A. Background

As stated in the Notice of Preparation (NOP), issued by the Department of Water Resources (DWR) on January 15, 2020, "DWR's underlying, or fundamental, purpose in proposing the project is to develop new diversion and conveyance facilities in the Delta necessary to restore and protect the reliability of State Water Project (SWP) water deliveries and, potentially, Central Valley Project (CVP) water deliveries south of the Delta, consistent with the State's Water Resilience Portfolio." The potential connection to the CVP was included in the NOP, but at this time the Bureau of Reclamation is not participating in development of the proposed Delta Conveyance Project.

As directed by the Governor, DWR has initiated the environmental planning process and preparation of a Draft Environmental Impact Report (Draft EIR), with issuance of the NOP, under the California Environmental Quality Act (CEQA) for a single tunnel option to modernize Delta conveyance. Modernizing Delta conveyance is referenced in the State's Water Resilience Portfolio, which describes the framework to address California's water challenges and support long-term water resilience and ecosystem health. Delta conveyance, along with other complementary projects described in the State's Water Resilience Portfolio are intended to address California's water needs, including actions to improve water recycling, recharge depleted groundwater reserves, strengthen existing levee protections and improve Delta water quality.

At the initial stages of environmental review in early 2020, DWR issued a NOP that identified the proposed project, referred to as the Delta Conveyance Project, as a 6,000 cubic feet per second (cfs) project following either the central or eastern corridor for a single tunnel connecting to a new forebay located in the south Delta adjacent to the existing State Water Project pumping facilities. At the direction of the U.S. Army Corps of Engineers (USACE), DWR's earlier application proposed two possible corridor options but identified the eastern corridor as the proposed action for purposes of initiating and processing the Section 404 application as well as to formally engage USACE in early coordination with DWR's CEQA process regarding environmental review under USACE's process for compliance with NEPA. Additionally, on June 15, 2020, DWR submitted a revised Aquatic Resources Delineation for the proposed Delta Conveyance Project and requested that the USACE issue a Preliminary Jurisdictional Determination based on this delineation. On June 18, 2020, USACE verified this Aquatic Resources Delineation. DWR acknowledged that this was a preliminary decision and not necessarily an indication of the proposed project DWR intended to identify in the Draft EIR.

Since that time, DWR has continued preparation of the Draft EIR in compliance with CEQA, including identifying and evaluating alternatives, and incorporating the results of design and engineering work in support of this analysis. As this work has continued, it has become clear that the Bethany Alternative, which, in general, extends the eastern corridor tunnel alignment to the existing Bethany Reservoir and avoids development of a new forebay in the south Delta, would reduce certain environmental effects under CEQA, and have less fill activities and impacts on wetlands and waters of the United States. DWR recognizes that the reduction of effects to wetlands and other waters of the United States within the USACE's jurisdiction is an important component of the overall planning process and specifically the Section 404 permit process. Because of this reduction in effects, DWR notified USACE on November 22, 2021 of its intent to change the proposed project to the Bethany Alternative for the Draft EIR and the Section 404 application. To follow-up on this initial notification of the change in the proposed project, DWR is amending its Section 404 permit application to reflect this change and has submitted a revised Aquatic Resources Delineation which was verified by USACE on March 10, 2022. Updated information describing the Bethany Alternative is provided below in this updated continuation sheet for the Delta

Conveyance Project. Identification of the Bethany Reservoir alignment as the proposed project for the Draft EIR does not indicate that DWR has in anyway approved the Delta Conveyance Project nor that, if DWR does determine to approve a project, that the Bethany Reservoir alignment will ultimately be the project that DWR approves. While DWR is identifying the Bethany Alternative as the proposed Delta Conveyance Project for purposes of this application, it is legally restricted from making a final decision on any project until after addressing public comments on the Draft EIR and making all necessary findings and approvals as part of the CEQA process.

The Delta Conveyance Project would involve the construction, operation, and maintenance of new conveyance facilities in the Delta that would be added to the existing SWP infrastructure, creating a dual-conveyance system. New intake facilities as new points of diversion would be located in the north Delta along the Sacramento River with a tunnel and appurtenant facilities to convey water to the existing Bethany Reservoir.

The existing SWP water conveyance facilities located in the Delta include Clifton Court Forebay, the John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility), and the Harvey O. Banks (Banks) Pumping Plant. These facilities, located in the south Delta, enable DWR to divert and convey water into the California Aqueduct for deliveries to SWP contractors located to the south of the Delta.

DWR is submitting this amended application (SPK-2019-00899) to USACE because of the change to the initially identified proposed project and because development of the project would result in discharges of fill material into waters of the U.S.

B. Additional Application Form 4345 Data
The following information is provided as a supplement to **ENG FORM 4345** and is provided in the same order in which information is requested on the form.

Block 13. NAME OF WATERBODY

The proposed project is located in the Sacramento-San Joaquin Delta and would affect waters of the U.S. within the Delta. The aquatic resources affected by the proposed project can be found in **Attachment 1, Mapbook of Impacts.** The proposed project would involve the construction of temporary or permanent facilities in the following navigable waters: Black Slough, Burns Cutoff, Sacramento River, and unnamed tributaries to Snodgrass Slough and within the Stone Lakes complex. The proposed project would also include subsurface tunnel crossings under the following navigable waters: Beaver Slough, Disappointment Slough, Hog Slough, Middle River, Mokelumne River, Old River, the Stockton Deep Water Ship Channel/San Joaquin River, Sycamore Slough, Victoria Canal, West Canal, Whiskey Slough, and White Slough. The proposed project facilities are listed in Table 1 below.

Table 1 – Navigable Waters Potentially Affected by the Proposed Project

Construction Feature	Waterway	Latitude	Longitude
Intake B	Sacramento River	38.38179	-121.52035
Hood-Franklin Road Improvements	Stone Lakes Complex	38.36559	-121.509609
Intake C	Sacramento River	38.350575	-121.532982

Underground SCADA Fiber Route	unnamed tributary to Snodgrass Slough	38.320493	-121.499731
Underground Power	unnamed tributary to Snodgrass Slough	38.320264	-121.500002
Underground Power	unnamed tributary to Snodgrass Slough	38.320225	-121.497702
Tunnel	unnamed tributary to Snodgrass Slough	38.319826	-121.500394
Tunnel	unnamed tributary to Snodgrass Slough	38.319122	-121.498701
Tunnel	unnamed tributary to Snodgrass Slough	38.270155	-121.455961
Tunnel	unnamed tributary to Snodgrass Slough	38.266354	-121.456196
Tunnel	Mokelumne River	38.257256	-121.45676
Tunnel	Beaver Slough	38.20428	-121.441046
Tunnel	Hog Slough	38.174785	-121.433625
Tunnel	Sycamore Slough	38.14578	-121.435817
Tunnel	White Slough	38.083161	-121.437828
Tunnel	Disappointment Slough	38.043147	-121.433492
Tunnel	San Joaquin River	37.997898	-121.428584
Tunnel	SJ River/Stockton Deep Water Ship Channel	37.995132	-121.428283
Lower Roberts Island Access Road, Power, and SCADA	Black Slough	37.983919	-121.423257
Lower Roberts Island Access Road and Railroad	Burns Cutoff	37.966285	-121.371386
Tunnel	Whiskey Slough	37.957268	-121.456008
Tunnel	Middle River	37.905582	-121.499211
Tunnel	Middle River	37.90324	-121.50064
Tunnel	Victoria Canal	37.877365	-121.51638
Tunnel	Old River	37.848808	-121.540643
Tunnel	West Canal	37.830218	-121.553638

Block 15. LOCATION OF PROJECT

The location of the proposed project is shown in **Attachment 2, Proposed Delta Conveyance Project Overview Map**. The northern-most component of the project is located at approximate Latitude 38.457847° North and Longitude -121.501379° West, while the southern-most component is located at approximate Latitude 37.752521° North and Longitude -121.575718° West.

Block 16. OTHER LOCATION DESCRIPTIONS

The components of the proposed project are located within Sacramento, San Joaquin, Contra Costa, and Alameda Counties.

Block 17. DIRECTIONS TO THE SITE

Portions of the proposed project work areas can be accessed from public roads such as Interstate 5, Interstate 580, State Route 12, and State Route 4. See the figures at **Attachment 2, Proposed Delta Conveyance Project Overview Map** for locational information.

Block 18. NATURE OF ACTIVITY

Project Facilities

See **Attachment 2, Proposed Delta Conveyance Project Overview Map,** for an overview map of proposed project facilities.

The proposed project consists of the following facilities:

- Intake B – 3,000 cfs with Cylindrical Tee Fish Screens
- Intake C – 3,000 cfs with Cylindrical Tee Fish Screens
- Tunnels
- Tunnel Reception Shaft at Intake B
- Tunnel Maintenance Shaft at Intake C
- Twin Cities Complex Double Launch Shaft
- New Hope Tract maintenance shaft
- Canal Ranch Tract maintenance shaft
- Terminous Tract reception shaft
- King Island maintenance shaft
- Lower Roberts Island double launch shaft
- Upper Jones Tract maintenance shaft
- Union Island maintenance shaft
- Surge Basin Reception Shaft (at Bethany Complex)
- Bethany Complex (including the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueduct, and Bethany Reservoir Discharge Structure)
- Reusable Tunnel Material Handling and Storage
- Road Improvements
- Park-and-Ride Lots
- Rail-Served Material Depot at Lower Roberts Island tunnel launch shaft site

- Electrical Facilities
- SCADA Facilities
- Fencing and Lighting
- Concrete Batch Plants
- Fuel Stations and Fuel Storage
- Emergency Response Facilities
- Standby Engine Generators

Calculations regarding the overall temporary and permanent acres affected by the proposed project are shown in Table 2, below. These acreages include all major project features, railroad and road work, power, SCADA, and construction support facilities. Geotechnical investigation zones and fault study areas are not included.

Table 2. Temporary Construction and Permanent Acreage for the Proposed Project

Footprint	Sum of Acres
Permanent Subsurface Area	671.81
Permanent Surface Area	1,313.75
Temporary Subsurface Area	1.95
Temporary Surface Area	1,235.67
Total (acres)	**3,223.18**

Description of Project Facilities

Intakes

The Delta Conveyance Project would allow for the diversion of water from the Sacramento River in the north Sacramento-San Joaquin River Delta (Delta), which would be conveyed to the Bethany Reservoir in the south Delta.

Two intakes (Intakes B and C) would be located along the Sacramento River eastern bank between Freeport and the Sacramento River confluence with Sutter Slough. Each intake would have a capacity of 3,000 cfs. The Intake B site would be located at approximately River Mile 39.4, approximately one mile upstream of the community of Hood. The Intake C site would be located at approximately River Mile 36.8, immediately upstream of the northeast end of Randall Island. The boundaries of the total site used for construction of Intake B and facilities would encompass approximately 242 acres and the post-construction site would encompass approximately 123 acres. The boundaries of the total site used for construction of Intake C and facilities would encompass approximately 239 acres and the post-construction site would encompass approximately 109 acres.

The locations of construction features described for Intakes B and C are referenced in the mapbook as "Intake Site" and "Intake Work Area".

Intakes: Construction

Intake features would include state-of-the-art cylindrical tee fish screens, intake structures, sedimentation basins, sediment drying lagoons, flow control structures, intake outlet channel and intake outlet shaft, embankments, and other appurtenant structures. Intakes would also include associated facilities to support construction and operations of the intakes. During construction, the intake footprints would contain areas for standby engine generators, staging and management of construction equipment and materials, and ground improvement and slurry cutoff wall material preparation areas. Standby engine generators would be permanently installed at the intakes. Construction access to the intake sites would be from new access/haul roads. Permanent intake footprints when construction is complete would be smaller once certain construction-related features are removed. The intake outlet shaft would serve as the tunnel boring machine (TBM) reception shaft (at Intake B) or maintenance shaft (at Intake C) during construction.

Installing the intake facility would require construction of a temporary cofferdam for in-river portions of intake construction to divert water and aquatic organisms around the work site and create a dry work area. Portions of the cofferdam would consist of interlocking steel sheet piles installed using a combination of vibratory and impact pile driving. Vibratory pile driving is a method by which the pile is vibrated into the soil beneath the site as opposed to being hammered in, as occurs in impact pile driving. Noise associated with the vibratory pile driving is considerably lower than noise associated with impact hammer pile driving. To minimize noise and other disturbances from pile driving, vibratory pile driving would be used to the extent possible where supported by additional geotechnical information. All pile driving would be restricted to the daytime hours between 7:00 a.m. and 7:00 p.m. and would not occur at night. Based upon preliminary geotechnical information, it is anticipated that the impact pile driving would occur at the Intake B for a total of 5.4 hours and less than 1 hour for Intake C. Each intake sheet pile construction period would be staggered by about 1 year.

Constructing the intakes along the riverbank would require relocating the federal project levee (under USACE jurisdiction) and State Route (SR) 160 prior to building the intake structure and fish screens. The federal (“jurisdictional” or “project”) levee was constructed as part of the Sacramento River Flood Control Project Levee program established by the USACE to provide flood management for surrounding lands. A temporary jurisdictional levee would be built at the intake sites east of the existing levee to reroute SR 160 and maintain continuous flood protection during construction of the new intake facilities.

The temporary levee would also facilitate construction sequencing of the permanent jurisdictional levee around the perimeter of the intake sedimentation basin. The level of flood control afforded by the existing levee would be maintained during and after construction.

A cofferdam would be constructed along the water side of the Sacramento riverbank to provide a dry workspace for intake structure construction. Following construction of the intake structure and the permanent levee system on the land side of the temporary levee, the area to the east of the intake structure would be backfilled and SR 160 would be relocated on top of the backfill along the Sacramento River.

The intake structure and the temporary and permanent levees, including the sedimentation basin and intake outlet channel embankments would be designed to protect the site and surrounding area from the 200-year flood event with sea level rise and climate change and 3-feet of freeboard. Modeling for design assumed the most extreme sea level rise of 10.2 feet at year 2100, scaled to how it would affect conditions in the Sacramento River. This level of protection exceeds the requirements of both the USACE and CVFPB. During a later phase of construction, once the sedimentation and outlet channel levee embankments are complete to the 200-year peak flood elevations plus climate change, sea level rise, and 3 feet of freeboard, the top of the intake outlet shaft would be adjusted to the bottom of the intake outlet channel.

Prior to construction of the intakes, slurry cutoff or sheet pile walls would be constructed around the site to reduce water infiltration from the river and groundwater dewatering impacts.
All in-water construction activities where special-status species are known or have a potential to occur would be conducted during the allowable in-water work windows established by the USFWS, NMFS, and CDFW for the protection of special-status fish or wildlife species (June through October).

The table below provides the estimated pile and drilled pier quantities and preliminary estimated tip elevations based on NAVD88 datum. However, not all of the piles identified in the table below would be placed in the High Tide Line. For more information on the piles, see Table 3.

