RECLAMATION

Appendix G
NODOS/Sites Reservoir Project Operations Plan (Alternative D)

North-of-the-Delta Offstream Storage Investigation

July 2017

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G.1 Introduction

This NODOS/Sites Reservoir Project Operations Plan (Operations Plan) describes proposed project operations for the Sites Project Authority (Authority) Alternative D. Alternative D would include a 1.81-million-acre-foot (MAF) reservoir, which would be located in the Sacramento Valley west of the town of Maxwell, and associated conveyance facilities, including use of existing Tehama-Colusa Canal (T-C Canal) and Glenn-Colusa Irrigation District (GCID) Main Canal diversion and conveyance facilities, plus a proposed new diversion and discharge pipeline. The proposed reservoir would be filled by diversion of excess Sacramento River water that originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. These flows are "excess" to those needed to meet current regulatory requirements or other water demands. Operation of the proposed reservoir would be in cooperation with the operations of existing Central Valley Project (CVP) and State Water Project (SWP) system facilities to facilitate and maximize the potential for a wide range of benefits. Detailed operating agreements would need to be developed that define a framework and procedures for cooperative operations among the Authority, CVP, and SWP.

Alternative D operations are designed to improve the ability to meet the following primary objectives:

- Enhance water management flexibility in the Sacramento Valley
- Reduce water diversion on the Sacramento River during critical fish migration periods
- Increase reliability of water supplies for a significant portion of the Sacramento Valley
- Provide storage and operational benefits for programs to enhance water supply reliability, benefit Sacramento-San Joaquin River Delta (Delta) water quality, and improve ecosystems

G.2 Approach

This Operations Plan for Alternative D was developed through a series of meetings and coordination with Authority representatives, including Bureau of Reclamation (Reclamation), California Department of Water Resources (DWR), and water district managers and county representatives. This Operations Plan and Alternative D build on previous work conducted under the CALFED Bay-Delta Program (CALFED) by Reclamation and DWR. Subsequent to CALFED, DWR has been the lead on technical studies, in coordination with the Authority as part of the North-of-Delta Offstream Storage (NODOS) Project and associated investigations. Alternative D is largely based on NODOS project Alternative C; it includes a 1.81 MAF reservoir and associated facilities similar to Alternative C. Following are key features included in Alternative D versus Alternative C:

- Improved water supply reliability and allocated Sites Reservoir storage for Authority members
- Delevan Pipeline diversion pump station power provided by north/south transmission line along existing Highway 45 utility corridor (versus new east/west line adjacent to proposed Delevan Pipeline alignment)
- Reduced Terminal Regulating Reservoir (TRR) storage capacity to 1,200 acre-feet (versus 2,000 acre-feet proposed as part of Alternative C)
- Two recreation areas and a boat ramp (versus five proposed as part of Alternative C)

The planning process and development of this Operations Plan included development and confirmation of Authority member project goals; review of DWR NODOS project materials; evaluation of Colusa Basin and Authority participant water needs; assessment of potential operational alternatives; and preliminary investigatory modeling.

Modeling was conducted using CalSim-II to evaluate Alternative D operations to provide water for participating Authority members, cooperate with the CVP and SWP, and supply water for ecosystem benefits. The modeling for Alternative D tiers off of NODOS Alternative C modeling, conducted previously by DWR, which assumes projected year 2020 level of development conditions. This level of development reflects current operating conditions, and does not include potential changes based on forecasts of future climate change or sea level rise. Additional information developed and documented as part of the NODOS project is available on the DWR website (http://www.water.ca.gov/storage/northdelta/).

CalSim-II is a planning model developed by Reclamation and DWR to simulate the CVP and SWP, and areas tributary to the Delta. CalSim-II uses a monthly time step to route flow throughout the river and reservoir system of the Central Valley. The model includes an 82-year (water years 1922–2003) modified historical hydrology, including tributary inflows for the Central Valley, developed jointly by Reclamation and DWR. The model includes the major CVP and SWP facilities and reservoirs in the Central Valley of California, including Trinity Lake, Lewiston Reservoir, Whiskeytown Reservoir, Shasta Lake, Keswick Reservoir, Lake Oroville, Folsom Lake, San Luis Reservoir, and New Melones Reservoir, located along the Sacramento and San Joaquin Rivers and their tributaries. CalSim-II uses a set of generalized rules that reflect assumed regulations, and are used to specify the operations of the CVP and SWP systems. The CalSim-II model is based on a monthly time step; therefore, it does not incorporate all the detailed decision processes that occur in actual daily operations of the CVP and SWP systems. To evaluate naturally occurring storm event flows, supplemental modeling was conducted on a daily time step to assess availability of excess Sacramento River flows. Model results are intended to be used in a comparative manner, which allows for assessing the changes in system operations and resulting incremental effects.

