

**Appendix 2B Additional Alternatives
Screening and Evaluation**

Appendix 2B Additional Alternatives Screening and Evaluation

This appendix describes the screening process and evaluations of alternatives proposed for inclusion in this RDEIR/SDEIS. It summarizes the screening process that generated the alternatives evaluated in the 2017 Draft EIR/EIS and describes the subsequent processes and input used to develop Alternatives 1, 2, and 3 that are analyzed in this RDEIR/SDEIS. This appendix also compares Alternatives 1, 2, and 3 with Alternatives A and D from the 2017 Draft EIR/EIS for informative purposes.

A number of screening processes spanning decades identified a Sites Reservoir in the Antelope Valley as the preferred type and location of reservoir to provide additional water storage in the western Sacramento Valley (Appendix 2A, *Alternatives Screening and Evaluation*). The screening assessment conducted to develop the alternatives carried forward in this RDEIR/SDEIS focused on the precise location, scale, and operational configurations of a storage reservoir located in the Antelope Valley. The Authority is considering Alternatives 1, 2, and 3 in this RDEIR/SDEIS after receiving input during the WSIP application process (Section 2B.2), from state and federal agencies (Section 2B.3), and from numerous stakeholders including nongovernmental organizations (NGOs), elected officials, landowners, and local communities through the public comment period on the 2017 Draft EIR/EIS.

2B.1 Summary of Previous Processes

In establishing the range of alternatives analyzed in this RDEIR/SDEIS, the Authority and Bureau of Reclamation (Reclamation) built on prior water resources planning efforts in California and on the associated body of evidence supporting the alternatives evaluated in the 2017 Draft EIR/EIS (Figure 2B-1; Section 2A.4, *Development of a Range of Conceptual Alternatives*, in Appendix 2A; and Reclamation and Department of Water Resources 2008).

During the environmental review process for the issuance of the CALFED Bay-Delta Program Programmatic Record of Decision in August 2000 (CALFED ROD), over 50 potential surface storage locations were initially identified, and retained several reservoir locations statewide for further study. As described in Appendix 2A, the CALFED statewide screening assessment concluded that the Sites Reservoir would result in less adverse environmental impacts when compared to the other reservoir locations and concepts that were considered. Constructing a reservoir in the other locations studied was determined to potentially cause extensive environmental effects, including the disturbance or loss of cultural resources, aquatic and terrestrial biological resources, and jurisdictional wetlands and waters. (Bureau of Reclamation 2019).

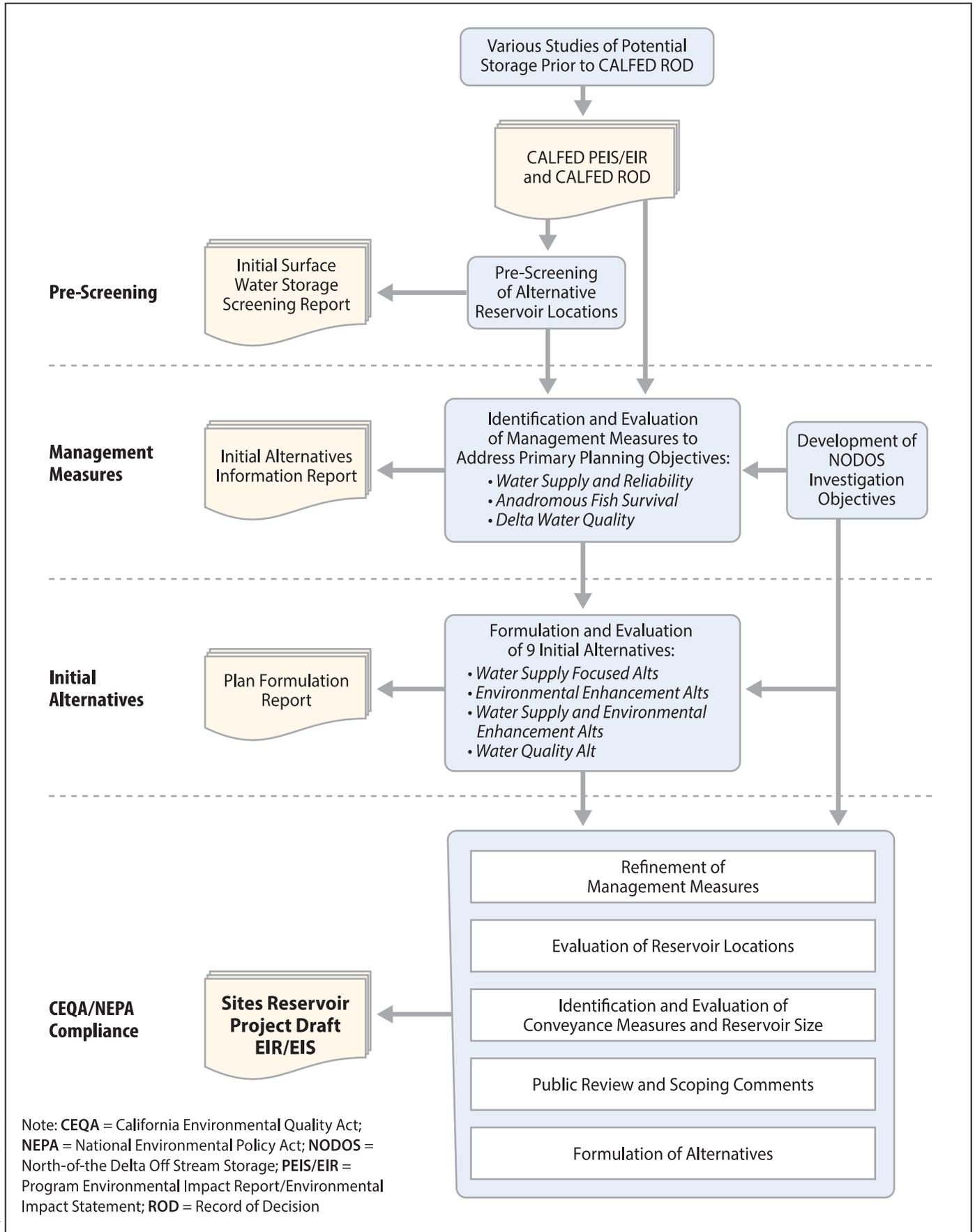


Figure 2B-1
Water Resource Planning Efforts Supporting
Alternatives Development for Sites Reservoir Project

The range of alternatives for Sites Reservoir studied in the 2017 Draft EIR/EIS, which built on the prior water resources planning efforts in California, included the alternatives listed below, all of which would divert and store water within the Sacramento River watershed when available during high-flow events and when not needed to meet other environmental and water supply requirements. This water would then be released from storage for beneficial uses in compliance with various operating agreements and relevant permits and approvals. The reliance on Sacramento River tributary flows downstream of Shasta Lake and ability to store flows when available pursuant to water rights and regulatory requirements were intended to provide a new and resilient source of supply to assist in improving ecosystem conditions, water supply reliability, and Delta water quality.