Table 3. Preliminary Estimated Pile and Drilled Pier Information

Intake Number	Length of cofferdam and training wall sheet pile system (feet)	Approximate number of piles ("Z" sheet pairs)	Preliminary cofferdam sheet pile tip elevations (ft)	Approximate number of drilled piers within cofferdam	Preliminary pipe pile tip elevation
B	2,261	493	-60	1,230	-100
C	2,338	509	-55	1,230	-100

Permanent paved roads and gravel-surfaced roads and work areas would be constructed at intakes for use during construction and later during operations. At Intake B, approximately 9,300 feet of 24-foot-wide paved permanent roads would be installed on the intake site toward the end of construction. Several 24-foot-wide paved internal roads would be constructed around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. About 6,800 feet of 20-foot-wide gravel roads with chip seal would be constructed around the sediment drying lagoons, along the length of the sedimentation basin parallel to SR 160, and to provide access along the sediment loading areas. All construction access and the primary maintenance access to the intake site would be from the intake access road.

Intake C would also have approximately 6,900 feet of 20-foot-wide gravel roads with chip seal around the same facilities as at Intake B. About 8,300 feet of paved permanent roads would be installed at Intake C near the end of construction, along with 24-foot paved internal access roads around the base of the intake outlet shaft area, along the top of the embankments, and on ramps up the side of the embankments. All construction access and the primary maintenance access to the intake site would be from the intake access road.

Although some in-water work would be necessary for construction of the intakes (encroachment during construction ranges from 130 feet at Intake B to 157 feet at Intake C from the shoulder of SR 160), the Sacramento River would always remain open to boat traffic during construction. The width of the river near the intakes (approximately 500 feet at Intake B and 640 feet at Intake C) would allow for passage of the types of boats typically observed on the Sacramento River. Construction of the alternatives would not require modification to existing deep water channels, interfere with Port of Stockton navigation, or substantially increase the volume of barge movement within the study area, such that existing marine traffic would be disrupted because of small number of barge trips proposed.

Tugboats and barges would be used to a limited extent during the latter part of intake construction on the Sacramento River. In general, not including a few days of mobilization and demobilization, tugboats, barges, and other construction vessels would be used for up to 47 round trips for Intake B and 37 round trips for Intake C at the end of the construction period to excavate the river bottom and place riprap along the levee after removing the cofferdam. Conflicts with marine transportation (commercial and recreational) would not occur because of the limited use of barges and tugboats for construction. It is anticipated that barges would be used for a short period of time at the intakes to deliver riprap rock for placement and to remove dredged spoils following removal of the cofferdam at the end of the construction period. No barge landings would be required. A limited number of barges would also be used to perform the pile installation method test program and barges, ships, or boats may be used to conduct overwater borings and testing.

Intakes: Operation

At each intake, water would flow through cylindrical tee fish screens mounted on the intake structure to a sedimentation basin before reaching the intake outlet (tunnel inlet) shaft at each site. These shafts would have an inside diameter of 83 feet. During operations, shafts at intakes would serve as intake outlet shafts to convey water into the tunnel system as well as for maintenance access to the tunnel. All tunnel shafts would be maintained during operations to provide access if ever needed.

During diversion operations, water would flow from the Sacramento River through the fish screens to a 60-inch diameter pipe. Control gates would regulate the flow through each screen unit to the sedimentation basin.

Diverted water would contain sediment suspended in the river water that would be collected in a sedimentation basin. Each intake would have one sedimentation basin divided into two cells by a turbidity curtain. Water would flow from the intake through the sedimentation basin and through a flow control structure with radial gates into the outlet channel and shaft structure that would be connected to the tunnel system.

The screen and intake design would allow sufficient flow velocities in diversion pipes to sweep sediment into the sedimentation basin and prevent it from settling in the piping system. Once the diverted water enters the sedimentation basins, larger sand and silt sediment particles would settle while smaller silt and clay particles would be carried into the tunnel. A flow control structure with four large radial gates and one smaller gate would control the water level in the sedimentation basin and discharge flow into the intake outlet channel and outlet shaft. Tunnel and aqueduct velocity would be sufficient to transport these smaller particles to the Bethany Reservoir.

Each intake would have four concrete-lined sediment drying lagoons, each approximately 15 feet deep, containing an average of 10 to 12 feet of water within its embankments when in use. On average, each drying lagoon would fill about once every 4 to 8 days and contain up to about 1,800 cubic yards of sediment. The volume of sediment collected would depend upon the volume, suspended sediment concentration, and flow rate of water diverted at the intake.

Once operational, dredging is not anticipated to be required at the intake sites based on the best available information and bathymetric surveys over the past decade.

Water surface changes and potential impacts associated with project operation would be minimal. The largest change in surface elevation would occur immediately downstream of the intakes. These changes are not expected to adversely affect maritime navigation passing by the intakes. The maximum changes in surface water flows anticipated under the project alternatives would not likely expose any currently unexposed natural or man-made features that would affect or impede navigation. There would be no new snags or obstructions caused by the project alternatives that would impede navigation. Moreover, even when operating at maximum capacity, the intakes would not alter flows in a way that would affect commercial vessels or recreational watercraft. The intakes are designed to ensure diversion velocities will have minimal impacts to aquatic species. Changes in flow velocity would not be perceptible to operators of marine vessels or recreational watercraft and would have no effect on navigation. Water depth and surface elevations would not be substantially affected (either localized or downstream of the intake structures) and, therefore, navigation would not be impeded.

Intakes: Maintenance

Maintenance activities at the intakes would be conducted at varying frequencies. Daily maintenance activities include inspections, security checks, and operations oversight. Less-frequent maintenance activities include operability testing, cleaning, sediment removal, and repaving.

The cylindrical tee fish screens and panels would be regularly inspected and maintained by manual cleaning to remove algae and other biofouling not cleaned by the automatic cleaning system. The screens would be raised out of the water and power washed with a high-pressure power washer approximately every 6 months. Sediment jetting the screens at the base of the screen structure in the water to help keep sediment from accumulating would occur hourly or daily, depending on needs. A diver would inspect the screens and panels while in place and operating once or twice per year, often in conjunction with manual screen cleaning activities.

The debris fender at the upstream end of the log boom and the log boom would require maintenance to prevent corrosion and related deterioration. Debris would be removed manually from the top deck of the structure, by workers on boats, or by divers.

Sedimentation basins would be dredged once per year using a portable floating hydraulic suction dredge. Dredging would occur during summer months (assumed to be May through September) to maximize natural drying in the sediment drying lagoons. The dredge would discharge a sediment slurry into the sediment drying lagoons. The drying lagoons would include an outlet structure with an adjustable weir to decant water off the top of the sediment slurry and underdrains to transport water from beneath the dredged sediment. Decant and underdrain water would be pumped back into the sedimentation basin. It is expected that it would take about 2 days to fill each sediment drying lagoon, and 6 to 8 days to fill all four lagoons. The sediment is anticipated to be large silt and sand particles with minimal organic material. Once dry, the sediment would be trucked off-site for disposal at a permitted disposal site or for beneficial uses. The fill and drain/dry sequence would take about 7 to 9 days, which would approximately match the dredged material filling rate so continuous, or nearly continuous, operation would be possible.

Minor vegetation management would be conducted at least monthly along the side slopes of the basins to keep them free of unwanted growth. Minor debris collection would be conducted continually.

Since the basin embankments would be the jurisdictional flood control levee, the levee side slopes and outside of the toe area would be inspected and maintained in full conformance with the CVFPB and USACE requirements. These requirements would include routine inspection and repair of all bulges, leaks, erosion, or other damage as soon as possible after detection.

Tunnels and Tunnel Shafts

Tunnels would be used to convey water from the intakes to the Bethany Complex. Consequently, impacts to surface resources would be avoided or minimized.

Under the proposed project, the main tunnel would convey water from the intakes to the proposed new Bethany Complex (described below).

Using a Tunnel Boring Machine (TBM), the proposed main tunnel would be constructed underground with the bottom elevations of the tunnel between the Twin Cities Complex and the Bethany Complex ranging from -145 feet to -164 feet below the ground surface. The inside diameter of the main tunnel would be 36 feet and the length of the main tunnel would be 45 miles.

Tunnel shafts to launch, remove, and/or maintain the TBMs would be constructed at intakes, along the alignment, and at the Bethany Complex. The TBM would be lowered into a launch shaft and would bore horizontally toward a reception shaft. Reception shafts would be used to remove the TBM from the tunnel at the end of each drive. Because the TBM cutterhead would need inspection and maintenance, if needed, at least every 6 miles, maintenance shafts would be located approximately every 4 to 6 miles between launch and reception shafts to provide access for TBM maintenance, repair, access or evacuation, and logistic support in a free-air (not pressurized) environment.

Because of high groundwater levels, the tunnel shafts would be constructed in saturated soil conditions. Water at the bottom of the tunnel shafts would be pumped after a 5-foot-thick slurry wall, 5-foot-thick shaft lining, and 30-foot tremie concrete base slab are installed, which would resist external earth, seismic and hydrostatic pressures. The tunnel shaft would then be excavated, followed by placement of an approximate 30-foot-thick concrete base slab. Following installation of the concrete plug at the base of the tunnel shaft, the shaft would be dewatered. The interior shaft concrete lining would then be placed from the top of the base slab.

Reusable tunnel material (RTM) would be generated at launch shafts as the TBMs bore the tunnel. RTM is the soil removed by the TBM boring the tunnel, mixed with conditioners, and lifted to the ground surface through the launch shaft. It would then be tested for hazardous materials, allowed to dry naturally, then stockpiled and transported for reuse or permanently stored.

RTM removed from the tunnel through the launch shafts would be transported by conveyor to handling and storage facilities near launch shaft sites. RTM excavation, testing, drying, and movement from the tunnel launch shaft sites during tunneling operations would occur year-round, 20 hours per day Monday through Friday and 10 hours on Saturdays, allowing time for equipment maintenance. RTM movement from temporary storage to dry stockpile areas would occur 5 days per week for up to 20 hours per day. Permanent RTM stockpiles would be elevated above the surrounding grades. Following construction, the RTM stockpiles would be covered with excavated topsoil, and planted with appropriate species primarily for erosion control, and potentially to create a natural habitat area.

The proposed project would also include subsurface tunnel crossings under the following navigable waters: Beaver Slough, Disappointment Slough, Hog Slough, Middle River, Mokelumne River, Old River, the Stockton Deep Water Ship Channel/San Joaquin River, Sycamore Slough, Victoria Canal, West Canal, Whiskey Slough, and White Slough.

The tunnels would also be engineered to withstand seismic events and other potential hazards that could result in below-ground failure. Concrete lined tunnel structures generally perform well in seismic events, as they are generally flexible in relation to the ground and subject to the same movements as the ground in which they are embedded. During tunnel boring, the main tunnels would be lined with precast, 18-inch-thick concrete segmental liners. This liner thickness is based on a tunnel inside diameter of 36 feet and experience with other tunnel projects having similar ground conditions. The voids between the liners and excavated soil would be continuously pressure-grouted simultaneous with the installation of new liner segments. The tunnel liner would provide support against static and dynamic external and internal pressures. External pressures would include TBM construction forces, earth weight, groundwater pressure, and earthquake loads.

There are numerous proven designs and construction means and methods to safely build a tunnel through fault zones. During a seismic rupture, the tunnels would experience deformations and changes in external ground and external water pressures. In this case, the tunnel lining would be designed to be flexible to accommodate the fault rupture displacement and to be strong enough to withstand the external ground and water pressures. In order to accommodate the displacement and withstand the pressure changes, the following would be considered and potentially implemented for the lining design:

- Over-excavating the tunnel and backfilling the annular space outside the lining with compressible or collapsible material would provide a flexible tunnel lining in the zone of potential fault rupture.
- Steel segmental lining would provide ground support that is stiff enough to resist external (ground and water) pressures induced by earthquake but ductile enough to tolerate seismically imposed movements within the fault zones.
- Doweled or bolted joint connections for steel or concrete segmental linings in the zone of potential fault rupture deformation can be designed with special consideration for displacement/deformation capacity.

Soil borings, overwater soil borings, and CPTs would be conducted within the construction boundaries of the intakes, tunnel shafts, tunnel alignments, power lines, access roads and bridges, levees, the Bethany Reservoir Pumping Plant and associated Surge Basin and aqueducts, and the Bethany Reservoir Discharge Structure.

The Bethany Complex features are located near the West Tracy Fault and Bethany Fault. To further investigate the geometry and location of the West Tracy Fault between the town of Byron and the area southeast of the Clifton Court Forebay, during the design phase, up to five test trenches (up to approximately 1,000 feet long, 3 feet wide, and 20 feet deep) would be excavated along a line running from the southeast of Byron to the southeast of Clifton Court Forebay to further investigate the nature and location of the West Tracy Fault between the town of Byron and the area southeast of Clifton Court Forebay. The trenches would remain open for up to 6 weeks, depending on the findings, and would be backfilled completely upon the completion of observation of soil conditions within the trench. In addition to the test trenches, two arrays of surface geophysical surveys would be completed before, and along the alignment of, the excavation of the test trenches. Geophysical surveys would consist of noninvasive techniques that could be used to provide information on subsurface conditions and anomalies, such as buried casings or abandoned wells. Seismic refraction/reflection techniques would be used at each of the two linear sites, referred to as geophysical arrays. CPTs and soil borings would also be conducted. Select soil samples from the test borings would be subjected to age-dating laboratory testing.

Additionally, under the Bethany Fault Study, electrical resistivity tomography (ERT) would be used to characterize subsurface soil characteristics above the proposed Bethany Reservoir aqueduct tunnels.

The final design of the conveyance facilities, which would be based on the results of the geological and geotechnical investigations described above and the results of the fault rupture displacement hazard assessment, would meet USACE, DWR, American Society of Civil Engineers (ASCE), and other industry standards to prevent failure of the conveyance facilities as a result of fault rupture or fault-related geologic folding.

Tunnels and shafts would be designed to be low maintenance. An initial inspection could occur during the construction contract’s warranty period, generally within about 1 year after the system is placed into operation. After the initial inspection, tunnel inspections could be completed once every 10 years for the first 50 years and every 5 years after 50 years from initial operation. The inspections could occur using autonomous underwater vehicles or remotely operated vehicles without the need to dewater the tunnel. Two portable 60 cfs dewatering pumps would be installed within the Surge Basin tunnel reception shaft. Each submersible pump would be equipped with a variable frequency drive with a flow meter and a flow control valve. The submersible pumps would discharge directly into the Bethany Reservoir Pumping Plant discharge pipelines and ultimately to the Bethany Reservoir Discharge Structure.

Tunnel shafts would be used for tunnel access postconstruction so that periodic inspections, repair, and maintenance activities could be performed. Design features of the gravity tunnel system should preclude the need for planned maintenance; necessary maintenance activities would be the result of inspection findings. However, it is anticipated that at some point during the service life of the system, some maintenance would be required. The maintenance work could range from cleaning out the tunnel invert with a loader or possibly patching or repairing the tunnel lining. Areas to perform inspection and maintenance activities would be provided adjacent to and on top of the shaft pads at each shaft location. Inspection and maintenance activities would comply with the confined space regulations in accordance with Occupational Safety and Health Administration requirements.