G.3 Proposed Sites Project Authority Operations

Sites Reservoir would be filled by diversion of excess Sacramento River flows that originate from unregulated tributaries to the Sacramento River downstream from Keswick Dam. As described below, diversions are assumed to potentially occur in any month or water year type,

but would likely be greatest in the winter months with wetter conditions (depending on storage conditions and annual flows and events). The project could operate in cooperation with CVP and SWP system facilities to facilitate a wide range of benefits. Sites Reservoir would provide water through two primary mechanisms: (1) water stored in Sites Reservoir could be released directly to Authority and Colusa Basin users or released to the Sacramento River; and (2) water stored in Sites Reservoir could be exchanged for water stored in Shasta Lake or other CVP and SWP system reservoirs. This second mechanism could be used to significantly increase upstream north-of-Delta storage and operational flexibility to support multiple water supply and ecosystem benefits.

This Operations Plan employs the same opportunistic approach developed as part of the NODOS project to maximize potential benefits of the NODOS project, while not adversely affecting the CVP and SWP's ability to meet existing system regulatory requirements including the following:

- Water rights
- Instream flow requirements
- Biological opinions
- Delta water quality requirements
- CVP and SWP requirements
- Central Valley Project Improvement Act (CVPIA)

The following sections describe the proposed NODOS project facilities, Sacramento River diversion criteria, Alternative D demands and reservoir operations, and integration with the CVP and SWP systems.

G.4 Project Facilities

The primary facilities proposed as part of Alternative D would include a 1.81 MAF Sites Reservoir that would rely on the existing T-C Canal and GCID Main Canal for diversion and conveyance purposes, as well as a new proposed Delevan Pipeline and intake to divert and convey water to and from the reservoir. Figure G-1 shows the location of the proposed reservoir and associated conveyance facilities. A brief description of existing and proposed new conveyance facilities and their proposed operation follows.