Alternatives evaluated in the 2017 Draft EIR/EIS included varying sizes of a surface water reservoir. The reservoir would be filled using existing Sacramento River diversion facilities and/or a new Delevan Pipeline on the Sacramento River. All but one alternative involved using the Delevan Pipeline to divert Sacramento River water. The alternatives evaluated in the 2017 Draft EIR/EIS were as follows:

- **Alternative A.** This alternative involved a 1.3-MAF Sites Reservoir with the Delevan Pipeline; conveyance to and from the reservoir would have been provided by the existing TC Canal and GCID Main Canal and the Delevan Pipeline (2,000 cubic feet per second [cfs] diversion/1,500 cfs release). This alternative would also include approximately 46 miles of new paved and unpaved roads and new hydropower facilities with related overhead power line facilities.
- **Alternative B.** This alternative involved a 1.8-MAF Sites Reservoir with a release-only Delevan Pipeline; conveyance to and from the reservoir would have been provided by the existing TC Canal and GCID Main Canal and the release-only Delevan Pipeline (1,500 cfs release). This alternative also included approximately 46 miles of new paved and unpaved roads and new hydropower facilities with related overhead power line facilities.
- **Alternative C.** This alternative involved a 1.8-MAF Sites Reservoir with the Delevan Pipeline; conveyance to and from the reservoir would have been provided by the existing TC Canal and GCID Main Canal and the Delevan Pipeline (2,000 cfs diversion/1,500 cfs release). This alternative also included approximately 46 miles of new paved and unpaved roads and new hydropower facilities with related overhead power line facilities.
- **Alternative C1.** This alternative was a variant of Alternative C. It was identical to Alternative C except that it did not include any hydropower-generating facilities or related overhead power line facilities.
- **Alternative D.** This alternative involved a 1.8-MAF Sites Reservoir with the Delevan Pipeline; conveyance to and from the reservoir would have been provided by the existing TC Canal and GCID Main Canal and the Delevan Pipeline (2,000 cfs diversion/1,500 cfs release). This alternative would include approximately 41 miles of new paved and unpaved roads, road relocations that would differ from those of the other alternatives, and an alternate alignment of an overhead power line. Alternative D would also include new hydropower facilities.

2B.2 2018 WSIP Application

In 2014, California voters passed Proposition 1 to dedicate \$2.7 billion for investments in water storage projects. The California Water Commission (CWC) established the WSIP and administers it as part of the implementation of Proposition 1. In August 2017, the Authority filed an application with the CWC for WSIP funding that was based on Alternative D in the 2017 Draft EIR/EIS. The CWC determined that the Project met all WSIP criteria and thus was eligible for maximum funding. The Authority then proceeded to refine the Project in 2019 and 2020 through focused discussions with agencies (Section 2B.3) and the value planning process (Section 2B.4).

2B.3 2019 Agency Input

In May 2019, the Authority initiated a series of focused discussions with the California Natural Resources Agency regarding Project planning and intended operations. The purpose of these discussions was to address the effects of the Project on the State's public trust resources and further refine the Project facilities and operational characteristics consistent with what would be affordable for member participants and also to meet applicable permitting requirements.

The Authority met with the aquatics and terrestrial technical teams from the California Department of Fish and Wildlife (CDFW) several times between May and September 2019 to explore refinements to Project operations and facilities. These meetings generally addressed the following topics:

- Potential effects of the Project on the State's public trust resources
- Operating criteria
- Avoidance and minimization measures (AMMs) to support CDFW permitting requirements under the California Endangered Species Act (CESA; Fish and Game Code Sections 2050 *et seq.*), and the provisions governing the issuance of Lake and Streambed Alteration Agreements (California Fish and Game Code Sections 1600 *et seq.*)
- CDFW's public comments on the 2017 Draft EIR/EIS

During and following this process, the Authority revised the Project operational components and eliminated or modified previously proposed facilities to ensure an affordable Project capable of providing a sufficient and reliable water supply and dedicated ecosystem benefits. These revised components include revised 2019 operational scenarios/criteria, proposed conservation measures, and a science and adaptive management strategy. It also included removing the Delevan Intake, revisions to the operational criteria and less water being pumped from the Sacramento River on average, as well as reducing the footprint of the reservoir from a maximum of 1.8 MAF to 1.5 MAF.

2B.3.1 Revised 2019 Operational Scenarios and Modifications to Facilities

Revised operational criteria and scenarios that were developed in 2019 provided the foundation for initial sensitivity analysis of the operations, evaluation of effects on listed species, and

assessment of affordability/yield. The Authority considered revised diversion criteria that incorporated components of the CDFW operational scenario provided during the focused discussions, as well as comments received on the 2017 Draft EIR/EIS, the value planning process, and discussions with stakeholders and NGOs. The revised operational scenarios and associated diversion criteria were based on flow measured at each of the diversion locations and scaled to a percent of actual river flow (based on a multiday running average) at each diversion location to reduce Project effects during important salmonid development and migration periods.

In addition to the revised minimum bypass flow requirements, the Authority proposed removing the Delevan Intake from the Project (only a Delavan outlet would remain). This change was made on the basis of the cost of this feature and in recognition of the environmental tradeoff between diverting water at existing facilities versus a new screened diversion. The Authority also proposed reducing the size of the Sites Reservoir to 1.5 MAF based on anticipated demand, a desire to reduce the overall footprint of the reservoir and related facilities, and the proposed elimination of the Delevan Intake.