There would be daily post-construction inspection and security checks at shaft sites. Operability would be tested annually. Grounds maintenance would take place every 1 to 2 years, and repaving every 15 years.

Tunnel Launch Shaft Sites: Overview

Launch shafts would generally have a finished inside diameter of 115 feet. Tunnel launch shaft sites would include a shaft pad for the tunnel launch shaft with adjacent areas for equipment to excavate and support the shaft, cranes, and appurtenant items to move equipment into and out of the tunnel shaft, equipment holding areas, and areas to receive and manage the excavated RTM. Tunnel launch shaft sites would also include areas for tunnel liner segment storage, aggregate storage, slurry/grout mixing plants, electrical substation and electrical building, workshops and offices, water treatment tanks, access roads, and RTM handling, drying, and storage areas. Construction activities at the launch shafts would continue for 10 to 14 years.

The tunnel launch shafts would be sited at the following locations:

- Double Launch Shaft at Twin Cities Complex: The Twin Cities Complex would occupy 586 acres during construction, with a permanent site size of 222 acres. The Twin Cities Complex would be off Twin Cities Road approximately 0.5 mile northeast of the interchange with I-5. Its northern boundary would fall between Dierssen and Lambert Roads, its eastern boundary along Franklin Boulevard, its western boundary offset from the I-5 embankment, and southern boundary at Twin Cities Road. During construction, the Twin Cities Complex would contain the double launch shaft, tunnel segment storage, a slurry/grout mixing plant, shops and offices for construction crews, parking, material laydown and erection areas, access roads, RTM conveyor and handling facilities, a water treatment plant, emergency response facilities, and a helipad. The construction site would be surrounded by a ring levee, with height varying from about 3.5 feet to 11.5 feet, designed to protect the facilities from the 100-year flood event with the Delta-specific Public Law 84-99 equivalent standards. After construction, the ring levee at Twin Cities Complex would be deconstructed except for a portion adjacent to the RTM storage area.
- Lower Roberts Island Double Launch Shaft: The Lower Roberts Island double launch shaft site would occupy 610 acres during construction, with a permanent site size of 300 acres. The Lower Roberts Island site would accommodate the shaft pad with shaft, tunnel liner segment storage, slurry/grout mixing plant, shops and offices for construction crews, RTM handling facilities (including RTM temporary wet storage and RTM natural drying areas), water treatment plant, emergency response facilities, a helipad, and other equipment and structures. A conveyor would move RTM from the shaft site approximately 2 miles along the access road to a separate RTM handling and storage area. Portions of existing perimeter levee on the Lower Roberts Island site do not comply with the Public Law 84-99 Delta-specific levee design standard because of insufficient freeboard or slopes. To address flood risk, targeted repairs would be performed to existing levees to address geometry and historic performance issues that could recur during a potential high-water event. All of the modifications would occur on the landside of the levees.

The locations of construction features described for tunnel launch shafts are referenced in the mapbook as “Shaft Site” and “Shaft Work Area”.

Tunnel Launch Shaft Sites: Construction

Most shafts would require construction of a shaft pad. Tunnel shaft pads would be constructed above the ground surface to an elevation approximately equal to the adjacent levee system on the island or tract. The height of the shaft pad would be sufficient to protect the tunnel and construction personnel from localized flooding but lower than the top of the shaft postconstruction to reduce the need for imported fill, which reduces related potential environmental effects. The final postconstruction shaft would be raised above the shaft pad to an elevation above the maximum water surface in the tunnel for hydraulic surge events or the Sacramento River 200-year flood event with sea level rise and climate change hydrology for year 2100, whichever is higher, including freeboard criteria. Note that the Sacramento River flood event water level in some locations is higher than the local 200-year flood event with sea level rise and climate change hydrology for year 2100 (including wind fetch wave run-up) at all of the tunnel shaft sites, so the river flood level controls over the local flood level for setting the tops of structures. At the end of construction, a concrete cover with air venting provisions would be placed over the top of the shaft. Cranes would be used to move the concrete cover and move any needed equipment and personnel into and out of the tunnel during operations.

Tunnel Reception Shaft Sites: Overview

Tunnel Reception Shafts would provide access to the tunnel to allow removal of the TBM at the end of each tunnel drive (approximately 10-15 miles in length). Tunnel reception shaft sites would not include areas for storing tunnel liner segments or RTM handling. Reception shafts would have finished inside diameters of 70 feet except for the surge basin reception shaft which would have a finished inside diameter of 120 feet. Tunnel reception shaft sites would include areas for the tunnel shaft with adjacent areas for equipment to excavate the shaft, and cranes and appurtenant items to move equipment into and out of the tunnel shaft. Reception shaft sites would be larger than maintenance shaft sites (described below) because of the area needed to disassemble the TBM equipment prior to removal from the construction site.

The tunnel reception shaft sites would include the following:

- Tunnel Reception Shaft at Intake B becomes part of the intake outlet structure: The construction and post-construction site acreages for this shaft would be included within the description of Intake B, above.
- Terminous Tract Reception Shaft: The post-construction site and the construction site would include 13 acres to accommodate two tunnel reception shafts.
- Surge Basin Reception Shaft at Bethany Complex becomes part of the surge basin: This reception shaft would be located within the surge basin at the Bethany Complex. The top of the reception shaft in the surge basin would be flush with the floor of the surge basin, 35 feet below ground surface. The construction and post-construction site acreages for this shaft would be included within the description of the Bethany Complex, below.

The locations of construction features described for tunnel reception shafts are referenced in the mapbook as “Shaft Site” and “Shaft Work Area”.

Tunnel Reception Shaft Sites: Construction

Construction methods for tunnel reception shafts would be identical to those described for tunnel launch shafts, above. Construction activities at reception shaft sites would continue for approximately 2 years.

Shaft pads at reception shafts sites would provide a working platform for construction of shaft diaphragm walls to minimize groundwater from entering the shaft construction site. Shaft pads would also serve as a refuge for workers during construction in the event of a levee breach that inundates the surrounding land up to a 100-year WSE plus sea level rise and climate change hydrology and 2 feet of freeboard***.*** These elevations should be considered a minimum to provide flood protection during site construction; during the design phase, future calculations may necessitate higher elevations as additional information becomes available related to climate change and sea level rise. At the end of construction, shaft pads would remain in place and maintenance and reception shafts themselves would be raised above the top of the shaft pads to a height determined sufficient to protect the facilities from the 200-year flood plus sea level rise at 2100 and 3 feet of freeboard. Each shaft would have a cover that could be removed by a crane if access to the shaft or tunnel were needed in the future.

Tunnel Maintenance Shaft Sites: Overview

Tunnel maintenance shafts, which would be located about every 4 to 6 miles between the launch and reception shafts, would be installed to provide access for TBM maintenance, repair, access or evacuation, and logistic support in a free-air (not pressurized) environment. Maintenance shafts would have finished inside diameters of 70 feet. Tunnel maintenance shaft sites would be smaller than the launch shaft sites because they would not include areas for storing tunnel liner segments or RTM handling. Tunnel maintenance shaft sites would include areas for the tunnel shaft with adjacent areas for equipment to excavate the shaft, and cranes and appurtenant items to move equipment into and out of the tunnel shaft.

The tunnel maintenance shaft sites would include the following:

- Tunnel Maintenance Shaft at Intake C would become part of the intake outlet structure: The construction and post-construction site acreages for this shaft would be included within the description of Intake C, above.
- New Hope Tract Maintenance Shaft: The post-construction site and the construction site would include 11 acres.
- Canal Ranch Tract Maintenance Shaft: The post-construction site and the construction site would include 11 acres.
- King Island Maintenance Shaft: The post-construction site and the construction site would include 12 acres.
- Upper Jones Tract Maintenance Shaft: The post-construction site and the construction site would include 11 acres.
- Union Island Maintenance Shaft: The post-construction site and the construction site would include 14 acres.

The locations of construction features described for tunnel maintenance shafts are referenced in the mapbook as “Shaft Site” and “Shaft Work Area”.

Tunnel Maintenance Shaft Sites: Construction

Construction methods for tunnel maintenance shafts would be identical to those described for tunnel launch shafts, above. Construction activities at maintenance shaft sites would continue for approximately 2 years.

Shaft pads at maintenance shafts sites would provide a working platform for construction of shaft diaphragm walls to minimize groundwater from entering the shaft construction site. Shaft pads would also serve as a refuge for workers during construction in the event of a levee breach that inundates the surrounding land up to a 100-year WSE plus sea level rise and climate change hydrology and 2 feet of freeboard*.* These elevations should be considered a minimum to provide flood protection during site construction; during the design phase, future calculations may necessitate higher elevations as additional information becomes available related to climate change and sea level rise. At the end of construction, shaft pads would remain in place and maintenance and reception shafts themselves would be raised above the top of the shaft pads to a height determined sufficient to protect the facilities from the 200-year flood plus sea level rise at 2100 and 3 feet of freeboard. Each shaft would have a cover that could be removed by a crane if access to the shaft or tunnel were needed in the future.

Bethany Complex

The main tunnel would terminate at a complex in the south Delta southeast of Clifton Court Forebay between Byron Highway and Mountain House Road near Mountain House. This complex is called the Bethany Complex would include a number of facilities associated with conveying water out of the tunnel into the Bethany Reservoir. The Bethany Complex would be located on ground above the flood elevations for the 200-year flood event with sea level rise and climate change hydrology for year 2100, as defined by DWR.

The Bethany Complex includes:

- Surge Basin Reception Shaft (described above and part of the surge basin)
- Bethany Reservoir Pumping Plant: to lift water from the main tunnel to Bethany Reservoir
- Bethany Reservoir Surge Basin: for use if potential transient-surge conditions occur
- Bethany Reservoir Aqueduct: to convey water from the Bethany Reservoir Pumping Plant to the Bethany Reservoir Discharge Structure
- Bethany Reservoir Discharge Structure: to convey water to Bethany Reservoir

Excess excavated soil from construction of the surge basin, Bethany Reservoir Pumping Plant, and aqueduct would be used on-site for grading as much as possible. Excess topsoil and excavation material would be stockpiled at four locations at the Bethany Complex. A permanent 33-foot high stockpile of excavated material from the Bethany Reservoir Pumping Plant and Surge Basin would occupy about 59 acres; topsoil from those features would cover about 7 acres up to 22 feet high for about 7 years. Temporary topsoil stockpiles from the aqueduct and discharge structure would cover 4.5 and 0.5 acres up to 22 feet high for 4 and 5 years, respectively. Each stockpile area would be cleared, grubbed, and stripped of topsoil before stockpiling. Topsoil from these locations and excess topsoil from other portions of the Bethany Complex would be spread over the completed stockpiles and hydroseeded. The total area of the Bethany Complex during construction would be 381 acres and the post-construction site would encompass 251 acres. Bethany Complex facilities are described in more detail below.

General and grounds maintenance would occur annually, and debris removal would be required periodically at the surge basin. The Bethany Reservoir Pumping Plant site would contain an equipment storage and operations maintenance building with office space, a welding shop, machine shop, and interior storage for spare pumps and rotating assemblies, motors, and accessories. Interior storage space would also accommodate large equipment such as tunnel dewatering pumps, cable reels, and discharge piping assemblies. An exterior isolation bulkhead gate panel storage and equipment laydown area would be provided on the north side of the building. Bridge and gantry cranes plus other cranes would be located both inside and outside of the buildings to move equipment during maintenance procedures.

Bethany Reservoir Pumping Plant

The construction and post-construction site acreages for the Bethany Reservoir Pumping Plant are included in the description of the Bethany Complex, above. The Bethany Reservoir Pumping Plant and Surge Basin would be located along Mountain House Road approximately 0.5 miles south of the intersection with Byron Highway.

The Bethany Reservoir Pumping Plant would be needed to lift the water from the tunnel to Bethany Reservoir. The main tunnel from the intakes would terminate at a reception shaft within the surge basin on the north side of the Bethany Reservoir Pumping Plant. Water would enter the Bethany Reservoir Pumping Plant and be conveyed directly to Bethany Reservoir in a cement-mortar-lined, welded steel aqueduct system (described below).

The Bethany Reservoir Pumping Plant would be a multilevel underground structure with its roof at grade. Flow capacity would range from a minimum of 300 cfs to a maximum of 6,000 cfs. Twelve 500-cfs pumps and two standby pumps would achieve the flow of 6,000 cfs. In addition to the below-ground pumping plant and wet well, the site would include aboveground water storage tanks for hydraulic transient-surge protection of the discharge pipelines, electrical building with variable speed drives and switchgear, heating and air conditioning mechanical equipment yard, transformer yard, electrical substation adjacent to the electrical building, standby engine generator building with an isolated and fully contained fuel tank, equipment storage building with drive-through access, offices, shops, storage area for spare aqueduct pipe sections and accessories, and a walled enclosure/storage facility for bulkhead panel gates that would be used to isolate portions of the Bethany Reservoir Pumping Plant during maintenance procedures. The pumping plant would include two separate dry-pit pump bays adjacent to the wet well.

Electrical, generator, and maintenance buildings, an electrical substation, surge tanks, and protective canopies on the site would be aboveground structures. The finished site pad elevation of 46.5 feet above mean sea level, at about existing grade, would be substantially above the elevation required to protect the facilities from surge events and the 200-year flood event including sea level rise in 2100, which is calculated to be a water surface elevation of 27.3 feet within the surge basin.

The locations of construction features described for the Bethany Reservoir Pumping Plant are referenced in the mapbook as “Pumping Plant and Surge Basin”.

Bethany Reservoir Surge Basin

The construction and post-construction site acreages for the Bethany Reservoir Surge Basin are included in the description of the Bethany Complex, above.

The surge basin would normally be empty when the Bethany Reservoir Pumping Plant is in operation. The top of the surge basin would be at existing grade and the bottom would be about 35 feet below the ground surface. The tunnel shaft within the surge basin would accommodate portable submersible pumps for dewatering the tunnel, if necessary. The top of the tunnel shaft would be at the floor of the surge basin; a shaft pad would not be required at the surge basin reception shaft since natural ground elevations at this site are considerably above the potential flood stage, and groundwater intrusion is unlikely based on available information.

Under rare circumstances, potential transient-surge conditions could occur in the main tunnel between the intakes and Bethany Reservoir Pumping Plant or in the Bethany Reservoir Aqueduct. Along the main tunnel, the transient surge could occur if there was a simultaneous shutdown of the main raw water pumps in the pumping plant. The surge flows would discharge into the surge basin through the tunnel reception shaft. A circular weir wall around the top of the tunnel reception shaft would allow the overflows to enter the surge basin but prevent water that enters the surge basin from reentering the main tunnel unless DWR operators open gates to allow the water to flow back in. The surge basin would also have pumps to remove the water more rapidly than gravity flow into the pumping plant to facilitate restarting the pumping plant after a surge event.