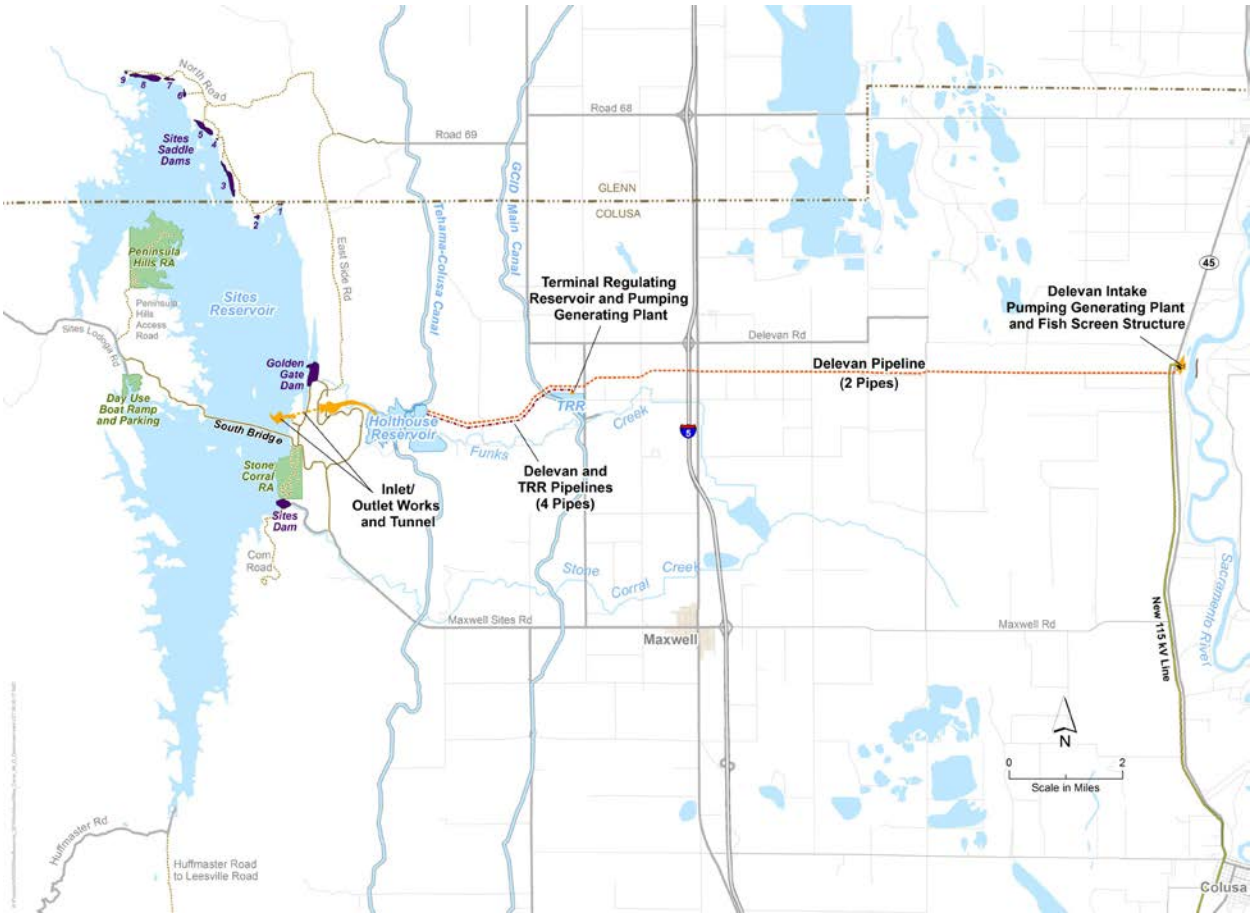

Figure G-1. Sites Reservoir and Proposed Facilities

Tehama-Colusa Canal and Red Bluff Pumping Plant Facilities and Capacity

The existing Tehama-Colusa Canal Authority's (TCCA) T-C Canal through the TCCA service area and Red Bluff Pumping Plant, located on the Sacramento River near Red Bluff, would be used to divert and convey water to the proposed Sites Reservoir. Operating agreements among the Authority, Reclamation, and TCCA, would need to be developed to define NODOS project operations and cooperation among the parties.

Red Bluff Pumping Plant has an existing pumping capacity of 2,000 cubic feet per second (cfs), which is used to meet current agricultural water demand. Alternative D would include installation of one additional pump (250 cfs) to the existing pump grouping, which would increase the overall pumping capacity to 2,250 cfs, to fully use the 2,100 cfs capacity for diversion of water through T-C Canal to Sites Reservoir. The total conveyance capacity of T-C Canal is assumed to be 2,250 cfs at the upstream end of the canal, and 2,100 cfs at Holthouse Reservoir. Any unused capacity remaining after meeting existing agricultural demands could be used as necessary to convey water to fill Sites Reservoir. Approximately 50 to 60 cfs of the T-C Canal capacity is assumed to be used for existing winter operations, based on communication with TCCA representatives.

No dedicated period for maintenance was assumed for T-C Canal on the basis of current canal capacity and projected Sites Reservoir diversion amounts. Discussions with TCCA representatives revealed operations and maintenance could be scheduled around proposed NODOS project operations.

Glenn-Colusa Irrigation District Main Canal and Hamilton City Pumping Facilities and Capacity

Similar to T-C Canal, GCID Main Canal would be used to convey water pumped from the existing Hamilton City pumping facility to divert and convey Sacramento River water to the proposed Sites Reservoir. Operating agreements between the Authority and GCID would need to be developed to define NODOS project operations and cooperation between the parties. The Hamilton City pumping facility has a 3,000 cfs diversion capacity at the Sacramento River intake, and the capacity of GCID Main Canal is 1,800 cfs at TRR. Any unused capacity remaining after existing agricultural operations could be used to convey water to the proposed Sites Reservoir. The following flows are assumed to occupy capacity in the canal during existing winter operations of GCID Main Canal (values in cfs).

October	November	December	January	February	March
513	534	389	235	56	48

A dedicated annual maintenance shutdown period was assumed from January 7 through February 21.

Proposed Delevan Pipeline and Intake Diversion and Release Capacities

The proposed Delevan Pipeline would extend east/west across the GCID service area, located west of the existing Maxwell Irrigation District intake facility. The proposed intake and discharge facility would include a fish screen and pump station intake to divert up to 2,000 cfs from the Sacramento River to Sites Reservoir when excess Sacramento River water is available for diversion. The pipeline would also have the ability to convey up to 2,500 cfs by gravity from the Sites Reservoir back to the Sacramento River for downstream uses.