In the 2019 and 2020 timeframe and in response to discussions with NGOs, the Authority also conducted a sensitivity analysis to determine if the Project would be viable with the following operating criteria met prior to the Project being able to divert: (1) bypass flows of at least 15,000 cfs past all diversion locations October through June; (2) bypass flows of at least 35,000 cfs at Freeport October through June; and (3) Delta outflow ranging from 42,800 cfs to 44,500 cfs in January through June. Based on these criteria, Project deliveries were reduced to a long-term average annual delivery of 131,000 AF. This resulted in Project per acre foot costs increasing by \$480 to \$525/AF above the costs estimated in the Value Planning Report. This scenario also resulted in a long-term average of 35,000 AF for Proposition 1 benefits, reducing the overall Project environmental benefits substantially and increasing the cost of the environmental benefits to a point that they would likely no longer result in a cost/benefit ratio sufficient to qualify for Proposition 1 funding. Due to the substantial increase in costs and the virtual elimination of the environmental benefits of the Project, this scenario was not considered for further analysis.

2B.3.2. Avoidance and Minimization Measures

During the 2019 agency input process, the Authority proposed several AMMs, as well as measures to offset and compensate for residual adverse effects associated with Project operations. These AMMs were developed in response to issues identified by CDFW during the focused discussions and those from other commenters on the 2017 Draft EIR/EIS. The Authority will continue working with CDFW, the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) on these issues as part of the CESA permitting process and the federal Endangered Species Act consultation process. The Authority intends to target priority actions that have been identified by CDFW, NMFS, and USFWS as set out in the following plans:

- *Delta Smelt Resiliency Strategy* (California Natural Resources Agency 2016).
- *Sacramento Valley Salmon Resiliency Strategy* (California Natural Resources Agency 2017).
- *Central Valley Chinook Salmon and Steelhead Recovery Plan* (National Marine Fisheries Service 2014).

- *Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon* (National Marine Fisheries Service 2018).

The Authority also intends to develop a science and adaptive management plan, in order to address iteratively as new information is collected any contingencies that arise during the course of the implementation of Project operations (refer to Appendix 2D, *Best Management Practices*, for more information regarding technical studies and adaptive management).

2B.4 Value Planning

After receiving comments from state and federal agencies, NGOs, elected officials, landowners, and local communities through the public comment period for the 2017 Draft EIR/EIS, the WSIP application process, and the agency input process, the Authority decided in October 2019 to initiate a value planning process to “right size” the Project. The primary goals of this effort were to identify a project that is permittable, is technically feasible, is financially feasible and cost-effective, and reduces the impacts on species and ecosystems associated with a larger reservoir (1.8 MAF) and with the previously proposed construction of the Delevan complex and pipeline (Sites Project Authority 2020a).

Many commenters on the 2017 Draft EIR/EIS were opposed to the Delevan Facility, which was an integral component of the alternatives evaluated in that document. During the agency input process described in Section 2B.3, the Authority proposed removing the Delevan Intake from the Project and retaining the Delevan Pipeline as an outlet-only facility. Comments on the Delevan Facility were considered during the value planning process and the Authority identified a new component option. This option would involve using the existing TC Canal to deliver water to the southern terminus of the canal, where it would be conveyed to either the CBD or the Sacramento River through a newly constructed pipeline originating near the town of Dunnigan (i.e., Dunnigan Pipeline). This new option for releasing water thus eliminates the entire Delevan Facility from the Project evaluated in the 2017 Draft EIR/EIS.

Many commenters on the 2017 Draft EIR/EIS also expressed concerns with the diversion criteria or identified different diversion criteria. During the agency input process, the Authority proposed revisions to the diversion criteria as a result of the comments and CDFW input.

2B.4.1 Objectives

Prior to the initiation of the value planning effort, the estimated Project cost for Storage Partners for a 1.8-MAF reservoir exceeded an acceptable average annual cost per acre-foot subscription (i.e., it was not affordable for the agricultural partners) for their continued partnership.

Accordingly, the value planning process looked closely at project cost and cost per acre-foot, existing participation levels, and the anticipated benefits to be funded through WSIP. The value planning process focused on the following primary objectives for the Project:

- Improve water supply and water supply reliability
- Provide Incremental Level 4 Refuge water supply
- Improve the survival of anadromous fish

- Enhance the Delta ecosystem

The value planning process also considered the secondary objectives to provide opportunities for flood damage reduction and recreation.

2B.4.2. Project Components Considered during Value Planning

This section describes the facilities associated with Project components proposed in the 2017 Draft EIR/EIS and additional options considered in the subsequent value planning process. Most of the Project costs are associated with four primary Project functions: diversions for filling, conveyance for releases, storage, and the addition of roads and a bridge (Alternatives 1 and 3). Thus, the value planning effort focused on the facilities that would satisfy these functions and meet the value planning objectives stated above.

2B.4.2.1. Diversions

The Sites Reservoir would be filled with diversions from the Sacramento River and therefore requires facilities to divert the water.

All of the alternatives evaluated in the 2017 Draft EIR/EIS included the Delevan Facility (Alternative B in that document included only a release-only Delevan Pipeline). The value planning process evaluated the use of existing diversions (i.e., RBPP and Hamilton City Pump Station) rather than constructing a new pumping plant on the Sacramento River. Eliminating the intake and pumping plant at Delevan would constrain the ability to fill Sites Reservoir; however, the value planning participants decided the two existing diversions would provide adequate conveyance capacity consistent with the range of permittable diversion capacities. In addition, eliminating the previously proposed Delevan Facility would provide substantial cost savings and would reduce potential environmental effects associated with constructing and operating a new intake/discharge facility on the Sacramento River (Sites Project Authority 2020: Appendix C-1).

Diversion and Operation Criteria

Sites Reservoir would be filled through the diversion of excess Sacramento River flows that originate from unregulated tributaries to the Sacramento River downstream from Keswick Dam. Diversions would be allowed when operational criteria are met, which would be set by permitting requirements. The diversion and operation criteria included in the *Value Planning Report* (Sites Project Authority 2020a: Table 3.1) were assumed for the value planning analysis and are referred to as Scenario B.

