* The type and frequency of maintenance activities by location and whether pre-activity wildlife surveys or monitoring of work will be required.
* The frequency, timing, and duration of wildlife surveys or monitoring, if required, and the qualifications of the biologist conducting surveys or monitoring.
* General measures and practices when working in or near habitat for special-status wildlife (e.g., ensure appropriate distance from habitat as described by state or federal protocols, restrict nighttime work, restrict work during nesting season if work is performed near trees).
* The procedure for reporting incidental injury or mortality of federal or state listed species.
* Clear statements about the Authority’s, hired staff’s, and qualified contractor’s responsibilities for implementing LMP requirements.
* Identification and mapping of sensitive habitats and vegetation, including special-status plant populations, sensitive natural communities, wetlands, and non-wetland waters, that were avoided during construction so that signs, fencing, or other exclusion practices are implemented during operation and maintenance activities and these areas are avoided.
* Description of annual reporting requirements, as approved by regulatory agencies.

The LMP will require a qualified biologist to provide annual training to maintenance personnel on the general measures and practices described in the plan and to document the surveys and monitoring conducted. A qualified biologist with knowledge or oversight of LMP measures and implementation will prepare an annual report summarizing the steps that were taken to minimize impacts on wildlife resources by December 31 of each year. This report will be submitted to USFWS and CDFW by January 31 of the following year. Each annual report will include the following information.

* The date of annual training, the name of the biologist who gave the training, and a list of attendee names and signatures.
* A summary of the measures and practices implemented during any work in or near habitat.
* A summary of wildlife surveys and monitoring that were conducted that year, including the type of maintenance activity for which surveys or monitoring was required, the date(s) and location(s) of the survey(s) or monitoring, the name of the qualified biologist, and observations of the target special-status species or other special-status wildlife during the surveys or monitoring.
* Any problems that were encountered by maintenance staff during implementation of general measures or by biologists conducting surveys or monitoring and an assessment of the success of the LMP in avoiding and minimizing effects on special-status wildlife and their habitats.
* Recommendations for improving existing practices and methods for Project implementation, if needed.
* Assessment of the success of the LMP measures, practices and methods.

Timing: The Authority and its qualified contractors will complete preparation of the LMP within 1 year of the first fee title acquisition by the Authority and will amend the LMP as needed as additional lands are acquired.

## Recreation Management Plan

Purpose: The Authority will prepare a Recreation Management Plan to describe the types, management, maintenance and monitoring activities on all Project recreation lands and areas and related to recreation. This plan will describe the coordination with Glenn and Colusa Counties to support to provide emergency services at the recreational facilities and will describe requirements for fire suppression in the recreation areas.

Outcomes: Implementing the Recreation Management Plan will ensure the Authority safely manages recreational facilities in coordination with Glenn and Colusa County to ensure appropriate emergency response resources are available to respond to emergencies at the recreation areas.

Content: The Recreation Management Plan will:

Support the existing emergency services and personnel by:

* Defining specific characteristics of the recreation areas and facilities expected to need emergency services and refine expected numbers of visitors based on the final design of the recreational facilities.
* Defining and describing the expected needs of each emergency service provider based on the specific characteristics of the final design of recreation areas using standards such as the National Fire Protection Association 1710 Standard for the Organization and Deployment of Fire Suppression Operations.
* Developing different measures, including but not limited to assessing the need for and considering funding of emergency response staff and purchasing equipment, incorporation of helicopter pad within the proposed footprint of a recreational area, to support service standards and response times based on the characteristics of the final design of the recreation areas.
*

Avoid fires and reduce fire risk in Recreation Areas by:

* Exercise precautions, such as monitoring the National Weather Service for Red Flag Warning events, to notify recreationists of enhanced fire danger.
* Describe procedures and policies for evacuating and reporting any fires that are on the facility sites, and other related fire prevention and control procedures, and descriptions of other actions that would reduce the risk of ignition and facilitate immediate control of an accidental fire.
* Maintain fire-suppression equipment (e.g., fire extinguishers, fire blankets) at recreational facilities, as well as in the administrative buildings.
* Create wildfire awareness signage at locations where recreationists or maintenance staff will likely be, these include at entrances to recreation areas and at kiosks for boats
* Provide a list all major potential fire hazards to promote caution and awareness on site.
* Assign and enforce all areas as designated no-smoking areas, no fireworks, and no other potential fire ignitation source; camp fires will be limited during Red Flag Warning Events.
* Enact fuel management and vegetation reduction practices in select locations in the Recreation Areas to reduce fuel load and maintain clear roadways.

Avoid and reduce disruption of sensitive habitats in Recreation Areas by:

* Identifying and mapping sensitive habitats and vegetation, including special-status plant populations, sensitive natural communities, wetlands, and non-wetland waters, that were avoided during construction of recreation areas
* Establishing signs, fencing, or other exclusion practices during operation and maintenance activities in the recreation areas so the mapped sensitive areas are avoided.

Support management of Recreation traffic through Maxwell by:

* Controlling and slowing expected recreational traffic through Maxwell in coordination and consultation with Colusa County
* Describing and implementing specific locations for lighted pedestrian crossings, stop signs, and other traffic calming features; identify specific timing for implementing these features with the County prior to the full opening of all recreational facilities.

Timing: The Authority will complete the Recreation Management Plan at least one year prior to the opening of Project recreational facilities.

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1. The Planktonic HAB advisory signs are available in both English and Spanish through the California Water Quality Monitoring Council at the following Web address: <https://www.mywaterquality.ca.gov/habs/resources/habs_response.html>. [↑](#footnote-ref-2)
2. The average methylmercury concentrations shall not exceed 0.2 milligrams per kilogram (mg/kg) fish tissue within a calendar year. The water quality objective must be applied to trophic level 3 or trophic level 4 fish, whichever is the highest existing trophic level in the water body. The objective applies to the wet weight concentration in skinless fillet. Freshwater trophic level 3 fish are between 150 to 500 millimeters (mm) in total length and trophic level 4 fish are between 200 to 500 mm in total length, or as additionally limited in size in accordance with the “legal size” set for recreational fishing, established by Title 14, California Code of Regulations 14 §§ 1 - 53.03. [↑](#footnote-ref-3)
3. For evaluating compliance with the sport fish objective, monitoring will include representative TL4 fish species, if present, or TL3 fish if no TL4 fish are present in the reservoir. A sample will be considered either an analytical result from individual fish tissue or a composite of tissue from several fish. Sample sets for comparison with the sport fish objective shall include a range of TL3 fish between 150 to 500 mm total length and TL4 fish between 200 to 500 mm total length. [↑](#footnote-ref-4)
4. https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow [↑](#footnote-ref-5)
5. Refugia are small depressions in the intake structure with bar racks to exclude larger predatory fish that can act as rest areas and areas to avoid predation. [↑](#footnote-ref-6)