A dedicated annual maintenance shutdown period sometime between April 1 and May 31 is assumed for the pipeline, intake, and fish screen facility in wet, above-normal, and below-normal water year types, in accordance with the Sacramento Valley 40-30-30 index. During the maintenance, both diversion and release operations at Delevan would be shut down. No maintenance would be scheduled in dry and critical water year types.

Existing Tehama-Colusa Canal and Glenn-Colusa Irrigation District Main Canal Intertie

The existing T-C Canal and GCID Main Canal intertie provides flexibility in routing flows of up to 285 cfs from the T-C Canal to the GCID Main Canal.

Williams Outlet

The Williams Outlet provides flexibility in routing water of up to 65 cfs from the T-C Canal to the GCID Main Canal.

Holthouse (Funks) Reservoir

The existing Funks Reservoir includes a storage capacity of 2,250 acre-feet and serves as a re-regulating reservoir to stabilize flows in T-C Canal as diverters come on line and off line. The existing Funks Reservoir would be expanded to form Holthouse Reservoir by constructing a new dam (Holthouse Dam) and reservoir to the east of Funks Reservoir, with an enlarged active storage capacity of approximately 6,500 acre-feet and a surface area of approximately 450 acres.

Terminal Regulating Reservoir and Pipeline

TRR would be a 1,200-acre-foot regulating reservoir constructed adjacent to GCID Main Canal, approximately 3 miles northeast of Holthouse Reservoir. TRR would be composed of an earthen embankment dam, concrete emergency overflow weir, outfall standpipe, and an approximate 4,000-foot-long underground 60-inch-diameter overflow outlet pipe to Funks Creek.

Water conveyed down GCID Main Canal would be directed into the proposed TRR. A new pump station (the proposed TRR pumping and generating plant) would then convey the water from TRR via the proposed TRR pipeline to the proposed Holthouse Reservoir. TRR would be required to provide operational storage for the TRR pumping and generating plant to balance normal and emergency flow variations between the upstream GCID Main Canal pump station, the 40 miles of connecting canal, and the TRR pumping and generating plant.

The proposed TRR pipeline would be bidirectional, allowing water to be pumped from TRR to Holthouse (Funks) Reservoir for storage, and allowing water to flow by gravity from Holthouse Reservoir for release to TRR and GCID Main Canal. The pipeline would have a capacity of 1,800 cfs to convey water pumped from TRR to Holthouse Reservoir. The capacity of the pipeline to convey water by gravity flow from Holthouse Reservoir to TRR would be 900 cfs.

G.5 Diversions to Sites Reservoir

The proposed Sites Reservoir would be filled through the diversion of excess Sacramento River water that originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. These unregulated tributaries contribute over 3 MAF of flow to the Sacramento River on an average annual basis. Less than 1 percent of diversions to Sites Reservoir are assumed to be provided by flood releases or spills that flow through Lake Shasta. Under Alternative D, Sacramento River water would be diverted at the three locations on the river as described above. Excess flows are defined as river flows in addition to those required to meet the following:

- Senior downstream water rights, existing CVP and SWP and other water rights diversions including SWP Article 21 (interruptible supply), and other more senior excess flow priorities (diversions associated with Freeport Regional Water Project and existing Los Vaqueros Reservoir)
- Existing regulatory requirements including State Water Resources Control Board (SWRCB) D-1641, CVPIA 3406(b)(2), the 2008 U.S. Fish and Wildlife Service biological opinion, and the 2009 National Marine Fisheries Service biological opinion and other instream flow requirements

- Bypass flow conditions needed to maintain and protect anadromous fish survival and Delta water quality

The Authority would need to obtain a water right permit to allow the intended operations. Operations would be consistent with the terms and conditions contained in the water right permit approved by SWRCB. The permit would describe the points and methods of diversion, diversion season, purposes of use, and places of use.

A description of proposed minimum bypass flow requirements and pulse flow criteria (identical to those developed previously in DWR NODOS investigations) to protect existing and future water uses are provided below.

Sites Reservoir Diversion Bypass Flow Protection

Excess Sacramento River flow diversions to Sites Reservoir would only take place when flow monitoring indicates that bypass flows are present in the river due to storm event flows. Several existing and additional proposed bypass flow criteria were assumed at specified locations, as part of Alternative D. These flow criteria are designed to make certain only excess water would be diverted into Sites Reservoir to maintain and protect existing downstream water uses, as follows.