Transient-surge conditions in the Bethany Reservoir Aqueduct pipeline could also occur if there was a simultaneous shutdown of the Bethany Reservoir Pumping Plant pumps. Under this transient-surge scenario, water would flow from surge tanks located at the Bethany Reservoir Pumping Plant into the aqueduct pipelines and excess surge flows would be conveyed into Bethany Reservoir.

The locations of construction features described for the Bethany Reservoir Surge Basin are referenced in the mapbook as “Pumping Plant and Surge Basin”.

Bethany Reservoir Aqueduct

The construction and post-construction site acreages for the Bethany Reservoir Aqueduct are included in the description of the Bethany Complex, above.

The aqueduct system would consist of four 15-foot-diameter parallel pipelines that would convey water from the Bethany Reservoir Pumping Plant to the Bethany Reservoir Discharge Structure, a distance of approximately 2.5 miles each. Each pipeline would have a maximum capacity of 1,500 cfs. The aqueduct system permanent footprint would be up to 200 feet wide. Two separate aqueduct reaches would require tunnels to carry each pipeline under existing features. The first reach would be under the Jones Pumping Plant discharge pipelines (about halfway from the Bethany Reservoir Pumping Plant to the discharge structure); at this location pipelines would run about 50 feet below ground surface for about 200 feet. Tunnels would also be needed under the existing conservation easements adjacent to Bethany Reservoir (at the last downstream reach of the aqueduct) for about 3,064 feet, ranging from 45 to 180 feet below ground surface.

The aqueduct pipelines would be laid mostly in open trenches, constructed by open cut and backfill methods. The tops of the pipes would extend above the existing ground surface and be covered by a minimum of 6 feet of soil that would form a single mound of earth above the four pipelines. Excavated material from the Bethany Reservoir Aqueduct trenches and tunnels would be used for backfill of the trenches and also used to make controlled low-strength backfill material (CLSM) for pipe bedding and zone material.

The aqueduct pipelines would terminate near the bottom of four 55-foot-inside-diameter below-ground vertical shafts at the Bethany Reservoir Discharge Structure. The pipelines would make a 90-degree bend upward inside the shafts, ending at the floor of the discharge structure and flowing through a concrete channel into Bethany Reservoir.

The aqueduct tunnels to carry the pipelines under the Jones discharge pipelines and the conservation easements would be constructed using a different method than used for the main tunnel between the intakes and the Bethany Reservoir Pumping Plant. Because of the shorter length of these tunnels compared to the main tunnel, a TBM would not be used during construction. For the Jones pipeline crossing, a digger shield outfitted with an excavator arm could be used for the anticipated ground conditions. For the conservation easement crossing, several excavation methods have been identified including a roadheader. Soil material would be moved out of the tunnels at the entry portals. The excavation would be supported with rock reinforcement and/or steel ribs or lattice girders and shotcrete depending on the ground conditions.

The excavated material from the aqueduct tunnels would be removed by different methods and would be in different geologic formations compared to the main tunnel bore; therefore, the excavated material characteristics would be different than the RTM from the main tunnel. The Bethany Reservoir Aqueduct tunneling machines also would not need additives; therefore, the excavated soil would not need to undergo the extensive drying that would be required for RTM from the TBMs on the main tunnel. Materials excavated from the aqueduct tunnels that are too wet or otherwise unsuitable for CLSM of backfill would be transported to the permanent excavation stockpile located adjacent to the Bethany Reservoir Pumping Plant and dried as part of final disposal.
Tunneling under the Jones discharge pipelines would require excavation of a large cut to establish entry and exit portals. The entry portal would be located on the east side of the Jones discharge pipeline crossings. Excavation of these tunnels would end at the exit portal about 200 feet away on the west side of the Jones pipelines. Major facilities at the site would include mobile cranes, construction shops and offices, parking, material laydown and erection area, equipment staging, tunnel ventilation system housing, temporary electrical substation, and storage for topsoil stripping. Construction activities would include clearing and grubbing, water quality protection, ground improvement, and other activities as needed.

Tunneling under the conservation easement also would require tunnel entry portals on the east side and tunnel exit portals on the west side of the 3,062-foot crossing. The entry portals would be located on the east side of the conservation easement and to the west of the existing high voltage power lines. Excavation of these tunnels would end at the vertical shafts, serving as the exit portal, located on the east side of the Bethany Reservoir Discharge Structure.

In addition to pipelines and tunnels, the aqueduct construction site would include contractor staging areas, CLSM batch plants, and ancillary facilities.

The locations of construction features described for the Bethany Reservoir Aqueduct are referenced in the mapbook as “Aqueduct”.

Bethany Reservoir Discharge Structure

The construction and post-construction site acreages for the Bethany Reservoir Discharge Structure are included in the description of the Bethany Complex, above.

This discharge structure portion of the Bethany Complex comprises the structure itself near the bank of Bethany Reservoir, the aqueduct conservation easement tunnel vertical exit shafts, contractor staging areas, and ancillary facilities. The proposed discharge structure site is located on a narrow strip of land between the conservation easement and Bethany Reservoir; a 10-foot-wide buffer would separate the disturbance area from the conservation easement. Significant grading would be required to build the structure on the site, which is above reservoir surface water level but varies considerably in elevation. Constructing a temporary cofferdam within the water near the shore in the reservoir would allow excavation, concrete, and backfill work to be completed on the reservoir bank within an area of dry ground excavated as much as 25 feet below the reservoir water surface.

The discharge structure would be divided into four separate channels, with a total width of approximately 327 feet including the four 55-foot-wide shafts with required 80-foot center-to-center spacing. The channels would taper from 55 feet wide to approximately half their original width on their approach to the bank of the reservoir. The concrete floor of the discharge structure at elevation 227.0 feet above mean sea level would end near the reservoir bank, and a layer of riprap would be placed between the structure and the temporary cofferdam to help stabilize and protect the bank and bed of the reservoir from the energy of the water being discharged, which is expected to be minor, given the relatively low discharge velocity. The top of the discharge would be approximately at the same elevation as the existing California Aqueduct Bikeway that would be modified to traverse through and over the new structure.

The Bethany Reservoir Discharge Structure would cross the existing California Aqueduct Bikeway, which is also used as a maintenance road. A 32-foot-wide bridge would span the four Bethany Reservoir Discharge Structure channels to maintain access for bikes and maintenance vehicles. Each of the four Bethany Reservoir Discharge Structure channels would be divided into two 21-foot-wide bays with radial gates and stoplogs to prevent backflow in an emergency and double isolate the aqueduct system from Bethany Reservoir. A 16-foot-wide service deck would be installed on the opposite (reservoir) side of the gate and stop log area to facilitate operations and maintenance of the gates and installation and removal of stoplogs. The bridge would include applicable openings for stoplog installation and removal through traffic-rated hatches. Similarly, stoplogs would be installed in open stoplog grooves adjacent to the service deck. The radial gates would automatically close under pressure loss conditions in the aqueduct pipelines to prevent water from Bethany Reservoir from flowing into the aqueduct pipelines during the unlikely event of a pipeline break or valve malfunction. Due to the critical control nature of this facility, a standby engine generator would be provided for backup power in case of a power outage. A storage yard for isolation bulkhead gates is also included at the site.

The locations of construction features described for the Bethany Reservoir Discharge Structure are referenced in the mapbook as “Discharge Structure”.

<u>RTM Handling and Storage</u>

As described above in *Tunnel Launch Shaft Sites: Overview*, RTM handling and permanent storage locations would be included at the Twin Cities Complex and the Lower Roberts Island Double Launch Shaft site. RTM generated at the Twin Cities Complex and Lower Roberts Island launch shafts sites would be processed and reused at the launch shaft sites to backfill borrow areas that were excavated to construct tunnel shaft pads. Approximately 40 acres of excavated areas within the limits of the permanent RTM stockpile at Twin Cities and 26 acres at Lower Roberts Island would be filled with RTM to raise the elevation to existing ground levels. The proposed project is expected to generate 14.4 million cubic yards of wet excavated RTM—6.7 million cubic yards at Twin Cities Complex and 7.7 million cubic yards at Lower Roberts Island.

Excavated RTM would be placed in temporary stockpile areas and tested (generally once or twice a day) in accordance with the requirements of the Central Valley Regional Water Quality Control Board and the Department of Toxic Substances Control for the presence of hazardous materials at concentrations above their regulatory threshold criteria. The contractor(s) would conduct chemical characterization of RTM and associated decant liquid prior to reuse or discharge, respectively, to determine whether it will meet requirements of the National Pollutant Discharge Elimination System and the Central Valley Regional Water Quality Control Board. All decant liquid would be collected and treated for direct on-site reuse or on-site storage to reduce water supply needs. If the amount of treated water flows from RTM decant, dewatering flows, and site runoff exceeds the on-site water demands and on-site storage, the treated flows would be discharged to adjacent waterbodies in accordance with the stormwater pollution prevention plan. While additives used to facilitate tunneling would be nontoxic and biodegradable, it is possible that some quantity of RTM would be deemed unsuitable for reuse and would be disposed of at a site approved for disposal of such material. This is expected to apply to less than 1% of the total volume of excavated material.

<u>Electrical Facilities</u>
Power supplies would be needed at construction sites for the intakes, tunnel shaft sites, Bethany Complex facilities including the Bethany Reservoir Pumping Plant, concrete batch plants, and park-and-ride lots. Power supplies would also be needed during operations of the intakes, Bethany Reservoir Pumping Plant and Bethany Reservoir Discharge Structure, and lights, security, and minor O&M loads at all permanent locations.

Power demand during construction would include support for large equipment, such as cranes and ground improvement machines, tunnel boring machines and associated equipment including ventilation, conveyors and pumps, small tools, and construction-support facilities. Support facilities would include, but not be limited to, construction trailers, temporary lighting, and electric vehicle charging stations. Some of this equipment could be powered by on-site generators or internal combustion engines; however, electrical grid service to the sites, if available, would be more efficient, use less diesel fuels, and produce fewer emissions.

Power for construction and operation of the conveyance facilities would use existing power lines to the extent possible, but the location or required load of some facilities would require either new aboveground power towers with lines or, depending on site specific parameters, underground conduit to serve those specific areas. Some existing lines would require adding new towers to extend service to conveyance facilities. Some power would also be abandoned or relocated, and some overhead lines, such as those crossing the intake haul road, would be moved underground to address overhead height constraints.

DWR is coordinating electric power transmission modifications with electricity providers: Sacramento Municipal Utility District (SMUD), Western Area Power Administration (WAPA), and Pacific Gas and Electric Company (PG&E). These companies own and maintain high-voltage transmission lines in the project area.

Road Improvements

Constructing the proposed project would require transportation facility improvements to serve the construction and material delivery processes and access to compensatory mitigation sites. Construction would require temporary relocation and realignment of SR 160 at the intakes, and new or improved access roads to intakes, tunnel shafts, and the Bethany Complex.

Pavement conditions on existing county and local roads in the project area are predominantly classified as unacceptable.[1] State routes are generally in good condition although pavement condition data were not available for all State routes at the time of the needs assessment. Therefore, repaving would be included during early construction phases and after construction.

Road improvement activities would include widened and improved roads, new roads, and new or improved and widened bridges. Where road and bridge improvements are undertaken, wider shoulders would be considered to meet bicycle lane standards. Some project-area bridges rated as structurally deficient or functionally obsolete are scheduled to be replaced or rehabilitated by their respective jurisdictions. Modifications to existing roadways would be completed in accordance with Caltrans or county criteria, depending upon the owner of the roadway. Future roadway projects under consideration by local or state agencies were reviewed to potentially coordinate road improvements. Improvements to State routes would be designed and constructed in collaboration with Caltrans. Project improvements to existing State routes, local roadways, and bridges would remain after construction.

Roads used for material hauling, construction equipment access, and employee access would consist of existing State routes and two-lane roadways in the Delta, new gravel or paved roadways constructed from existing roads to construction sites, and new roads within facility construction sites. Project logistics studies identified Lambert Road, portions of SR 4, SR 12, Byron Highway, and I-5 and I-205 as the core road access for trucks to haul equipment and materials to and from the project work sites. Current conditions of nonstandard shoulders and lane widths, combined with a lack of parallel streets and roads for detour, contribute to congestion on some of these routes. Truck routes were evaluated for existing and project truck volumes and would be improved where project truck traffic warrants, based on the duration of work and expected commodities to be carried. Minimum requirements for truck routes are 12-foot-wide lanes and 4-foot-wide shoulders. SR 99, Twin Cities Road, and more than 30 local roads would also provide direct access to project work sites. Construction access roads would remain postconstruction for maintenance access to the facilities.

To minimize construction traffic within areas of the Delta that are not located near construction sites and to focus construction traffic on improved access roads, the following assumptions for access roads to construction sites would be included in the design specifications for each key feature.

[1] Each county and the California Department of Transportation use different pavement management systems for classifying pavement conditions. For ease of interpretation, the separate condition categories were mapped into a single classification with two categories: acceptable and not acceptable.

- No construction traffic would be allowed within Solano County except for I-80 and SR 12 in Solano County (between I-80 and Sacramento River) or for individuals traveling from homes or vehicles traveling from businesses in Solano County.
- No construction traffic would be allowed in Yolo County except for I-80 and for individuals traveling from homes or vehicles traveling from businesses in Yolo County.
- No construction traffic would be allowed on SR 160 between SR 12 and Cosumnes River Boulevard except for realignment of this highway at the intake locations or for individuals traveling from homes or vehicles traveling from businesses in this portion of Sacramento County.
- No construction traffic, except the employee shuttle buses and small pickup trucks, would be allowed on Hood-Franklin Road. However, construction traffic would cross Hood-Franklin Road west of Snodgrass Slough bridge to access Intake B.
- No trucks with three or more axles would be allowed on SR 4 across Victoria Island.

Proposed transportation improvements are based on construction traffic analyses to reduce the daily effect of truck trips on local roadways. For the Lower Roberts Island tunnel launch shaft site, hauling certain construction material by rail where rail is potentially available was also evaluated. Construction of rail spurs and rail-served materials depots would involve realigning or closing certain roads and railroad crossings. Construction traffic on these routes and local access roads would be minimized by construction sequencing of project facilities and incorporating construction material hauling by rail; limited use of barges at intakes only at the end of construction to place riprap on the disturbed river bank, restricted to daytime hours Monday through Friday; and park-and-ride facilities for employee trips into the construction traffic management plans.

Construction would start with clearing, grubbing, and moving utilities. Existing drainage facilities either within the construction site or adjacent to construction sites would be rerouted so as to not affect overland drainage flows or groundwater seepage flows prior to construction and after construction.

SR 160 near the proposed north Delta intakes would be temporarily rerouted east of its existing alignment during the intake construction process and then relocated through the intake facility in the vicinity of the current SR 160 alignment, in collaboration with Caltrans for design and construction oversight.

Approximately 3.2 miles of Lambert Road between I-5 and the new intake haul road and various portions of SR 12 near tunnel shaft sites would be widened under all alternatives. Tunnel crossings under I-5, SR 4 and 12, and addition of turn lanes to SR 12 to access the Terminous Tract tunnel shaft would be designed by DWR under Caltrans oversight and constructed through the Caltrans encroachment permit process with Caltrans oversight of construction activities.