Pumping Facilities

Water diverted from the Sacramento River would need to be pumped into Sites Reservoir. This would require pumping plants with regulating reservoirs on the existing TC Canal and GCID Main Canal.

A number of the alternatives in the 2017 Draft EIR/EIS included a forebay/afterbay (Holthouse Reservoir), where diversions would be stored and then lifted into Sites Reservoir using the Sites PGP. During the ongoing process of refining the Project to minimize impacts and prior to the value planning process, the Authority and Reclamation identified a new option called Fletcher Reservoir as an alternative forebay/afterbay option to Holthouse Reservoir. Refinement of the

forebay/afterbay feature was an effort to minimize impacts that could result from construction of Hothouse Reservoir. The value planning process participants decided to eliminate pumpback generation from the Project because of the costs of the facilities. Elimination of pumpback generation removed the need for a forebay/afterbay and resulted in a significant cost savings.

The Project design has involved two regulating reservoir options for the TC Canal: a new TC Canal Regulating Reservoir (TC CRR) and the existing Funks Reservoir. The primary advantages of a new northern regulating reservoir (TC CRR) are that it would eliminate almost all impacts on TC Canal operations, and it would allow for early filling of Sites Reservoir. Using the existing Funks Reservoir would minimize the length of pipeline needed, avoid constructing a new regulating reservoir associated with the TC Canal, and therefore reduce Project costs.

Conveying water from the GCID Main Canal requires the construction of a TRR to regulate levels in the canal with the operation of the new pumping plant to convey water to Sites Reservoir. Therefore, construction of the TRR was included. Alternatives to the TRR location are described in Section 2B.6.1.1.

2B.4.2.2. Storage

An appropriately sized Sites Reservoir would be needed to store the water diverted from the Sacramento River. The size of the reservoir would affect the amount diverted and the ability to meet the demands of the Storage Partners and realize the public benefits identified in the WSIP application.

As noted above, the alternatives evaluated in the 2017 Draft EIR/EIS considered a 1.3-MAF reservoir and a 1.8-MAF reservoir. During the agency input process described in Section 2B.3, the Authority proposed a 1.5-MAF Sites Reservoir; this and other smaller reservoir sizes were considered during the value planning process. The heights of Golden Gate Dam and Sites Dam are reduced for a 1.5-, 1.3-, or 1.0-MAF reservoir, and some of the saddle dams are eliminated with the smaller reservoirs (e.g., 1.3 or 1.0 MAF). Reducing the capacity of the reservoir would also reduce the height and number of ports required for the I/O tower. Finally, reducing the reservoir size would reduce the head on the pumping facilities needed to fill Sites Reservoir. The value planning effort focused on 1.5-, 1.3-, and 1.0-MAF facilities to reduce construction costs and the overall footprint of the reservoir. The 1.0-MAF reservoir was generally found to not be cost effective and not affordable, and thus it was eliminated relative early in the value planning process.

2B.4.2.3. Releases

Once water is stored in Sites Reservoir, it would need to be released and delivered to the Sacramento River, Delta, and Storage Partners. The releases would require conveyance facilities and the establishment of operating criteria to determine when the releases would occur.

Conveyance Facilities

All of the alternatives evaluated in the 2017 Draft EIR/EIS included a capacity of 1,500 cfs for releasing water from the Delevan Pipeline to the Sacramento River. The value planning process considered a reduced capacity using a Delevan canal rather than a pipeline where possible to reduce costs, which was deemed to be technically feasible. However, this canal was determined

to have potentially significant agricultural impacts (Sites Project Authority 2020a: Appendix C-1). Therefore, the value planning process also considered a new option using the existing TC Canal to deliver water. Water could be conveyed from the southern end of the TC Canal, near Dunnigan, to either the CBD or the Sacramento River through a newly constructed pipeline. This option would significantly reduce cost and potential environmental impacts because existing facilities would be used (e.g., TC Canal), the underground pipeline would result in overall less ground disturbance, and the construction and operation of the underground pipeline would result in fewer impacts than a new canal.

Operating Criteria

Sites Reservoir would be operated in cooperation with CVP and SWP operations to coordinate releases from Shasta Lake, Lake Oroville, and Folsom Lake. Sites Reservoir releases could allow reduced releases from other reservoirs while maintaining minimum instream flow objectives, Sacramento River temperature requirements, and Delta salinity control requirements for CVP and SWP. Releases from Sites Reservoir to the Sacramento River would be operated to achieve multiple benefits in specific water year types and months of the year associated with the Project's primary objectives:

- Provide water to Project participants north and south of the Delta.
- Provide water to the Cache Slough area via the Yolo Bypass.
- Provide water for Incremental Level 4 Refuge deliveries.
- Support Reclamation and DWR goals through exchange. Goals could include improved Shasta Lake temperature management, Sacramento River fall flow stabilization to improve spawning and rearing success of anadromous fish, and Delta outflow.

2B.4.2.4. Roads and Bridge

The location of the Sites Reservoir would eliminate the existing Sites Lodoga Road connecting the communities of Lodoga and Maxwell; therefore, road network improvements would be required.

The alternatives in the 2017 Draft EIR/EIS included a new 1.5-mile-long bridge to maintain emergency and public access from Maxwell to Lodoga. A new road around the southern end of Sites Reservoir that would connect to Lodoga was considered as an alternative to building a bridge in the value planning process. Alternatives considered in the value planning analysis include a realignment of Huffmaster Road to the southern end of Sites Reservoir to provide access for residences along the existing Huffmaster Road that would otherwise be isolated by the new reservoir.

2B.4.3. Value Planning Alternatives

Multiple alternatives were evaluated through the value planning process between October 2019 and April 2020 (Sites Project Authority 2020a), based on the needs and interests of Storage Partners and the objectives stated above. Value planning alternatives that combined different types and sizes of diversion, release, reservoir, and road and bridge facilities were developed.

Figure 2B-2, Value Planning Approach, depicts the approach used to develop and evaluate the initial alternatives.