- A bypass flow of 3,250 cfs downstream from Red Bluff Diversion Dam must be present to maintain flows in the upper Sacramento River that are required in SWRCB WR 90-5 to prevent dewatering salmonid redds and maintain water temperatures. Diversions at Red Bluff Pumping Plant for filling Sites Reservoir would only be allowed when flows in the river were above the 3,250 cfs bypass flow criteria.
- Diversions at the Hamilton City intake for GCID Main Canal currently require a bypass flow of 4,000 cfs to prevent fish entrainment. Diversions at Red Bluff Pumping Plant and GCID Main Canal intake for filling Sites Reservoir would only be allowed when flows in the river were above the 4,000 cfs bypass flow requirement downstream from Hamilton City.
- Diversions for filling Sites Reservoir would only be allowed when flows below Wilkins Slough were above 5,000 cfs given the current minimum flow requirements. Wilkins Slough Navigation Control Point minimum flows currently range from 3,250 to 5,000 cfs depending on hydrologic conditions.
- Diversions for filling Sites Reservoir would only be allowed when a Sacramento River flow of 15,000 cfs is present at Freeport in January, 13,000 cfs in December and February through June, and 11,000 cfs in all other months. This flow threshold was designed to protect and maintain existing downstream water uses and water quality in the Delta.

Sites Reservoir Diversion Restrictions for Pulse Flow Protection

As a mitigation measure to more fully avoid and minimize entrainment and impingement of juvenile salmonids and other poor-swimming aquatic species, diversions to Sites Reservoir would also be restricted to protect fish migration during naturally occurring, storm-induced, pulse flow events in the Sacramento River. Protection of fish migration pulse flows is included because numerous recent studies have documented fish movement in association with naturally occurring flow pulses. A recent study by del Rosario et al. (2013) found an abrupt and substantial

spike in winter-run Chinook salmon arrivals at Knights Landing in association with the first storm event producing a flow of 400 cubic meters per second (14,126 cfs) at Wilkins Slough. This spike was followed shortly by passage of the 50th percentile of cumulative migration. This relationship was apparent for a wide range of water year types, as shown by catch data collected between 1999 and 2007.

The proposed pulse protection period would extend from October through May to address outmigration of juvenile winter-, spring-, fall- and late-fall-run Chinook salmon, as well as steelhead. Pulse flows during this period would provide flow continuity between the upper and lower Sacramento River to support fish migration. It is recognized that research regarding the benefits of pulse flows is ongoing, and further research and adaptive management will be required to develop and refine a pulse flow protection strategy for fish migration.

For the purpose of NODOS project operations, pulse flows are defined by extended peak river flows at Bend Bridge that originate from storm event tributary inflows downstream from Keswick Dam. A naturally occurring pulse event would be considered initiated when the 3-day running average Bend Bridge flow exceeded 15,000 cfs. Such an event would need to continue for at least a 7-day duration to be considered a "qualified" storm event. Diversions to Sites Reservoir would not be allowed during the 7-day period when flow was greater than 15,000 cfs. The duration of a pulse flow event would be considered terminated if (1) the 3-day running average flow remained greater than 15,000 cfs for 7 days after initiation, (2) the 3-day running average flow dropped below 15,000 cfs before reaching the 7-day duration, or (3) the 3-day running average flow exceeded 25,000 cfs before reaching the 7-day duration as shown on Figure G-2.