A new 3.8-mile paved intake access/haul road would be constructed along the west side of the abandoned railroad embankment, to become a new dedicated haul road east of the intakes to access Intakes B and C. Approximately 180 feet of the existing bridge over Snodgrass Slough at Hood-Franklin Road would be widened. The haul road would eliminate the need for construction traffic to travel through the main portion of the Town of Hood and on SR 160; it would not be a public road. All access for construction, plus most operations phase access, would use the haul road to enter the intake sites.

The new intake haul/access road would be extended north by another 0.7 mile from Intake C past Hood-Franklin Road to a new 0.25-mile access road connecting to Intake B.

For Twin Cities Complex access, 1 mile of Dierssen Road between Franklin Boulevard and I-5 would be widened, and 0.48 mile of Franklin Boulevard would be widened between locations 0.22 miles north of Dierssen Road and 0.25 miles south of Dierssen Road. Twin Cities Road would be widened for 1 mile from a location 0.83 miles west of Franklin Boulevard to a location 0.17 miles east of Franklin Boulevard.

A new 0.3-mile access road to the shaft site on New Hope Tract maintenance shaft would be constructed from Blossom Road. The entire access route would extend from I5 along West Walnut Grove Boulevard

For Canal Ranch Tract, access would be from Peltier Road with a new driveway.

To access the Terminous Tract maintenance shaft site, a new uncontrolled interchange with longer acceleration and deceleration lanes along SR 12 would be built and 2.3 miles of SR 12 from Interstate 5 to the tunnel shaft site would be improved.

For King Island, access would be from West Eight Mile Road with a new driveway.

Access to the Lower Roberts Island double launch shaft site would involve 1.2 miles of new paved road on Rough and Ready Road on Port of Stockton, a new bridge over Burns Cut from Port of Stockton, 2 miles of new paved road to West House Road with widening 1.2 miles of West House Road, and 1.3 miles of new paved road from West House Road to North Holt Road with a new bridge over Black Slough. The proposed project would involve constructing an overpass over the East Bay Municipal Utility District (EBMUD) Mokelumne Aqueducts to reduce stresses on the aqueducts from the access road. Approximately 20 feet of clearance would be provided from the top of the Mokelumne Aqueducts to the bottom of the bridge deck. This height would be subject to design development and coordination with EBMUD. A rail line also would be extended from the Port of Stockton to a new railroad bridge over Burns Cut to Lower Roberts Island. The rail line would be extended on Lower Roberts Island for 3.2 miles.

The Upper Jones Tract tunnel maintenance shaft site would be accessed from SR 4 along Bacon Island Road with a new driveway.

The Union Island tunnel maintenance shaft site would be accessed from SR 4 to Tracy Boulevard, Clifton Court Road, and Bonetti Road with a new driveway.

Access to the Bethany Reservoir Pumping Plant would be from the Byron Highway immediately north of the site, at a new interchange constructed at Lindemann Road. Byron Highway would be realigned and widened to four lanes for 0.5 mile from the new Lindemann Road interchange to Great Valley Parkway. New bridges would be built over UPRR tracks and Byron Highway. A new 1.2-mile paved frontage road would be constructed for the Lindemann Road interchange parallel to the Byron Highway on the southern side, extending south into the site. This new frontage road would also connect to Byron Highway at the existing Mountain House Road intersection. A new 2.1-mile paved road would provide access to the surge basin between new Byron Highway frontage road and Mountain House Road. Mountain House Road would be widened for 1.34 miles between Byron Highway and Connector Road.

The pumping plant and surge basin would also be accessible from I-580, located approximately 3 miles south of the site, via West Grant Line Road and Mountain House Road. Improvements to Kelso Road would provide roadway connections to Mountain House Road and the new north-south access road along the southern side of the site. A merge lane on West Grant Line Road would be widened for 0.14 mile west of Mountain House Road to Mountain House Road. Mountain House Road would be extended by 0.6 mile to West Grant Line, including a new roundabout at Grant Line Road and a new bridge over a swale. Mountain House Road would be widened for 2.2 miles from the new extension to a point 0.18 mile north of the surge basin access road.

The Bethany Reservoir Aqueduct would require widening 1.23 miles of Kelso Road between a location 0.14 miles east of Mountain House Road and the new access road to the aqueduct construction staging area, and a new 0.27 mile paved road extension of Connector Road from Mountain House Road to the surge basin access road.

The Bethany Reservoir Discharge Structure would be accessed via a new 1.2-mile paved road from Mountain House Road to the existing Bethany Reservoir (California Aqueduct Bikeway). A 0.6-mile segment of existing paved road (California Aqueduct Bikeway) along Bethany Reservoir would be widened from the new access road to the discharge structure. The California Aqueduct Bikeway would not be accessible across the Bethany Reservoir Discharge Structure during construction.

The site access and interior circulation roads would generally be two-lane roads with 12-foot travel lanes and 3-foot paved shoulders. Paved access would be provided to each of the pumping plant facilities.

Park-and-Ride Lots

Park-and-ride lots would be established near major commute routes, where workers could park and ride shuttle buses or vans to construction sites. Trucks arriving late at night could also use these lots to park overnight to minimize nighttime deliveries to construction sites. Lots would be lighted with nighttime security lighting with motion detectors and equipped with electric vehicle charging stations. Lots would be at the following sites.

- **Hood-Franklin Park-and-Ride Lot.** Parking for employees at intakes. This lot would be located along the south side of Hood-Franklin Road immediately east of I-5. The total construction area would be 4.1 acres. The land is currently mostly agricultural land; a Caltrans construction yard occupies a small portion.
- **Charter Way Park-and-Ride Lot.** Parking for employees at Lower Roberts Island tunnel launch shaft. However, this lot could also be used for tunnel shafts on New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island. This lot would be located along the south side of Charter Way at the southwest corner of the I-5 overpass, on the south side of SR 4, just west of I-5. The total construction area would be 2.4 acres. The land is currently a truck parking lot and would only require upgrade or replacement of pavement and lighting systems.

On-site parking would be provided at the Twin Cities Complex, Lower Roberts Island construction sites, all maintenance and reception shafts, and Bethany Complex.

The locations of construction features described for the park-and-ride lots are referenced in the mapbook as “Park and Ride”.

Rail-Served Materials Depot

Rail access to serve major construction sites would reduce truck use of local roads and highways. The UPRR and BNSF Railroad serve the project area.

The proposed project would have a rail-served materials depot at Lower Roberts Island. Rail access to Lower Roberts Island would be provided from an extension of an existing short haul line at the Port of Stockton. Rail access would be extended over a new bridge over Burns Cut and continue to the launch shaft site and RTM storage area.

SCADA Facilities

SCADA (supervisory control and data acquisition) systems and associated data communication systems are common features of water infrastructure that enable remote monitoring and control of the performance and operation of the system, including video security cameras. The new proposed project facilities would need to be integrated into SWP's existing SCADA system to allow for coordinated operations. The communications network for the project would connect three major data centers, two intakes, and four remote data sites for the proposed project. The major data centers would be at the existing DWR Project Control Center, DWR Operations and Maintenance Area Control Center at the Delta Field Division, and the new Bethany Reservoir Pumping Plant. It would provide real-time performance data at intakes, tunnel launch shafts, and the Bethany Complex facilities. A SCADA connection point would be included at the Terminous Tract maintenance shaft. The communications aspects of the SCADA system would be used during construction to facilitate internet applications at the launch shaft sites, the intakes, and the Bethany Reservoir Pumping Plant.

The SCADA system would consist of SCADA equipment and communications links based upon fiber-optic cables that would be installed within and connecting to new structures. Whenever possible, the construction of fiber-optic based communications systems for the project would use existing telecommunications infrastructure, dedicated conduits within project road modifications, and termination panels installed inside or on the buildings or structures. Wherever possible, underground routes would be located along existing roads and project access routes. Overhead fiber installation would be limited to alignments with existing power pole corridors. The fiber cables would look similar to cable television cables.

Fencing and Lighting

Construction site security for major work sites would include security guards stationed at the main entry and exit gates for 24-hour site access management and surveillance. Security personnel would be on-site with regular inspection rounds. Cameras would also be used at key locations. Once construction is complete, permanent security fencing would be in place, and cameras would be installed with either local recording devices or transmission capabilities. These cameras would be located at locations where permanent power and SCADA facilities are proposed. Security personnel would monitor the site periodically.

At park-and ride lots, during construction, they would have downcast lighting. After construction, park-and-rides and associated lighting would be removed. During construction, night lighting at park-and-ride lots would be controlled by motion detectors; the lots would be demolished at the end of construction. During operations, the lights at the intakes, tunnel shafts, and Bethany Complex would be motion-activated to minimize light and glare to adjacent properties.

Permanent lighting at facility sites would be downcast, cut-off type fixtures with non-glare finishes and controlled by photocells and motion sensors, depending on the location. Temporary construction lighting would be similar except for a few necessary nighttime work activities that would require higher-illumination safety lighting of the work sites. Lights would provide good color with natural light qualities and minimum intensity with adequate strength for security, safety, and personnel access. The lights would comply with the Illuminating Engineering Society industry standards for light source and luminaire measurements and testing methods.

Concrete Batch Plants

The proposed project would utilize two concrete batch plants at Lambert Road at the intersection with Franklin Boulevard which would serve construction of the intakes, Twin Cities Complex, New Hope Tract, Canal Ranch Tract, and King Island. Placing batch plants at Lambert Road would help minimize construction traffic and site sizes at intakes. Concrete for Terminous Tract, Lower Roberts Island, Upper Jones Tract, and Union Island tunnel shafts would come from existing local concrete suppliers from the Sacramento or Stockton areas.

Another two concrete batch plants would be at the Bethany Reservoir Pumping Plant and Surge Basin would provide concrete to all portions of the Bethany Complex. They would occupy about 11.5 acres at the intersection of Kelso Road and the new Bethany access road east of Mountain House Road. These batch plants were sited to allow a central delivery location for cement and aggregate and allow a centrally positioned site for distribution of the concrete around the Bethany Complex area.

Each batch plant site would be approximately 600 feet wide by 600 feet long with a 50- to 75-foot-tall batch plant that would include three bulk cement storage silos, a portable cement silo, a 500-square-foot batch trailer, propane and diesel fuel tanks, a reclaimed water system and related collection facilities for stormwater and wash water, and dust collectors to minimize particulate matter in the air. Filtered particulates would be hauled to licensed off-site disposal facilities or added to raw materials used to produce concrete. The batch plants would be removed after construction.

Fuel Stations and Fuel Storage

Fuel stations would be constructed at the intakes and fuel would also be stored at all tunnel shaft sites in accordance with stormwater pollution prevention plan and hazardous waste management criteria. The fuel tanks would be aboveground and would be surrounded by protective bollards to protect against collisions. Double-walled tanks with built-in secondary containment or external secondary containment beneath/around the tanks would protect surroundings from fuel leaks. A protective containment would be used beneath each of the fuel tanks and a protective area would be constructed beneath the refueling area to help contain leaks that may occur during fueling. Spill containment kits would be placed at each of the fueling locations. One 4,000-gallon diesel tank and one 4,000-gallon gasoline tank would be present at the Bethany Reservoir Pumping Plant and Surge Basin during construction. All fuel stations would be removed following construction.

Emergency Response Facilities

In general, it is expected that primary emergency response services would be provided by the construction contractors. During the design phase, evaluations and discussions with local agencies would be required to determine the most appropriate method to coordinate between project contractor-provided emergency response services at the construction sites and integration with local agencies.

For the proposed project, emergency response facilities would be located at the Intake B construction site. Resources would include fire, rescue and medical equipment, personnel, and a helipad. Emergency personnel could include construction management staff that would be cross-trained. Emergency response facilities for the Bethany Complex would be located just south of the Bethany Reservoir Pumping Plant and Surge Basin, near the aqueduct alignment. Facilities would include two ambulances; fire, rescue, and medical equipment; accommodations for one full-time crew during work hours; and a helipad for emergency evacuations. Emergency personnel could include construction management staff that would be cross-trained.

Intakes B and C, tunnel launch shaft sites, and the Bethany Reservoir Pumping Plant and Surge Basin would each have a helipad for emergency evacuations. Intakes would also have a rescue boat. The Twin Cities Complex and the Lower Roberts Island double launch shaft site under Alternative 5 would have two ambulances during construction because there are two launch shafts.

Emergency response facilities at construction sites could be removed during construction demobilization depending on DWR's decision for need during operations.

Standby Engine Generators

Engine generators would be expected to be used during construction at the intakes. Standby engine generators would be used in the event of power outages. For the proposed project, standby engine generators would be used during construction at the intakes, the Twin Cities Complex, Lower Roberts Island shaft site, each of the Bethany Reservoir Aqueduct tunnel portals, and the Bethany Reservoir Discharge Structure.

During operations, intakes would each have two permanent standby engine generators under all alternatives. The standby engine generators would be installed inside a fenced area on the top of site embankments, with the fuel tank. The fuel would be provided by a diesel tank with suitable containment or a propane tank set aboveground. The permanent standby engine generators would provide energy to operate the valves and gates, including the ability to stop diversions at the intake structure.

The Bethany Reservoir Pumping Plant and the Bethany Reservoir Discharge Structure sites would each have a permanent standby engine generator with an isolated and fully contained fuel tank.

Block 19. PROJECT PURPOSE

Just as CEQA requires an EIR to include a statement of project objectives as is described in the proposed Delta Conveyance Project's Notice of Preparation (NOP), the National Environmental Policy Act (NEPA) requires that an EIS include a statement of purpose and need to which the federal agency is responding in proposing the alternatives, including the proposed action (40 CFR 1502.13).

DWR's fundamental purpose in proposing to develop new diversion and conveyance facilities in the Delta is to restore and protect the reliability of SWP water deliveries consistent with the State's Water Resilience Portfolio in a cost-effective manner.

The above stated purpose, in turn, gives rise to several related objectives of the Delta Conveyance Project, as follows.

- To help address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events.
- To minimize the potential for public health and safety impacts from reduced quantity and quality of SWP water deliveries, and potentially CVP water deliveries, south of the Delta as a result of a major earthquake that could cause breaching of Delta levees and the inundation of brackish water into the areas where existing SWP and CVP pumping plants operate in the southern Delta.
- To protect the ability of the SWP, and potentially the CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts of water, consistent with the requirements of state and federal law, including the California and federal Endangered Species Acts and Delta Reform Act, as well as the terms and conditions of water delivery contracts and other existing applicable agreements.
- To provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

Block 20. REASON FOR DISCHARGE

The construction of the proposed project would require the discharge of fill material into waters of the U.S. Discharge of fill material would be associated with construction of the two intake facilities and associated structures on the Sacramento River, tunnel launch and reception shaft facilities and work areas including sites for storage of RTM along the tunnel corridor, levee improvements, and access roads.