Four alternatives (Alternatives VP 1 through VP 4) were developed for the 1.3-MAF reservoir with combinations of the highest ranked facilities to bookend the value planning options for a March 2, 2020, review meeting. An additional three alternatives were developed during the review meeting taking into consideration the sizes of the diversion, releases, and reservoir, as well as the primary objectives for the Project.

- **Alternative VP 5.** This alternative included a 1.3-MAF reservoir and used Funks Reservoir and TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the TC Canal through a pipeline to the CBD.
- **Alternative VP 6.** This alternative included a 1.3-MAF reservoir and used Funks Reservoir and TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the TC Canal through a pipeline that would extend to the Sacramento River.
- **Alternative VP 7.** This alternative included a 1.5-MAF reservoir and used Funks Reservoir and TRR to fill Sites Reservoir with releases (1,000 cfs) from the southern end of the TC Canal through a pipeline to the CBD.

The recommended Project resulting from the value planning process (Alternative VP 7) included a 1.5-MAF reservoir to provide additional storage for Dry and Critical Water Years. All of the options included a bridge to minimize travel times and provide emergency access for communities on the west side of the reservoir. The bridge was sized based on the maximum water surface elevation for a 1.5-MAF reservoir. All of the value planning alternatives also included a new unpaved road (i.e., realigned Huffmaster Road) to maintain access for residents along the southern portion of the reservoir.

Although Alternative VP 5 (1.3-MAF reservoir) had the lowest overall cost and lower cost per acre-foot, the value planning workgroup recommended Alternative VP 7 based on higher deliveries at a comparable cost and improved operational flexibility with a 1.5-MAF reservoir. The value planning workgroup also recommended further evaluation of a 1.3-MAF reservoir (per Alternatives VP 5 & VP 6), and additional evaluation of a 1,000-cfs Dunnigan Pipeline to the Sacramento River (per Alternative VP 6) to provide design flexibility.

2B.5 Reclamation Feasibility Report

Reclamation developed a Federal Feasibility Report to evaluate overall project feasibility, as well as the federal benefit associated with the Project. Reclamation's funding for the Project is assumed to be provided by appropriations made under the Water Infrastructure Improvements for the Nation (WIIN Act). The WIIN Act requires a determination by the Secretary of the Interior of feasibility prior to December 31, 2020, and such a determination for the Project was made on December 22, 2020. Meeting the statutory deadline required Reclamation to advance the feasibility before the value planning process was completed by the Authority. Therefore, the Federal Feasibility Report included two alternatives generally based on Alternative A and

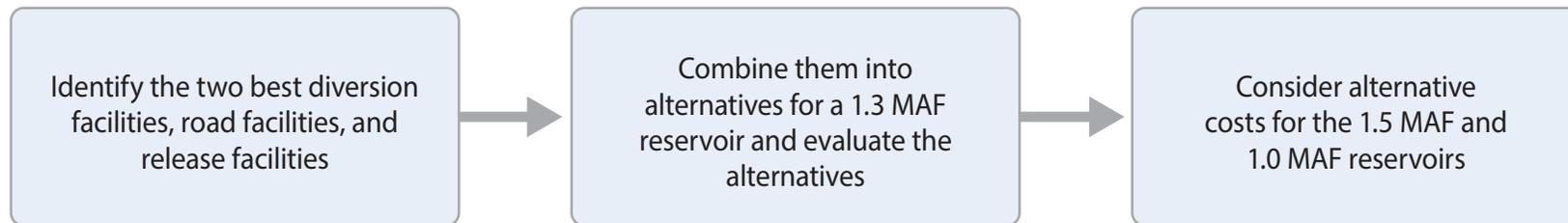


Figure 2B-2
Value Planning Approach

Alternative D from the 2017 Draft EIR/EIS: a 1.3-MAF reservoir and a 1.5-MAF reservoir with a new pipeline and intake from the Sacramento River (Bureau of Reclamation 2020).

Due to timing of the preparation of the Federal Feasibility Report to meet the WIIN Act timelines, the alternatives included in this RDEIR/SDEIS were not evaluated in that report. To address these differences, an addendum to the Federal Feasibility Report will be developed and will evaluate the federally preferred alternative from this RDEIR/SDEIS. The addendum will evaluate the technical and financial feasibility of the Project and will integrate the Feasibility Report with the alternatives evaluated in this RDEIR/SDEIS. The determination of feasibility allows additional funding to be appropriated to the Project. As a result of this determination, the Authority and Reclamation added Alternative 3, which reflects a higher level of federal funding.

2B.6 Alternatives Carried Forward to the RDEIR/SDEIS

The Project and alternatives carried forward for evaluation in this RDEIR/SDEIS correspond to Alternative VP 7 (Recommended), Alternative VP 5 (Option 1), and Alternative V P6 (Option 2). Alternatives VP 1 through VP 4 were not carried forward for evaluation because they were determined to be infeasible as a result of higher costs and reduced or limited ability to meet Storage Partners' water supply reliability criteria (Sites Project Authority 2020a: Table E-3). Furthermore, a qualitative analysis determined that Alternatives VP 1 through VP 4 did not have any different or reduced potentially significant environmental impacts compared to value planning alternatives that were being carried forward (Sites Project Authority 2020a: Appendix C-1).

The Authority carried forward Alternative VP 7 and parts of Alternatives VP 6 and VP 5 to be evaluated as Alternatives 1, 2, and 3 in this RDEIR/SDEIS. The primary changes from the alternatives evaluated in the 2017 Draft EIR/EIS were:

- Reduced overall Project footprint, including a smaller maximum reservoir size of 1.5 MAF
- Reduced Sacramento River diversions
- Elimination of the Delevan Intake and pump station on the Sacramento River
- Elimination of the Delevan Pipeline

2B.6.1. Further Project Refinement

Multiple facilities would be required to control the conveyance of water between the Sites Reservoir, TC Canal, and GCID Main Canal. These facilities would include regulating reservoirs, pipelines, PGP, electrical substations, switchyards, and administration and maintenance buildings. The two regulating reservoirs would be the existing Funks Reservoir and the new TRR. The new TRR was originally planned to be on the east side of the GCID Main Canal, roughly due east of Funks Reservoir in an area being used for agriculture.