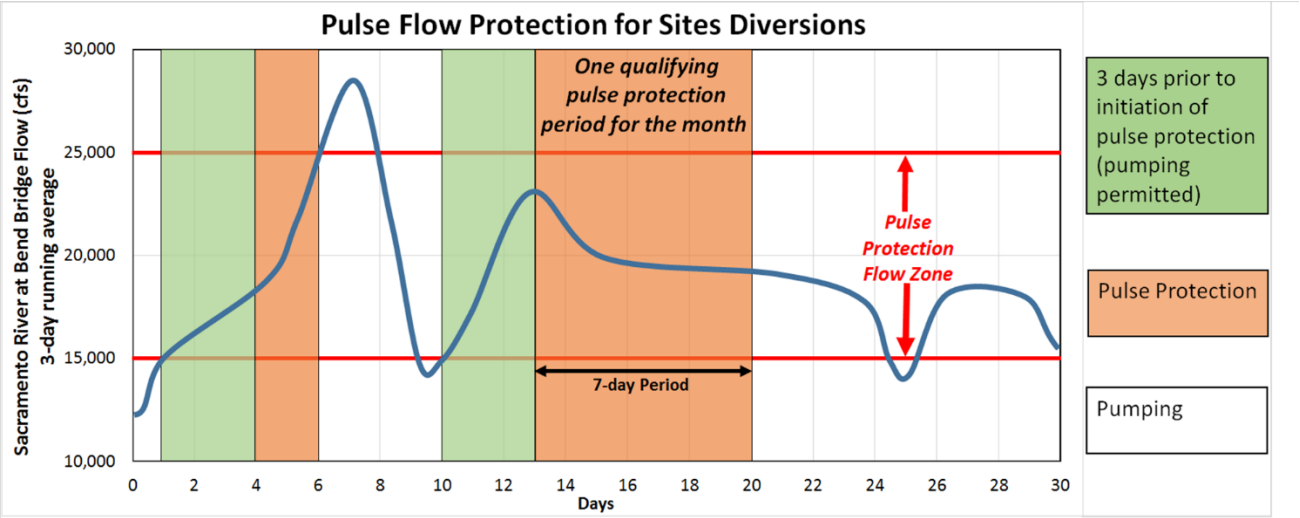

Figure G-2. Pulse Flow Protection for Sites Diversions

Because del Rosario et al. (2013) showed that the first storm event was associated with a spike in salmon arrivals at Knights Landing, diversions to Sites Reservoir would not be allowed during

the first 7-day "qualified" pulse period when flows reach 15,000 cfs during the outmigration season starting in October. Subsequent to the first major storm event of the migration season, "real-time" monitoring of fish movement would be evaluated to determine the timing for additional pulse protection periods. For evaluation of NODOS project operations, it was assumed that up to one qualified 7-day pulse event would occur each month during the pulse protection period from October through May to encourage and support salmonid outmigration and minimize potential diversion impacts. Therefore, diversions to Sites Reservoir storage would be restricted (1) if pulse conditions exist at Bend Bridge and a qualified pulse event has not already occurred within the given month, and (2) if Bend Bridge flows are less than 25,000 cfs during the pulse event. Diversions are allowed when flows exceed 25,000 cfs because flows of this magnitude are considered to provide lesser benefits to fish migration.

Diversions to Fill Sites Reservoir Storage

Diversions of excess Sacramento River water to Sites Reservoir using existing T-C Canal and GCID Main Canal conveyance facilities could occur at any time during the year, given the flow conditions described above are present in the river. Deliveries for TCCA and GCID service areas have first priority at the existing T-C Canal and GCID intakes, with diversions to Sites Reservoir using the unused capacities of the two canals.

Diversions through the proposed Delevan Pipeline could also occur at any time of the year assuming Sacramento River flow conditions are above the bypass and pulse flow criteria described above. In summer months, preference would generally be given to Sites Reservoir releases to the river, resulting in limited diversions to storage because the pipeline could only convey flows in one direction at a time.

Given the diversion criteria and facility capacities identified above, investigatory CalSim-II modeling results for Alternative D indicate an average annual diversion of 545 thousand acre-feet (TAF) of excess Sacramento River flow could be conveyed to the proposed Sites Reservoir. Annual diversions would be a function of varying hydrologic conditions, excess Sacramento River water availability, and diversion and conveyance facility capacities. Annual diversions of excess river water would range from close to zero in critical and dry years to over 1,000 TAF in wetter years.

G.6 Water Demands and Supply Operations

A series of meetings was held with Authority members to identify and evaluate local demands for Sites Reservoir water, potential water supply operational concepts, and conveyance constraints. Investigatory modeling was conducted to evaluate potential Sites Reservoir diversion and reservoir storage scenarios that could provide water to meet local Authority demands. The modeling analysis tiered from the DWR modeling conducted for the NODOS project Alternative C.

The fundamental concept guiding development of the NODOS project operations strategy was to develop a balanced operation that (1) provides reliable average annual water deliveries to supplement existing supplies, and (2) retains a reasonable volume of water in storage to provide deliveries during extended drought periods. In general, one- third of the reservoir storage capacity was operated aggressively to meet yearly demands, and the remaining two thirds of

storage was managed more conservatively and retained as long-term carryover storage to provide water during drought periods. The drought periods of 1929–1934, 1976–1977, and 1987–1992 were used to evaluate longer-term carryover storage needs.