Block 21. TYPE OF MATERIAL BEING DISCHARGED AND AMOUNT IN CUBIC YARDS

The total amount of fill material to be discharged into waters of the U.S. during construction of the conveyance facilities is estimated to exceed 1 million cubic yards. The estimated volume of fill material to be permanently discharged in waters of the U.S. for each project component is disclosed in Table 4. The volume of fill that would be discharged to accommodate temporary project components is disclosed in Table 5. Most fill volumes were calculated based on the intersection of the project footprint and the verified aquatic resource delineation GIS layers, using an estimated depth for each aquatic resource type. These estimated depths are provided in the estimate assumption column of the tables below. Fill volumes that were calculated using engineering information, rather than GIS, are also indicated in the estimate assumption column.

Construction of the proposed project facilities would be anticipated to be approximately 16 years; however, the duration of construction at most locations would vary and would not extend for this full construction period.

Table 4. Estimate of Permanent Fill Volume into Waters of the U.S.

	Aquatic Feature Type	Acreage	Aquatic feature fill depth (feet)	Fill Volume (cubic yards)	Fill Material
Access Railroad: Lower Roberts Island					
	Agricultural Ditch	0.24511	3	1186	Soil, gravel, rail, rail spikes
	Scrub Shrub Wetland	0.089348	2	288	
	Seasonal Wetland	0.82936	1	1338	
	Tidal Channel	0.156769	engineering calculation	207	
Access Road: Intake Haul Rd: I5 - I3					
	Agricultural Ditch	0.045253	3	219	Soil, gravel, pavement, concrete
	Emergent Wetland	0.041467	3	201	
Access Road: Intake Haul Rd: I5 - I3 / Power					
	Agricultural Ditch	0.026715	3	129	Soil, gravel, concrete pipe culvert, conduit
	Emergent Wetland	0.055466	3	268	
Access Road: Intake Haul Rd: I5 - I3 / SCADA Fiber Routes					
	Agricultural Ditch	0.142885	3	692	Soil, gravel, concrete pipe culvert, conduit
	Emergent Wetland	0.121343	3	587	
Access Road: Intake Haul Rd: Lambert - I5					
	Agricultural Ditch	0.23854	3	1155	Soil, gravel, pavement, concrete
	Scrub Shrub Wetland	0.023649	2	76	
Access Road: Intake Haul Rd: Lambert - I5 / Power					
	Agricultural Ditch	0.019593	3	95	Soil, gravel, concrete pipe culvert, conduit
Access Road: Intake Haul Rd: Lambert - I5 / SCADA Fiber Routes					
	Agricultural Ditch	0.267626	3	1295	Soil, gravel, concrete pipe culvert, conduit
Access Road: Lower Roberts Island					
	Agricultural Ditch	0.279675	3	1354	Soil, gravel, pavement, concrete
	Forested Wetland	0.034884	2	113	

	Seasonal Wetland	0.152605	1	246	
Access Road: Lower Roberts Island / Power					
	Agricultural Ditch	0.03416	3	165	Soil, gravel, concrete pipe culvert, conduit
Access Road: Lower Roberts Island / SCADA Fiber Routes					
	Agricultural Ditch	0.005514	3	27	Soil, gravel, concrete pipe culvert, conduit
	Seasonal Wetland	0.049815	2	161	
Access Road: New Hope Tract					
	Agricultural Ditch	0.000386	3	2	Soil, gravel, pavement, concrete
Access Road: New Hope Tract / Power					
	Agricultural Ditch	0.003469	3	17	Soil, gravel, concrete pipe culvert, conduit
Access Road: New Mtn House Rd and Grant Line Rd					
	Alkaline Wetland	0.108611	1	175	Soil, gravel, pavement, concrete
	Natural Channel	0.072828	3	352	
Bethany Complex: Aqueduct					
	Agricultural Ditch	0.193432	3	936	Soil, gravel, concrete, concrete pipe, culvert, pipe, conduit
	Vernal Pool	0.103274	1	167	
Bethany Complex: Aqueduct / Power					
	Agricultural Ditch	0.009584	3	46	Soil, gravel, concrete pipe culvert, conduit
Bethany Complex: Aqueduct / SCADA Fiber Routes					
	Agricultural Ditch	0.024745	3	120	Soil, gravel, concrete pipe culvert, conduit
	Vernal Pool	0.037412	1	60	
Bethany Complex: BRPP and Surge Basin					
	Agricultural Ditch	0.4856	3	2350	Soil, gravel, concrete, concrete pipe culvert, slurry wall, pipe, conduit
Bethany Complex: BRPP and Surge Basin / Power					
	Agricultural Ditch	0.160928	3	779	Soil, gravel, concrete pipe culvert, conduit
Bethany Complex: Discharge Structure					
	Depression	0.388314	6	3759	Soil, gravel, concrete, concrete pipe culvert, slurry wall, pipe, sheet pile, conduit
Caltrans Road: Terminous Tract - SR 12					

	Agricultural Ditch	0.026445	3	128	Soil, gravel, pavement, concrete
Caltrans Road: Terminous Tract - SR 12 / SCADA Fiber Routes					
	Agricultural Ditch	0.009507	3	46	Soil, gravel, concrete pipe culvert, conduit
County Road: Dierssen Road					
	Agricultural Ditch	0.02826	3	137	Soil, gravel, pavement, concrete
County Road: Franklin Boulevard					
	Agricultural Ditch	0.082206	3	398	Soil, gravel, pavement, concrete
County Road: Hood-Franklin					
	Tidal Channel	0.162572	engineering calculation	476	Soil, gravel, pavement, concrete
County Road: Lambert Road					
	Emergent Wetland	0.021327	3	103	Soil, gravel, pavement, concrete
	Forested Wetland	0.004313	2	14	
	Scrub Shrub Wetland	0.015691	2	51	
County Road: Lambert Road / SCADA Fiber Routes					
	Emergent Wetland	0.000002	3	0	Soil, gravel, concrete pipe culvert, conduit
County Road: Lindemann Road Interchange at Byron Highway					
	Agricultural Ditch	0.442541	3	2142	Soil, gravel, pavement, concrete
	Natural Channel	0.00893	3	43	
	Scrub Shrub Wetland	0.08546	2	276	
County Road: Mountain House Road					
	Alkaline Wetland	0.111491	1	180	Soil, gravel, pavement, concrete
	Natural Channel	0.054848	3	265	
County Road: Twin Cities Road					
	Agricultural Ditch	0.118639	3	574	Soil, gravel, pavement, concrete
County Road: West House Road					
	Agricultural Ditch	0.382491	3	1851	Soil, gravel, pavement, concrete
Intake B - 3,000 cfs - Cylindrical Tee Screen					
	Agricultural Ditch	0.601282	3	2910	Soil, gravel, pavement, concrete pipe culvert, slurry cutoff wall, riprap,
	Tidal Channel	2.489291	engineering calculation	106600	

					steel piers, sheet pile, concrete, conduit
Intake B - 3,000 cfs - Cylindrical Tee Screen / Power					
	Agricultural Ditch	0.034093	3	165	Soil, gravel, concrete pipe culvert, conduit
Intake B - 3,000 cfs - Cylindrical Tee Screen / SCADA Fiber Routes					
	Agricultural Ditch	0.008023	3	39	Soil, gravel, concrete pipe culvert, conduit
Intake C - 3,000 cfs - Cylindrical Tee Screen					
	Agricultural Ditch	0.188764	3	914	Soil, gravel, pavement, concrete pipe culvert, slurry cutoff wall, riprap, steel piers, sheet pile, concrete, conduit
	Tidal Channel	2.495002	engineering calculation	102500	
Intake C - 3,000 cfs - Cylindrical Tee Screen / Power					
	Agricultural Ditch	0.006098	3	30	Soil, gravel, concrete pipe culvert, conduit
Intake C - 3,000 cfs - Cylindrical Tee Screen / SCADA Fiber Routes					
	Agricultural Ditch	0.001374	3	7	Soil, gravel, concrete pipe culvert, conduit
Lambert Road/Franklin Concrete Batch Plant #1					
	Agricultural Ditch	0.005749	3	28	Soil, gravel, pavement, concrete pipe culvert, conduit
Lambert Road/Franklin Concrete Batch Plant #1 / Power					
	Agricultural Ditch	0.009183	3	44	Soil, gravel, concrete pipe culvert, conduit
Lambert Road/Franklin Concrete Batch Plant #2					
	Agricultural Ditch	0.014942	3	72	Soil, gravel, pavement, concrete pipe culvert, conduit
Levee: Lower Roberts Island					
	Agricultural Ditch	0.925527	3	4480	
	Forested Wetland	1.291237	2	4166	Soil, gravel
	Scrub Shrub Wetland	0.36017	2	1162	
Lower Roberts Island RTM					
	Agricultural Ditch	3.640389	3	17619	Soil
Lower Roberts Island Power					
	Agricultural Ditch	0.097797	3	473	

Lower Roberts Island SCADA Fiber Routes					Soil, gravel, concrete pipe culvert, conduit
	Agricultural Ditch	0.000553	3	3	Soil, gravel, concrete pipe culvert, conduit
	Forested Wetland	0.001148	2	4	
Shaft: Canal Ranch Tract					
	Agricultural Ditch	0.000821	3	4	Soil, gravel, pavement, concrete pipe culvert, slurry wall, tunnel shaft liner
Shaft: King Island					
	Agricultural Ditch	0.110892	3	537	Soil, pavement, gravel, concrete pipe culvert, slurry wall, tunnel shaft liner, conduit
Shaft: King Island / Power					
	Agricultural Ditch	0.008193	3	40	Soil, gravel, concrete pipe culvert, conduit
Shaft: Lower Roberts Island					
	Agricultural Ditch	0.655864	3	3174	Soil, gravel, rail, rail spikes, concrete, concrete culvert pipe, pipe, concrete, rip rap, steel piers, sheet pile, slurry wall, tunnel shaft liner
Shaft: Lower Roberts Island / Power					
	Agricultural Ditch	0.072341	3	350	Soil, gravel, concrete pipe culvert, conduit
Shaft: Terminous Tract					
	Agricultural Ditch	0.002356	3	11	Soil, gravel, pavement, concrete pipe culvert, slurry wall, tunnel shaft liner, conduit
Shaft: Union Island					
	Agricultural Ditch	0.000008	3	0	Soil, gravel, pavement, concrete pipe culvert, slurry wall, tunnel shaft liner
Shaft: Upper Jones Tract				0	
	Agricultural Ditch	0.00162	3	8	Soil, gravel, pavement, concrete pipe culvert,

					slurry wall, tunnel shaft liner
Twin Cities Complex RTM					
	Agricultural Ditch	1.479397	3	7160	Soil

Table 5. Estimate of Temporary Fill Volume into Waters of the U.S.

	Aquatic Feature Type	Acreage	Aquatic feature fill depth (feet)	Fill Volume (cubic yards)	Fill Material
Access Railroad: Lower Roberts Island					
	Agricultural Ditch	0.01768	3	86	Soil, gravel, rail, rail spikes
	Scrub Shrub Wetland	0.007638	2	25	
	Seasonal Wetland	0.128239	1	207	
Access Road: Bethany Complex South					
	Agricultural Ditch	0.040161	3	194	Soil, gravel, pavement, concrete
Access Road: Intake Haul Rd: I5 - I3					
	Agricultural Ditch	0.010647	3	52	Soil, gravel, pavement, concrete
Access Road: Intake Haul Rd: I5 - I3 / Power					
	Agricultural Ditch	0.176865	3	856	Soil, gravel, concrete pipe culvert, conduit
	Emergent Wetland	0.123108	3	596	
Access Road: Intake Haul Rd: Lambert - I5					
	Agricultural Ditch	0.015688	3	76	Soil, gravel, pavement, concrete
	Scrub Shrub Wetland	0.022687	2	73	
Access Road: Intake Haul Rd: Lambert - I5 / Power					
	Agricultural Ditch	0.045342	3	219	Soil, gravel, concrete pipe culvert, conduit
Access Road: Lower Roberts Island					
	Agricultural Ditch	0.169353	3	820	Soil, gravel, pavement, concrete
	Forested Wetland	0.031352	2	101	
	Seasonal Wetland	0.034655	1	56	
Access Road: Lower Roberts Island / Power					
	Agricultural Ditch	0.05618	3	272	Soil, gravel, concrete pipe culvert, conduit
Access Road: Lower Roberts Island / SCADA Fiber Routes					
	Agricultural Ditch	0.007644	3	37	Soil, gravel, concrete pipe culvert, conduit
	Seasonal Wetland	0.024509	1	40	

Access Road: New Hope Tract					
	Agricultural Ditch	0.003593	3	17	Soil, gravel, pavement, concrete
Access Road: New Hope Tract / Power					
	Agricultural Ditch	0.000279	3	1	Soil, gravel, concrete pipe culvert, conduit
Bethany Complex: Aqueduct					
	Agricultural Ditch	0.407834	3	1974	Soil, gravel, concrete, concrete pipe culvert, pipe, conduit
	Vernal Pool	0.060731	1	98	
Bethany Complex: BRPP and Surge Basin					
	Agricultural Ditch	0.530203	3	2566	Soil, gravel, concrete, concrete pipe culvert, slurry wall, pipe, conduit
	Conveyance Channel	0.265596	engineering calculation	2142	
Bethany Complex: BRPP and Surge Basin / Power					
	Agricultural Ditch	0.192875	3	934	Soil, gravel, concrete pipe culvert, conduit
Bethany Complex: Discharge Structure					
	Depression	0.704964	6	6824	Soil, gravel, concrete, concrete pipe culvert, slurry wall, pipe, sheet pile, conduit
County Road: Franklin Boulevard					
	Agricultural Ditch	0.010357	3	50	Soil, gravel, pavement, concrete
County Road: Hood-Franklin					
	Tidal Channel	0.244073	engineering calculation	1181	Soil, gravel, pavement, concrete
County Road: Lambert Road					
	Agricultural Ditch	0.099133	3	480	Soil, gravel, pavement, concrete
	Emergent Wetland	0.000252	3	1	
	Forested Wetland	0.189881	2	613	
	Scrub Shrub Wetland	0.005324	2	17	
County Road: Lambert Road / Power					
	Agricultural Ditch	0.226935	3	1098	Soil, gravel, concrete pipe culvert, conduit
County Road: Lindemann Road Interchange at Byron Highway					
	Agricultural Ditch	0.08472	3	410	