In 2019, geotechnical explorations were performed in two locations around the proposed location for the TRR, adding to historical borings from 1975, to inform the feasibility of its design and

construction (Sites Project Authority 2021). The subsurface conditions encountered in the borings indicated the presence of adverse foundation conditions for the TRR. These adverse soil conditions would require amendments and ground improvement to construct the TRR at that site. This need for ground improvement, likely through cement deep soil mixing (CDSM), at the TRR site represented a significant cost and introduced additional risk to the Project's cost and schedule. Consistent with Project Objective OBJ-1¹, an alternative to incurring this significant additional cost was assessed. This alternative provides a different location for the TRR to an area that does not necessitate extensive ground improvement in order to develop the site. Results of that assessment are provided below.

In addition, Sites Reservoir would inundate the existing route for Sites Lodoga Road through the Antelope Valley. Sites Lodoga Road provides access to and from the community of Maxwell, which is adjacent to Interstate 5. Sites Lodoga Road becomes Maxwell Sites Road east of the community of Sites, which is in the reservoir footprint. Sites Lodoga Road is an east-west, two-lane major collector road and provides an emergency and evacuation route to and from the local rural communities due to a limited roadway network. Because construction of the Sites Dam would impede access on Sites Lodoga Road, this main collector road would need to be relocated (realigned) prior to the construction of the reservoir. A number of alternative alignments have been evaluated and the results of the evaluation are provided below.

2B.6.1.1. Terminal Regulating Reservoir

Four preliminary alternative locations for a regulating reservoir were identified. Three of these alternative locations are in the topographically higher area between the GCID Main Canal and TC Canal, to the northwest of the original TRR site. The fourth alternative location identified for consideration is to the west of the GCID Main Canal, approximately 2 miles southeast of Funks Reservoir. The alternative regulating reservoir locations were sized for the analysis to provide the same storage capacity within the same water surface elevation operational range required for the GCID Main Canal as the original TRR. For the three alternative locations between the GCID Main Canal and TC Canal, the reservoir is referred to as the Between-Canals Management (BCM) Reservoir, and the three alternative locations for this reservoir are referred to as BCM-1, BCM-2, and BCM-3. The fourth alternative location, along Stone Corral Creek, is referred to as the Stone Creek Canal (SCC) reservoir alternative.

These alternatives were evaluated in Appendix I, Alternatives to the Terminal Regulating Reservoir of the Final Feasibility Basis of Design Report – HC Conveyance Facilities (Sites Project Authority 2021). Key criteria identified and used in the analysis of TRR alternatives include:

- Real estate impacts
- Construction cost

¹ The objectives are described in Chapter 1 and OBJ-1: Improve water supply reliability and resiliency to meet Storage Partners' agricultural and municipal long-term average annual water demand in a cost-effective manner for all Storage Partners, including those that are the most cost-sensitive.

- Optimization potential
- Resilience to changes
- Environmental impacts
- DSOD jurisdiction

Alternative locations BCM-2 and BCM-3 would result in a significantly lower Project cost. The BCM-1 and SCC locations would result in higher additional costs than TRR. The requirement to perform CDSM at TRR and SCC would have implications on the overall Project schedule, both in terms of overall length and predictability. There may also be additional cost savings at some of these locations associated with pipeline length and real estate requirements.

It is likely that one or more of the BCM locations would be more resilient (i.e., less prone to risk) with respect to Project changes than the TRR location. The TRR is tightly constrained by real estate requirements; changes to hydraulic design needs could result in significant real estate conflicts. One or more of the BCM alternatives would likely be much more flexible in configuration and constraints and could accommodate changes to hydraulic requirements or other changes that might alter the capacity requirements. However, the BCM-1, BCM-2, and SCC locations were eliminated for reasons documented in the TRR Technical Memorandum (Sites Project Authority 2021), including the potential presence of special-status species based on preliminarily identified freshwater resources. The BCM-1 location was preliminarily identified as having a freshwater marsh, ephemeral stream, and canal within the footprint. The BCM-2 site was preliminarily identified as having multiple small seasonal wetlands, ephemeral streams, and a pond. The BCM-3 location included a large seasonal wetland, ephemeral and intermittent stream, and a pond. The SCC site included rice fields, canals, and ditches. Therefore, constructing the TRR at all locations could potentially affect habitat for listed species (i.e., giant garter snake, California red-legged frog, and vernal pool branchiopods) and special-status birds (burrowing owls, tricolored blackbird) (Sites Project Authority 2021). The BCM-2, BCM-3, and SCC locations would involve potentially effects on agricultural resources, similar to that of TRR (e.g., orchards) (Sites Project Authority 2021).

Further evaluations narrowed the possible regulating reservoir options to two alternative locations that are currently being evaluated: TRR West (modified BCM-1) and TRR East. TRR East would consist of the reservoir footprint and an access bridge over the GCID Main Canal.

2B.6.1.2. Roads and Bridge

The Sites Lodoga Road realignment has been studied in various alternative alignments, two of which have been carried forward for further analysis in this RDEIR/SDEIS. Road Alignment Alternative 1 focuses on the most efficient alignment, with construction of a bridge crossing the Sites Reservoir, while Road Alignment Alternative 4 focuses on a southerly alignment around the reservoir (Sites Project Authority 2020b). Road Alignment Sub-Alternative 1A would involve a full-length bridge at approximately 7,800 feet across the reservoir; Sub-Alternative 1B would entail placing fill in the reservoir and have shorter bridge segments. Road Alignment Alternative 1B is more favorable because it has the lowest construction cost. Road Alignment

Alternative 4 would be a complete realignment of Sites Lodoga Road to the south of the reservoir.

It was determined that Road Alignment Alternatives 1A, 1B, and 4 would be carried forward in this RDEIR/SDEIS for further analysis. Project Alternative 1 and 3 would include the bridge crossing proposed in Road Alignment Alternative 1 of the TM (Sites Project Authority 2020b), with Road Alignment Sub-Alternative 1B (shorter bridge segments with fill) being recommended to potentially reduce air quality and greenhouse gas emissions associated with concrete production. Alternative 2 in the RDEIR/SDEIS would involve the southern realignment of Sites Lodoga Road proposed as Road Alignment Alternative 4 in the TM (Sites Project Authority 2020b). The bridge crossing the Sites Reservoir in Alternatives 1 and 3 of the RDEIR/SDEIS is similar to the bridge identified in the 2017 Draft EIR/EIS.