The primary operational criteria developed through this evaluation process include the following:

- Sites Reservoir water would be used to meet unmet demands and supplement existing CVP allocations to CVP contractors in the Colusa Basin, including participating TCCA districts (North-of-Delta CVP water service contractors with associated curtailment provisions and assumptions), and GCID and Reclamation District 108 (RD 108) (both CVP Sacramento River Settlement Contractors [SRSC] with curtailment provisions based on Shasta inflow).
- Each of the participating members would be allocated a defined storage account in the NODOS project to manage their water, as well as store water from other potential sources of supply.
- It is assumed that a water market of some form would be facilitated by the Authority to promote efficient use and exchange of water in Sites Reservoir storage.
- All members would receive an equal proportional share of new water diversions into Sites Reservoir storage.
- Any water in storage beyond designated member account volumes would be “at risk” and would be “spilled” if the reservoir fills to capacity.
- A set of operating guidelines and rules would need to be developed to promote efficient water management for operations of Sites Reservoir and associated facilities.
- All water stored in Sites Reservoir storage accounts are subject to evaporation and other losses.

The following summarizes the process conducted to determine Authority participant water demands and associated storage requirements, as well as anticipated ability of the NODOS project to assist in meeting annual member demands. Historical water diversion records were compared to CalSim-II water demand patterns and diversion results to confirm that historical data correlated sufficiently well with the model to support the evaluation of NODOS project operations to meet Colusa Basin water demands. Supporting CalSim-II model results, including Sites Reservoir levels and diversions, are provided in Attachment A.

Tehama-Colusa Canal Authority Water Demands and Operations

TCCA historical monthly diversion data were reviewed to assess seasonal diversion patterns and variations in water use for a range of hydrologic conditions and CVP allocations. The historical data were compared to CalSim-II model demands to verify that irrigation demands and diversion patterns were representative of actual water operations for a range of water year types as defined by the Sacramento Valley 40-30-30 water year type index (SVI). The SVI is computed using flows in the Sacramento, Feather, Yuba, and American Rivers and includes five water year types: wet, above normal, below normal, dry, and critical.

TCCA's CVP Agricultural Water Service Contracts are subject to shortage allocations based on CVP storage and annual hydrologic conditions. Although not typical, TCCA contractors received a zero allocation from the CVP in 2014 and 2015 because of severe drought conditions and extremely low Shasta storage levels. Prior to these years, maximum cuts had generally been no greater than 40 percent of contract supply, even in very dry years. Preliminary CalSim-II investigatory model runs were conducted at various supply levels to evaluate the availability of NODOS project water and storage to meet TCCA member district demands. TCCA participants ultimately determined the goal was to use water from the NODOS project to supplement their existing CVP contract supplies to meet demands.

Based on CalSim-II forecasts of future CVP delivery levels, an average annual supplemental supply of 90 TAF from the NODOS projects is estimated to be needed to achieve this level of reliability. Figure G-3 shows CalSim-II estimated annual allocations of NODOS project water needed to supplement existing TCCA CVP allocations to attempt to achieve the 100 percent delivery goal. The figure also shows Sites Reservoir end-of-September storage values, demonstrating how storage could be used to meet demands. Deliveries would occasionally be less than 100 percent in years when Sites Reservoir storage would not be sufficient to meet all demands or in some very wet years when TCCA demands for NODOS project water are reduced and no Sites Reservoir water is needed.

Participating TCCA districts served by T-C Canal north of Sites Reservoir would receive Sites Reservoir water through exchange. TCCA members located south of Sites Reservoir could take water directly through Holthouse Reservoir and T-C Canal.