	Natural Channel	0.005451	3	26	Soil, gravel, pavement, concrete
	Scrub Shrub Wetland	0.020467	2	66	
	Seasonal Wetland	0.033051	1	53	
County Road: Mountain House Road					
	Alkaline Wetland	0.192045	1	310	Soil, gravel, pavement, concrete
	Natural Channel	0.098857	3	478	
County Road: Twin Cities Road					
	Agricultural Ditch	0.454678	3	2201	Soil, gravel, pavement, concrete
County Road: West House Road					
	Agricultural Ditch	0.061089	3	296	Soil, gravel, pavement, concrete
County Road: West House Road / Power					
	Agricultural Ditch	0.001707	3	8	Soil, gravel, concrete pipe culvert, conduit
	Scrub Shrub Wetland	0.003932	2	13	
Intake B - 3,000 cfs - Cylindrical Tee Screen					
	Agricultural Ditch	0.415832	3	2013	Soil, gravel, pavement, concrete pipe culvert, slurry cutoff wall, riprap, steel piers, sheet pile, concrete, conduit, cofferdam
	Forested Wetland	0.158526	2	512	
	Tidal Channel	0.453503	engineering calculation	35119	
Intake B - 3,000 cfs - Cylindrical Tee Screen / Power					
	Agricultural Ditch	0.025983	3	126	Soil, gravel, concrete pipe culvert, conduit
	Forested Wetland	0.095073	2	307	
Intake B - 3,000 cfs - Cylindrical Tee Screen / SCADA Fiber Routes					
	Agricultural Ditch	0.008515	3	41	Soil, gravel, concrete pipe culvert, conduit
	Forested Wetland	0.042146	2	136	
Intake C - 3,000 cfs - Cylindrical Tee Screen					
	Agricultural Ditch	0.583661	3	2825	Soil, gravel, pavement, concrete pipe culvert, slurry cutoff wall, riprap, steel piers, sheet pile,
	Forested Wetland	0.007876	2	25	
	Tidal Channel	0.381068	engineering calculation	29510	

					concrete, conduit, cofferdam
Lambert Road/Franklin Concrete Batch Plant #1					
	Agricultural Ditch	0.006922	3	34	Soil, gravel, pavement, concrete pipe culvert, conduit
Lambert Road/Franklin Concrete Batch Plant #2					
	Agricultural Ditch	0.006996	3	34	Soil, gravel, pavement, concrete pipe culvert, conduit
Levee Access Road: Lower Roberts Island					
	Agricultural Ditch	7.004378	3	33901	Soil, gravel, pavement, concrete
	Forested Wetland	0.164991	2	532	
	Scrub Shrub Wetland	0.10855	2	350	
Levee: Twin Cities Complex					
	Agricultural Ditch	0.337252	3	1632	Soil, gravel
	Scrub Shrub Wetland	0.077642	2	251	
Power					
	Agricultural Ditch	2.342502	3	11338	Soil, gravel, concrete pipe culvert, conduit
	Depression	0.09488	6	918	
	Emergent Wetland	0.160013	3	774	
	Forested Wetland	0.028963	2	93	
	Scrub Shrub Wetland	0.087185	2	281	
SCADA Fiber Routes					
	Agricultural Ditch	0.059576	3	288	Soil, gravel, concrete pipe culvert, conduit
	Depression	0.079083	6	766	
	Natural Channel	0.002493	3	12	
	Scrub Shrub Wetland	0.001322	2	4	
	Seasonal Wetland	0.032284	2	104	
Shaft: Lower Roberts Island					
	Agricultural Ditch	5.724658	3	27707	Soil, gravel, rail, rail spikes, concrete, concrete culvert pipe, pipe, concrete, rip rap, steel piers, sheet pile,
Shaft: Lower Roberts Island / Power					

					slurry wall, tunnel shaft liner
Shaft: Twin Cities Complex	Agricultural Ditch	2.191329	3	10606	Soil, gravel, concrete pipe culvert, conduit
	Agricultural Ditch	2.770536	3	13409	Soil, gravel, pavement, concrete pipe culvert, slurry wall, tunnel shaft liner, conduit
	Depression	0.124258	6	1203	
	Scrub Shrub Wetland	0.634681	2	2048	
Shaft: Twin Cities Complex / Power	Seasonal Wetland	0.00369	1	6	
	Agricultural Ditch	0.03491	3	169	Soil, gravel, concrete pipe culvert, conduit

Block 22. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED

Construction of the proposed project would result in unavoidable impacts to waters of the U.S. Several aquatic types were identified and delineated within the Study Area. Descriptions of the aquatic types are provided below, including general characterizations of the associated vegetation expected to occur within each type of aquatic habitat. This section sets out the surface area of the discharge for each type of waters of the U.S. that would be affected as a result of the proposed project based on a delineation of these waters. This delineation has been verified by the USACE.

Aquatic Types Within the Study Area

Perennial Wetlands

Emergent Wetland

Emergent wetlands within the study area are dominated by herbaceous emergent plants such as California tule (*Schoenoplectus californicus*; OBL), hard-stem tule (*S. acutus*; OBL), narrow-leaf cattail (*Typha angustifolia*; OBL), broad-leaf cattail (*T. latifolia*; OBL), and floating water primrose (*Ludwigia peploides*; OBL). The vegetation assemblages typically associated with this wetland type are almost exclusively dominated by species rated as obligate on the National Wetland Plant List (Lichvar et al. 2016). These areas have a persistent vegetative aerial signature and evidence of inundation or saturation is present on most aerial images evaluated.

This wetland class typically occurs at the edges of ponds or lakes, along the margins of tidal channels, on in-channel islands of major tidal channels within the Delta, and where seepage occurs on the landside of levees. Average water depth in this type of feature is estimated to be around 3 feet.

Scrub-Shrub Wetland

Scrub-shrub wetlands within the study area are dominated by woody vegetation less than 20 feet tall and include shrubs typically associated with riparian areas such as sandbar willow (*Salix exigua*; FACW), Himalayan blackberry (*Rubus armeniacus*; FAC), red twig dogwood (*Cornus sericea* [syn. *C. alba*]; FACW) buttonwillow (*Cephalanthus occidentalis*; OBL), and California wild rose (*Rosa californica*; FAC). Fremont's cottonwood (*Populus fremontii* [syn. *P. deltoides*]; FAC) seedlings or saplings may also be present. The vegetation assemblages typically associated with this wetland type include species rated as obligate, facultative wetland, and facultative on the National Wetland Plant List (Lichvar et al. 2016). Herbaceous species are generally lacking or are a minor component of the vegetation assemblage as the canopy cover in scrub-shrub wetlands is high and low-growing herbaceous species do not receive sufficient light for survival. Evidence of saturation or inundation is more variable as compared to the emergent wetland class; however, the vegetation community is persistent due to the dominance of perennial shrubs.

The scrub-shrub wetland class typically occurs at the periphery of depressions, ponds, and lakes; along the margins of tidal and non-tidal channels; and on in-channel islands in the Delta.

Average water depth in this type of feature is estimated to be around 2 feet.

Forested Wetland

Forested wetlands are defined by woody vegetation that is 20 feet tall or taller with a tree canopy cover equal to or greater than 25 percent. Riparian trees common in the study area include Goodding's black willow (*Salix gooddingii*; FACW), red willow (*S. laevigata*; FACW), box elder (*Acer negundo*; FACW), Oregon ash (*Fraxinus latifolia*; FACW), Fremont's cottonwood, white alder (*Alnus rhombifolia*; FACW), black walnut (*Juglans hindsii*; FAC), and valley oak (*Quercus lobata*; FACU). Forested wetlands generally have a shrub component, typically in canopy openings and along the forested edge. The presence of an herbaceous layer is variable. The vegetation assemblages typically associated with forested wetlands include species rated as facultative wetland and facultative on the National Wetland Plant List (Lichvar et al. 2016). Species with obligate or facultative upland ratings are occasional in forested wetlands, and generally not the dominant species represented in the habitat.

Forested wetlands within the study area are located along the edges of tidal and non-tidal channels, and on in-channel islands located within tidally influenced waterways. Evidence of saturation or inundation is variable on aerial images as compared to the emergent wetland class; however, the vegetation community is persistent due to the dominance of perennial tree species. Average water depth in this type of feature is estimated to be around 2 feet.

Seasonal Wetlands

Vernal Pool

Vernal pool wetlands are topographic depressions that are usually found within annual grassland habitats. There is a water-restricting soil horizon, often high in clay content and indurated, located near the soil surface that prevents water from infiltrating deep into the soil horizons and away from the root zone. These depressions fill with rainwater and may remain inundated through spring or early summer. Vernal pools often occur in complexes of many small pools that are hydrologically interconnected via overland surface flow through swales when pools are full. Water may also move below the soil surface as water infiltrates and travels above the hardpan or claypan layer into adjacent pools. Vernal pools support distinct herbaceous vegetation assemblages and many of the plant species that occur in this wetland type are endemic to California. Vernal pool wetlands can support a variety of floristic diversity, ranging from common to rare. Commonly encountered species typical of vernal pool habitats within the study area include popcorn flower (*Plagiobothrys* spp.; OBL to FACW), Fremont's tidy tips (*Layia fremontii*; OBL), goldfields (*Lasthenia* spp.; OBL to FACU), coyote thistle (*Eryngium* spp.; OBL to FACW), calicoflower (*Downingia* spp.; OBL), and pale spike rush (*Eleocharis macrostachya*; OBL). The wet phase of vernal pools is dominated by plants rated as obligate or facultative wetland on the National Wetland Plant List (Lichvar et al. 2016). As the vernal pools draw down as a result of evaporation and increased evapotranspiration in late spring and early summer, annual upland grasses sometimes colonize and become dominant in these seasonal wetland habitats.

Vernal pool wetlands within the study area are located primarily in areas that are relatively undeveloped without substantial land alteration. This wetland type occurs on lands with hummocky surfaces, primarily at the northernmost portion of the study area south of North Stone Lake, and along the western side of the San Joaquin Valley near Clifton Court Forebay. Average water depth in this type of feature is estimated to be around 1 foot.

Alkaline Wetland

Alkaline wetland is a type of seasonal wetland influenced by strongly alkaline or saline soils. Alkaline wetlands often support alkaline or saline tolerant shrubs such as iodine bush (*Allenrolfea occidentalis*; FACW), alkali heath (*Frankenia salina*; FACW), bush seepweed (*Suaeda nigra*; OBL), and saltbush (*Atriplex* spp.; FACW to FAC). The shrub layer may be co-dominate with salt-tolerant grasses including salt grass (*Distichlis spicata*; FAC) and alkali sacaton (*Sporobolus airoides*; FAC). This wetland type may have large unvegetated areas as a result of salt accumulations at or near the soil surface. Alkaline wetland habitats are dominated by an assemblage of plants with facultative wetland or facultative ratings on the National Wetland Plant List (Lichvar et al. 2016).

Evidence of seasonal saturation or inundation may be present on wet season aerial imagery, and salt crust presents bright white signatures during dry season imagery. Alkaline wetlands are primarily located in the southern portion of the study area on lands without substantial land alteration, or in small patches at the periphery of agricultural fields or along canals. Average water depth in this type of feature is estimated to be around 1 foot.

Seasonal Wetland

Seasonal wetlands are the most broad and diverse of the wetland types identified in this report. These wetlands are primarily colonized by herbaceous species that are common throughout the Central Valley and Delta. The vegetation assemblages typically associated with seasonal wetlands primarily include species rated as facultative wetland and facultative on the National Wetland Plant List (Lichvar et al. 2016), and often include ruderal species such as tall flatsedge (*Cyperus eragrostis*; FACW), Santa Barbara sedge (*Carex barbarae*; FAC), soft rush (*Juncus effusus*; FACW), fiddle dock (*Rumex pulcher*; FAC), curly dock (*R. crispus*; FAC), and perennial rye grass (*Festuca perennis* [syn. *Lolium perenne]*; FAC). Species with obligate or facultative upland ratings typically comprise a lesser percentage of the plant community. The vegetation composition is influenced primarily by landscape position, influence of ground water, soil texture, and runoff and drainage properties, as well as anthropogenic and natural disturbances.

Seasonal wetlands are the most prevalent and widespread of all wetland classes mapped within the study area. Evidence of saturation or inundation is variable on aerial images, especially in areas with a high degree of anthropogenic modification and which may be subject to regular disturbance such as agriculture or winter flooding for migratory bird and waterfowl management. Numerous seasonal wetlands were mapped in active agricultural fields in the Delta. While the size and shape of seasonal wetlands in farmed fields is subject to a degree of annual variation which may result from on-going farming practices, some evidence of wet season inundation or saturation is visible in a typical year. Although ground water levels are controlled on Delta islands using a system of pumps and drainage ditches to maintain water levels on the subsided islands, a high water table persists in some areas. Upland crops planted in these areas may be subject to failure or may be impossible to harvest; therefore, aerial signatures indicating reduced growth and/or vigor in crops such as corn or areas within cropped fields that were seldom planted were interpreted as indications of wetland conditions and these areas were categorized as seasonal wetland. Average water depth in this type of feature is estimated to be around 1 foot.

Non-Tidal Waters

Agricultural Ditch

Agricultural land cover is common throughout the study area, most notably on Delta islands. Agricultural ditches are used for irrigation and drainage purposes. Agricultural ditches within the study area, particularly ones on Delta islands, may have been constructed in wetlands or may partially drain wetlands and, therefore, are potentially jurisdictional. Agricultural ditches range in size from 1 to 75 feet in width. These features are generally unvegetated with unconsolidated mud bottoms as a result of regular maintenance activities conducted to maintain capacity for drainage and water delivery. Tule and cattail species may colonize ditch side-slopes if there is a lapse in the vegetation maintenance cycle. Average water depth in this type of feature is estimated to be around 3 feet.

Natural Channel

Non-tidal natural channels are present primarily along the northeast and southwest portions of the study area. Natural channels include large perennial rivers that qualify as TNW, intermittent streams that qualify as RPW, and ephemeral channels that qualify as non-RPW. All features mapped to this class are assumed to have an OHWM as indicated by a change in vegetative character or break in bank slope, as evidenced on aerial imagery or DEM. The substrate in natural channels may be mud, sand, gravel, and/or cobble depending on geographic location. Natural channels within the study area include waterways such as drainages to Stone Lake and tributaries to the Cosumnes River and Italian Slough. Average water depth in this type of feature is estimated to be around 3 feet.

Depression

Depressions are open-water ponds that are permanently or seasonally inundated, with little to no rooted vegetation on an unconsolidated or mud bottom. These features may be artificially filled as a result of agricultural or stormwater detention, or may result from a high water table. Depressions are less than 20 acres in size and generally have a water depth of less than 6 feet. These water bodies are often created by excavation, and are diked or otherwise artificially impounded.

Depressions may be colonized by floating plant species such as common duckweed (*Lemna minor*; OBL), mosquito fern (*Azolla* spp.; OBL), or water hyacinth (*Eichhornia crassipes*; OBL), but generally lack rooted vegetation except on depression margins. Average water depth in this type of feature is estimated to be around 6 feet.

Tidal Waters

Tidal Channel

Tidal channels in the Delta are natural or constructed perennial riverine waterways, though most within the study area have been modified with leveed banks that are reinforced with rock revetment. In-channel water velocity and depth fluctuate under tidal influence, and the channel bottom is generally composed of mud or unconsolidated sediments with varying amounts of sand, silt, and clay.

Emergent wetlands that occur along the margins of tidal channels and in-channel islands that are also commonly encountered in the study area, notably along Old River and Middle River, were mapped separately from the tidal channel aquatic type.