2B.7 RDEIR/SDEIS Alternatives Compared to 2017 Draft EIR/EIS

There are several differences in the facilities and operational characteristics between the RDEIR/SDEIS Alternatives 1, 2, and 3 and the alternatives evaluated in the 2017 Draft EIR/EIS. A comparison of the current Alternatives 1, 2, and 3 to the smallest and largest reservoir alternatives evaluated in the 2017 Draft EIR/EIS (Alternatives A and D, respectively) highlights the primary differences between the alternatives evaluated in this RDEIR/SDEIS and those analyzed in 2017:

- Elimination of the Delevan Facility on the Sacramento River and conveyance pipeline in Alternatives 1, 2, and 3 as compared to Alternatives A and D
- Elimination of Holthouse Reservoir and existing transmission line realignments in Alternatives 1, 2, and 3 as compared to Alternatives A and D
- Elimination of dedicated pump/generation hydropower facilities in Alternatives 1, 2, and 3 as compared to Alternatives A and D
- Fewer saddle dams in Alternatives 1, 2, and 3 as compared to Alternative D
- Change in location of the spillway on a saddle dam (8B) in Alternatives 1, 2, and 3 as compared to Alternatives A and D
- New conveyance facilities, including an underground Dunnigan Pipeline, for discharge into CBD in Alternatives 1 and 3 as compared to Alternatives A and D
- New conveyance facilities, including an underground Dunnigan Pipeline and the Sacramento River discharge, from TC Canal to the Sacramento River in Alternative 2 as compared to Alternatives A and D
- New operation for Alternatives 1, 2, and 3 as compared to Alternatives A and D, including bypass flows; pulse flow protection measure to be applied to precipitation-generated pulse flow events from October through May; Wilkins Slough bypass flow; and Fremont Weir notch criteria.

Table 2B-1 provides details of the differences between the alternatives.

Table 2B-1. Summary of RDEIR/SDEIS Alternatives 1, 2, and 3 and Alternatives A and D in the 2017 Draft EIR/EIS

Facilities/Operations	RDEIR/SDEIS Alternative 1	RDEIR/SDEIS Alternative 2	RDEIR/SDEIS Alternative 3	2017 Draft EIR/EIS Alternative A	2017 Draft EIR/EIS Alternative D
Diversion/Reservoir Infrastructure Details					
Reservoir Size	1.5 MAF	1.3 MAF	Same as Alternative 1	1.3 MAF	1.8 MAF
Dams [scaled to the size of the reservoir]	Golden Gate and Sites Dams; 7 saddle dams; 2 saddle dikes (includes helipad within footprint of Sites and Golden Gate Dams for emergency access)	Golden Gate and Sites Dams; 4 saddle dams; 3 saddle dikes (includes helipad within footprint of Sites and Golden Gate Dams for emergency access)	Same as Alternative 1	Golden Gate and Sites Dams; 7 saddle dams	Golden Gate and Sites Dams; 9 saddle dams
Spillway	One spillway on Saddle Dam 8B	Similar to Alternative 1	Same as Alternative 1	Single spillway at Saddle Dam 6 with invert elevation	Same as Alternative A
Funks Reservoir (existing)	New Funks PGP and Funks pipelines	Similar to Alternative 1	Same as Alternative 1	Expand the existing Funks Reservoir located 1 mile downstream of Golden Gate Dam site	Same as Alternative A
Terminal Regulating Reservoir	Construction of TRR PGP and TRR pipelines; TRR East location	Construction of TRR PGP and TRR pipelines; TRR West location	Same as Alternative 1	2,000 acre-feet capacity; 200 acres; 4,000-foot-long, 60-inch-diameter underground outlet pipe to Funks Creek	1,200 acre-feet capacity; 150 acres; Only a minimal drain would be required due to the proximity to Funks Creek
Holthouse Reservoir/Fletcher	Eliminates facilities identified in 2017 Draft EIR/EIS	Same as Alternative 1	Same as Alternative 1	Holthouse Reservoir: 6,250 acre-feet capacity; 600 acres	Same as Alternative A
Hydropower	Incidental power generation up to 40 megawatts each at Funks PGP and TRR PGP Eliminated pumpback power generation described in 2017 Draft EIR/EIS	Same as Alternative 1	Same as Alternative 1	Hydropower generation capacity approximately 96 megawatts. Includes dedicated pump/generation facilities with a dedicated afterbay/forebay of 6,500 acre-feet allowing more than 30 hours per week of uninterrupted operation and generation.	Hydropower generation capacity approximately 118 megawatts. Include dedicated pump/generation facilities with a dedicated afterbay/forebay of 6,500 acre-feet allowing more than 30 hours per week of uninterrupted operation and generation.
Diversion(s)	Diversion from Sacramento River into existing TC Canal at RBPP and the existing GCID Main Canal diversion at Hamilton City; Eliminates Delevan Intake	Same as Alternative 1	Same as Alternative 1	Diversion from Sacramento River into existing TC Canal diversion at RBPP and the existing GCID Main Canal diversion at Hamilton City Delevan Pipeline Intake/Discharge facilities (2,000 cfs).	Diversions from RBPP and Hamilton City same as Alternative A. Delevan Pipeline Intake same as Alternative A but different pipeline location.
Emergency Release Flow	Releases into Funks Creek and Stone Corral Creek via Inlet/Outlet Works, Sites Dam; structures in Saddle Dams 3 and 5 to release north to Hunters Creek watershed; Release from spillway on Saddle Dam 8B north to Hunters Creek watershed	Similar releases via Inlet/Outlet Works, Sites Dam, and spillway on Saddle Dam 8B; No emergency release structures on Saddle Dams 3 and 5	Same as Alternative 1	Emergency release outlet into Holthouse Reservoir. Releases into Funks Creek and Stone Corral Creek via Inlet/Outlet Works, Sites Dam. Overflow spillways at Saddle Dams to release north to the Hunters Creek watershed.	Same as Alternative A
Flood Control	Same as Alternative A	Same as Alternative A	Same as Alternative A	Operation of Sites and Golden Gate Dams would result in incremental flood damage reduction improvements to areas located immediately downstream of the reservoir that are prone to flooding and downstream of the diversions from the Sacramento River.	Same as Alternative A