Conveyance Channel

Conveyance channels include rock or cement-lined linear channels. These are constructed water features which are associated with the SWP or CVP. These features are generally straight as a result of excavation and are diked or have reinforced banks. Vegetation is generally absent due to water depth or a lack of rooting substrate. Control structures are present that periodically affect tidal influence, but conveyance channels experience tidal fluctuation when water is brought into the system, generally on a flood tide.

Surface Area of Discharge of Fill Material

The proposed project would result in the discharge of fill material into approximately 50.4 acres of waters of the U.S. The acres of waters that would be affected by surface fill are set out in Table 6 below. Locations of fill impacts are identified in **Attachment 1, Mapbook of Impacts**. Some of the impacts may be overestimated; for example, the location or configuration of some tunnel launch shaft, maintenance shaft, or reception shaft sites may be modified to further avoid wetlands and other waters, and the bridge crossings are currently designed to be constructed on piles only, which would reduce the amount of estimated fill acreage.

Table 6. Acres of Filled Waters

Aquatic Type	*Permanent Fill (Acres)*	*Temporary Fill (Acres)*
Wetlands	**3.53**	**2.48**
Alkaline Wetland	0.22	0.19
Emergent Wetland	0.24	0.28
Forested Wetland	1.33	0.72
Scrub Shrub Wetland	0.57	0.97
Seasonal Wetland	1.03	0.26
Vernal Pool	0.14	0.06
Other Waters	**17.24**	**27.15**

Agricultural Ditch	11.14	24.13
Conveyance Channel	0	0.27
Depression	0.39	1
Natural Channel	0.14	0.11
Tidal Channel	5.57	1.64
TOTAL	**20.77**	**29.63**

Block 23. DESCRIPTION OF AVOIDANCE, MINIMIZATION, AND COMPENSATION

DWR has designed the proposed project to avoid and minimize, to the maximum extent practicable, adverse impacts to waters of the U.S. However, unavoidable losses of aquatic resources would occur as a result of the project. DWR would provide appropriate compensatory mitigation for these unavoidable effects to aquatic resources in accordance with USACE regulations and policies.

Environmental Commitments

The proposed project would be designed to avoid impacts to waters of the U.S. to the maximum extent practicable. The measures listed below and in **Attachment 3, Environmental Commitments,** describe the types of currently proposed Environmental Commitments (ECs) that would be implemented for the Delta Conveyance Project as it pertains to waters of the U.S. ECs are those actions that are incorporated into the engineering or design of the proposed project and are intended to avoid, reduce, or minimize general environmental impacts not necessarily specific to a particular potential significant resource impact. DWR will continue to develop ECs through the environmental review and planning process and the proposed project may be further enhanced with additional measures. ECs implemented to avoid and minimize impacts to aquatic resources and species that use aquatic habitats are intended to reduce project impacts to waters of the U.S.

Table 7. Summary of the Environmental Commitments Applicable to Impacts on Aquatic Resources[2]

Title	Summary
EC-1: Conduct Environmental Resources Worker Awareness Training	Includes procedures and training requirements to educate construction personnel on the types of sensitive resources in the proposed project area, the applicable environmental rules and regulations, and the measures required to avoid and minimize effects on these resources.
EC-2: Develop and Implement Hazardous Materials Management Plans	Includes measures and practices that will be implemented for hazardous materials management plans, including practices to reduce the likelihood of a spill of toxic chemicals and other hazardous materials.
EC-3: Develop and Implement Spill Prevention, Containment, and Countermeasure Plans	Includes measures and practices that will be implemented for a spill prevention, containment, and countermeasure plan (SPCCP) for each project site, including preventing and responding to discharges that could affect navigable waters of the U.S. Each SPCC plan will address actions used to prevent spills in addition

[2] Please note that Attachment 3 – Environmental Commitments – contains additional ECs that have been identified in the Environmental Impact Report for the Delta Conveyance Project and is not necessarily specific to impacts on aquatic resources.

	to specifying actions that will be taken should any spills occur, including emergency notification procedures.
EC-4a: Develop and Implement Erosion and Sediment Control Plans	Includes measures that will be implemented for erosion and sediment control plans to control short-term and long-term erosion and sedimentation effects and to restore soils and vegetation in areas damaged by construction activities, and that will be incorporated into stormwater pollution prevention plans.
EC-4b: Develop and Implement Stormwater Pollution Prevention Plans	Includes measures that will be implemented for stormwater pollution prevention plans (SWPPPs) to control short-term and long-term effects associated with construction-generated stormwater runoff. The SWPPPs will include all the necessary state requirements regarding construction-generated stormwater collection, detention, treatment, and discharge that will be in place throughout the construction period.
EC-10: Marine Vessels	Includes requirements that all marine vessels operate engines no older than model year 2010 (manufactured or retrofitted) and keeping a written record of engine usage during construction.
EC-14: Construction Best Management Practices for Biological Resources	Includes elements of site or activity-specific environmental compliance monitoring plans and measures that will be implemented prior to and during construction activities and field investigations for the protection of special-status fish, wildlife and plant species and their habitats, designated critical habitats, and sensitive natural communities.
EC-15: Sediment Monitoring, Modeling, and Reintroduction Adaptive Management	Includes monitoring and estimating sediment entrainment during the first several years of operations following north Delta intake construction, the monitoring and modeling of potential effects, and, if performance criteria are exceeded, the development and implementation of a sediment reintroduction plan
EC-16: Provide Notification of Construction and Maintenance Activities in Waterways	Includes notification procedures to agencies or at nearby affected Delta marinas and public launch ramps to provide information such as site location(s), schedules, speed limits, and identification of no-wake zone and/or detours, where applicable.

Compensatory Mitigation

DWR will provide compensatory mitigation to offset unavoidable impacts to waters of the U.S. associated with the proposed discharges. In some cases, restoration actions that DWR intends to implement to provide habitat for species may also serve as compensatory mitigation for the loss of aquatic resources (e.g. created emergent marsh may function as both habitat for delta smelt and longfin smelt, as well as compensatory mitigation for discharges into emergent marsh habitat). The proposed compensatory mitigation would be subject to specific success criteria and monitoring requirements, assurances of permanent protection, and long-term maintenance and monitoring commitments pursuant to the requirements of the Mitigation Rule. In some cases, proposed mitigation would likely afford significantly higher function and value than that of waters proposed for discharge.

Compensation ratios, which are developed by USACE, must be, to the extent practicable, sufficient to replace lost aquatic resource functions. It is anticipated that mitigation ratios would be at a minimum of 1:1, but may be greater to account for such factors as the type of mitigation proposed (e.g., preservation), the likelihood of success, and the differences between the functions lost at the impact sites and the functions expected to be produced by the compensatory mitigation. DWR may propose a combination of several methods of mitigation, including restoration, enhancement, establishment, and preservation. DWR recognizes that USACE does not typically accept preservation as the only form of mitigation and, where preservation is proposed, USACE generally requires substantially greater ratios of replacement to impact. Different ratios would likely be developed for each affected aquatic resource type, and further, for each functional ranking within each aquatic resource type. Impacts to some lower functioning aquatic resources, such as seasonal wetland and agricultural ditches, may be mitigated out-of-kind with higher functioning aquatic resource types.

DWR has prepared a draft Compensatory Mitigation Plan that has identified mitigation options to adequately compensate for unavoidable impacts to aquatic resources. The current conceptual draft of the Compensatory Mitigation Plan involves the creation of habitat restoration areas on Bouldin Island and at the I-5 ponds as well as proposed tidal marsh restoration activities in which exact locations have not been identified.

DWR proposes compensatory mitigation using one or more of the following approaches:

- Purchase of credits at a USACE approved mitigation bank
- Payment into a USACE approved in-lieu fee program
- On-site (adjacent to the project footprint) restoration or enhancement of aquatic resources converted to uplands due to past land use activities (such as agriculture) or functionally degraded by such activities
- On-site (adjacent to the project footprint) creation of aquatic resources
- Off-site (within the Delta) restoration or enhancement of aquatic resources converted to uplands due to past land use activities (such as agriculture) or functionally degraded by such activities
- Off-site (within the Delta) creation of aquatic resources

Purchase of Mitigation Bank Credits or Payment into In-lieu Fee Program

DWR may purchase bank credits and/or make payments into an in-lieu fee program to compensate for impacts. DWR would utilize programs that have been USACE-approved and have service areas that encompass areas in which the proposed impacts would occur.

On-Site Restoration, Enhancement, and/or Creation

Much of the Delta consists of degraded or converted habitat that is generally functioning as upland. DWR may seek opportunities to conduct on-site restoration, enhancement, and/or creation in areas adjacent to project footprints. It is anticipated that some of the compensatory mitigation would fall into this category.

Off-Site Restoration, Enhancement, and/or Creation

Within the immediate vicinity of the project area, much of the land has been subject to agricultural or other land uses which have degraded or even eliminated wetlands that existed historically. DWR would evaluate sites within the Delta to determine their potential for restoration, enhancement, and/or creation. It is anticipated that most of the compensatory mitigation obligation would be satisfied through this approach.

DWR will seek input from USACE regarding these options and will prepare a final mitigation plan that reflects USACE guidance.

Block 25. ADDRESSES OF ADJOINING PROPERTY OWNERS

Please see **Attachment 4, Updated Adjacent Landowner Mailing List.**

Block 26. LIST OF OTHER CERTIFICATES/APPROVALS[3]

AGENCY	TYPE OF APPROVAL	STATUS
USFWS	Biological Opinion/Incidental Take Statement	Expected 2023
NMFS	Biological Opinion/Incidental Take Statement	Expected 2023
CDFW	2081(b) Incidental Take Permit	Expected 2023
CDFW	Streambed Alteration Agreement	Expected 2023
SWRCB	Change in Point of Diversion	Expected 2024
SWRCB	Water Quality Certification/WDR	Expected 2024

C. Additional Information

In addition to the supplemental data above, the following **additional information** is provided to assist USACE in the permit process.

1. NEPA

In order to comply with the NEPA, USACE, as the federal lead agency, will develop an EIS for the proposed Delta Conveyance Project, which is intended to provide the analysis for all federal actions that are necessary for implementation of the proposed project.

2. WATER QUALITY CERTIFICATION
A Clean Water Act Section 401 Water Quality Certification (WQC) will be required from the State Water Resources Control Board (SWRCB). Because the proposed project crosses multiple Regional Water Boards' jurisdiction and issuance of water right authorization is required, the SWRCB will be responsible for issuing a water quality certification.

DWR has not yet submitted the application for the Section 401 WQC; this is expected to occur in late 2023. In addition, implementation of the proposed Delta Conveyance Project will require the SWRCB to authorize a change in the point of diversion for the SWP, amending DWR's water right. Preliminary coordination with the SWRCB has begun and is ongoing.

3. ENDANGERED SPECIES

[3] Please note that this is a list of major project certificates/approvals and is not meant to be an exhaustive list of all approvals that would be needed for the proposed Delta Conveyance Project.

Section 7 of the ESA requires all federal agencies to ensure that its actions do not jeopardize the continued existence of a listed species or adversely modify or destroy designated critical habitat. The process for documenting compliance with Section 7 includes a consultation process with the U.S. Fish and Wildlife Service and National Marine Fisheries Service (the Services). It is anticipated the proposed Delta Conveyance Project is likely to adversely affect listed species or designated critical habitat requiring formal consultation under Section 7 of the federal ESA. DWR will work with USACE to define the scope of the Section 7 consultation process and development of the biological assessment (BA). Submittal of a BA is anticipated for mid-2022. Coordination with the Services has begun and is ongoing.

4. CULTURAL RESOURCES

The National Historic Preservation Act (NHPA), specifically 54 U.S.C. §306108, which is commonly known as “Section 106” of the NHPA, requires federal agencies, in coordination with the State Historic Preservation Officer, to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The Section 106 process is governed by federal regulations issued by the ACHP, “Protection of Historic Properties” (36 CFR Part 800) (August 5, 2004), as administered by the USACE through its implementing regulations (33 CFR 325, Appendix C, “Procedures for the Protection of Historic Properties”).

USACE is the lead federal agency pursuant to Section 106. An area of potential effect (APE) for purposes of Section 106 compliance encompasses only work areas that fall under the USACE jurisdiction pursuant to Section 408 permission and Section 10 and Section 404 permit areas, and indirect effects on historic properties from activities within work areas and permit areas. USACE has drafted a programmatic agreement (PA) for Section 106 compliance, in coordination with DWR, and has begun coordination with interested parties soliciting review and comment on the draft PA. DWR will work with USACE to establish the APE for each phase of Section 106 review and assist with compliance with Section 106.

5. ANALYSIS OF ALTERNATIVES

DWR will develop an analysis of alternatives pursuant to the Section 404(b)(1) Guidelines (40 C.F.R. section 230.10(a)-(d)) to support the USACE’s findings and permit decision under Section 404. The analysis of alternatives will be submitted to USACE separate from this application.

6. 408 AUTHORIZATION

A Section 408 permission under Section 14 of the Rivers and Harbors Act of 1899 (RHA) will be required for the proposed Delta Conveyance Project. To construct the proposed water conveyance facility, and potentially associated mitigation, the USACE facilities potentially altered requiring Section 408 permission are the Sacramento River Flood Control Project (SRFCP) and the Stockton Deep Water Ship Channel (Stockton DWSC).

The process for securing Section 408 permission is set forth in the Department of the Army, U.S. Army Corps of Engineers, Circular No. EC 1165-2-220 and involves (1) precoordination; (2) submit Review Plan (3) written request; (4) required documentation (including environmental compliance, if applicable); (5) district-led Agency Technical Review (ATR); (6) Summary of Findings; (7) division review; (8) headquarters review; (9) notification; and (10) post-permission oversight. Not all the steps will apply to every Section 408 request. In simple cases, steps may be combined or be undertaken concurrently.

The Section 408 permission process, as defined by EC 1165-2-220, also requires a "Statement of No Objection" letter from the non-federal sponsor, which is the Central Valley Flood Protection Board (CVFPB) for the proposed Delta Conveyance Project. On May 22, 2020, the CVFPB sent the "Statement of No Objection" letter to USACE.

DWR expects that the Section 404 and Section 10 permit authorizations will be coordinated with the actions that also require approvals under Section 408. Separate USACE approval will be requested for those project activities requiring authorization under Section 404 and Section 10 that are independent from and not connected to project activities requiring authorization under Section 408. Early coordination with USACE regarding Section 408 permission has been initiated and is ongoing. A draft Section 408 Review Plan has been developed and is undergoing USACE review. The 408 application is expected to be submitted in mid-2024.

DWR's request to construct a tunnel crossing under the Stockton Deep Water Ship Channel requires a Real Estate outgrant from the San Francisco District. While the outgrant is an independent decision, work products developed for the 408 request would be utilized for both reviews.

DESIGNED	APPROVAL RECOMMENDED
DRAWN	APPROVAL BY
CHECKED	

REV | DATE | DESCRIPTION | SUB. | APP'D

Attachment 2

Proposed Delta Conveyance Project Overview Map

PROJECT NO. W8X97000

SHEET NO. STB-G-0050GN

REV | SEQUENCE NO.

STB-G-0050GN_W8X97000.dgn