Facilities/Operations	RDEIR/SDEIS Alternative 1	RDEIR/SDEIS Alternative 2	RDEIR/SDEIS Alternative 3	2017 Draft EIR/EIS Alternative A	2017 Draft EIR/EIS Alternative D
Reservoir Management	Reservoir Management Plan and Reservoir Operations Plan	Same as Alternative 1	Same as Alternative 1	None	None
Electrical Facilities	Transmission lines, substations, and switchyards; interconnection with WAPA or PG&E	Same as Alternative 1	Same as Alternative 1	<ul style="list-style-type: none"> Up to 6 acres at Funks/Holthouse Reservoir of electrical structures (e.g., transmission tower) New 1- to 4-mile-long 230 kV or 115-kV overhead power line from the proposed substation west to Sites PGP New 230-kV or 115-kV overhead power line from the proposed substation, east to TRR PGP New 230-kV or 115-kV overhead power line from the proposed Sites Substation, east to Delevan PGP 	<ul style="list-style-type: none"> In addition to substation near Funks/Holthouse Reservoir identified in other alternatives, would include substation to stepdown power from existing WAPA 230 kV lines approximately 1 mile southwest of Colusa, north of SR 20; up to 6 acres; similar facilities as Alternative A New 1- to 4-mile-long 230 kV or 115-kV overhead power line from the proposed substation west to Sites PGP New 230-kV or 115-kV overhead power line from the proposed substation, east to TRR PGP New 115-kV overhead power line along SR 45 from the proposed substation west of Colusa to the Delevan PGP; line will cross SR 45
Recreation Facilities	Multiple Facilities Consistent with the Authority's WSIP Application. Two primary areas with infrastructure: 1. Peninsula Hills Recreation Area 2. Stone Corral Creek Recreation Area An additional day-use boat ramp	Same as Alternative 1	Same as Alternative 1	Up to five recreation areas; three are likely to be constructed. The five recreation areas include: 1. Stone Corral Creek Recreation Area 2. Saddle Dam Recreation Area 3. Peninsula Hills Recreation Area 4. Antelope Island Recreation Area 5. Lurline Headwaters Recreation Area	Two recreation facilities: 1. Stone Corral Creek Recreation Area 2. Peninsula Hills Recreation Area An additional day-use boat ramp
Transportation/Circulation					
Provide Route to West Side of Reservoir	Permanent bridge crossing the reservoir and realignment of a segment of Huffmaster Road with gravel road to residents at the south end of the reservoir	Paved roadway including the realigned segment of Huffmaster Road and a new South Road on the west side of the reservoir	Same as Alternative 1	Permanent bridge crossing the reservoir and relocation of a portion of Huffmaster Road with gravel road to residents at the south end of the reservoir	Same as Alternative A
Multiple Maintenance and Local Access Roads	Approximately 46 miles of new paved and unpaved roads would provide construction and maintenance access to the facilities, as well as provide public access to the recreation areas	Similar to Alternative 1	Same as Alternative 1	Temporary construction roads, several access roads to new facilities, and new roads to replace those currently in the inundation area	Same as Alternative A but with a road to provide access to the community of Leesville; some southern roads not needed
Operations					
Diversion Criteria	Bypass flows; Pulse flow protection measure to be applied to precipitation-generated pulse flow events from October through May; Wilkins Slough Bypass Flow; Fremont Weir Notch Criteria	Same as Alternative 1	Same as Alternative 1	Bypass flows; Pulse flow protection measure to be applied once per month; Wilkins Slough Bypass Flow; Freeport Bypass Flow	Same as Alternative A

Facilities/Operations	RDEIR/SDEIS Alternative 1	RDEIR/SDEIS Alternative 2	RDEIR/SDEIS Alternative 3	2017 Draft EIR/EIS Alternative A	2017 Draft EIR/EIS Alternative D
Reclamation Involvement	1. Funding Partner (up to 7% investment) with operational exchanges; or, 2. Operational Exchanges Only a. Within Year Exchanges b. Real-time Exchanges	Operational Exchanges Only a. Within Year Exchanges b. Real-time Exchanges	Funding Partner, up to 25% investment, and Operational Exchanges: a. Within Year Exchanges b. Real-time Exchanges	Funding partner	Same as Alternative A
California Department of Water Resources Involvement	Operational Exchanges with Oroville and use of SWP facilities south of the Delta	Same as Alternative 1 (volumes may vary, however)	Similar to Alternative 1 (volumes may vary, however)	Operational exchanges with Lake Oroville and storage in SWP facilities south of the Delta	Same as Alternative A
Releases into Funks Creek and Stone Corral Creek	Specific flow criteria to maintain flows to protect downstream water right holders and ecosystem function	Same as Alternative 1	Same as Alternative 1	Chapter 3 of the 2017 Draft EIR/EIS identifies the release of 10 cfs.	Same as Alternative A
Conveyance Dunnigan Release	Release 1,000 cfs into new pipeline to CBD	Release into new pipeline to Sacramento River discharge, partial release to the CBD	Same as Alternative 1	The Delevan Pipeline would have a west-east alignment from Delevan Intake/Discharge to Holthouse Reservoir with 1,500 cfs capacity release	Same as Alternative A

Note: CBD = Colusa Basin Drain; cfs = cubic feet per second; GCID = Glenn-Colusa Irrigation District; kV = kilovolt; MAF = million acre-feet; MW = megawatt; PG&E = Pacific Gas and Electric; PGP = pumping generating plant; RBPP = Red Bluff Pumping Plant; SR = State Route; SWP = State Water Project; TC Canal = Tehama-Colusa Canal; TRR = Terminal Regulating Reservoir; WAPA = Western Area Power Administration

2B.8 References

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