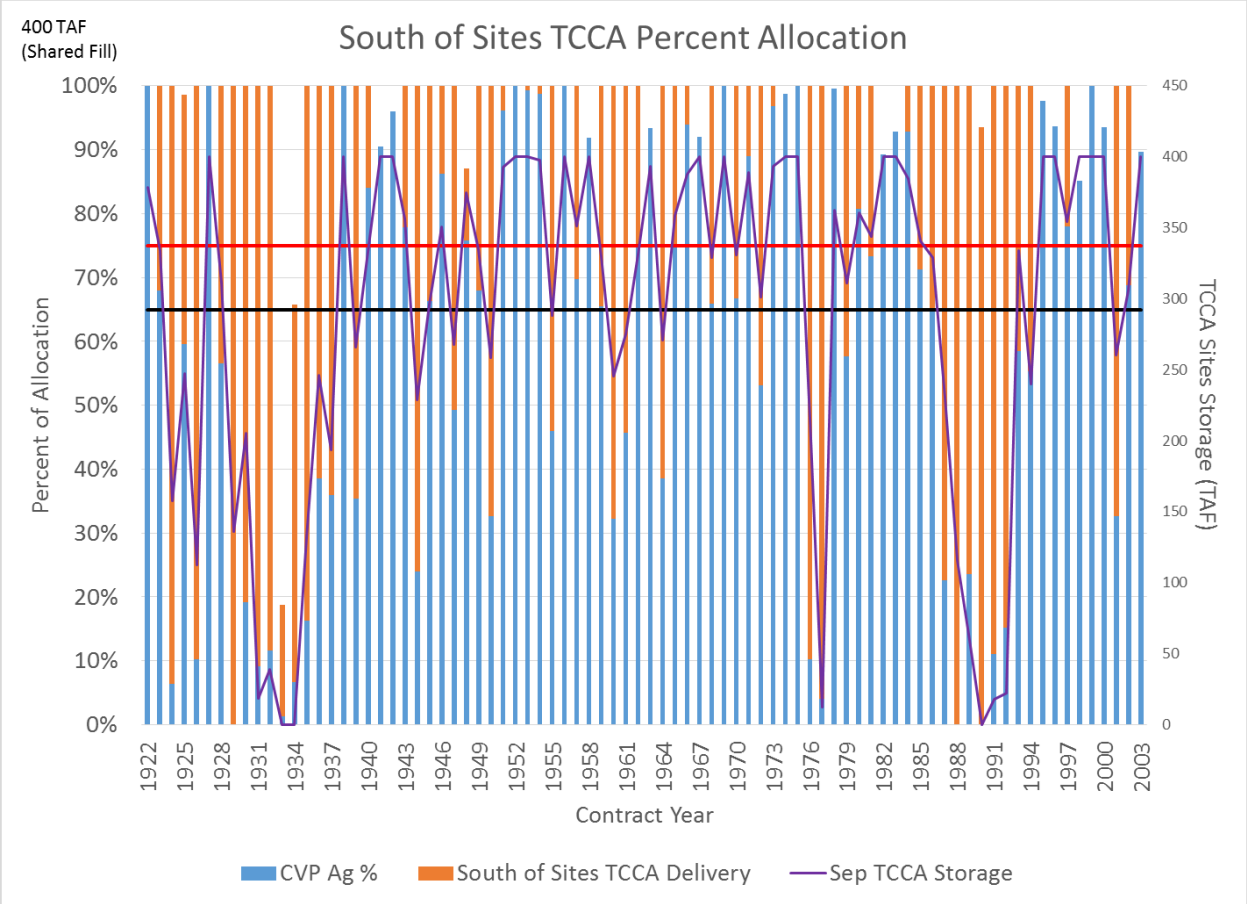

Figure G-3. Sites Reservoir Allocation to Meet TCCA 100 Percent Delivery

Participating TCCA districts requesting NODOS project water include the following:

- Proberta Water District
- Orland-Artois Water District
- Colusa County Water District
- Colusa County
- Davis Water District
- Dunnigan Water District
- La Grande Water District
- Westside Water District
- Cortina Water District
- 4M Water District

Glenn-Colusa Irrigation District and Reclamation District 108 Demands and Operations

GCID and RD 108 are CVP SRSCs and are subject to a 25 percent contract reduction in a Critical Year.. A Critical Year is defined as a year when the total annual inflow to Shasta Reservoir is below 3.2 MAF. In consecutive dry years, this criterion increases to 4.0 MAF.

GCID and RD 108 historical monthly diversion data were reviewed to assess seasonal diversion patterns and variations in water use for recent operating conditions. The historical data were compared to CalSim-II model demands to verify that CalSim-II irrigation demands and diversion patterns were representative of actual water supply operations.

GCID and RD 108 are each interested in 20 TAF of water per year from the NODOS project to supplement their existing CVP supplies and water rights diversions. Figure G-4 and Figure G-5 show percent annual allocations of NODOS project water needed to supplement existing GCID and RD 108 CVP deliveries in Shasta critical years.

GCID would take delivery of water from Sites Reservoir through the TRR pipeline, which has a gravity-flow capacity of 900 cfs. RD 108 would take delivery of water from Sites Reservoir through the Delevan Pipeline, which has a gravity-flow capacity of up to 2,500 cfs.

Other Regional Water Demands

In addition to improving local water supply reliability in the Colusa Basin, the project has the potential to provide a substantial amount of water to other potential project participants, and provide water to support a wide range of ecosystem and water quality benefits. With an estimated average annual diversion to storage of over 500 TAF, the NODOS project could provide an average annual volume of up to 350 TAF of water for other purposes after accounting for supplies dedicated to meet Authority demands. Other sources of demand for NODOS project water could include agricultural, municipal and industrial (M&I), and environmental needs.

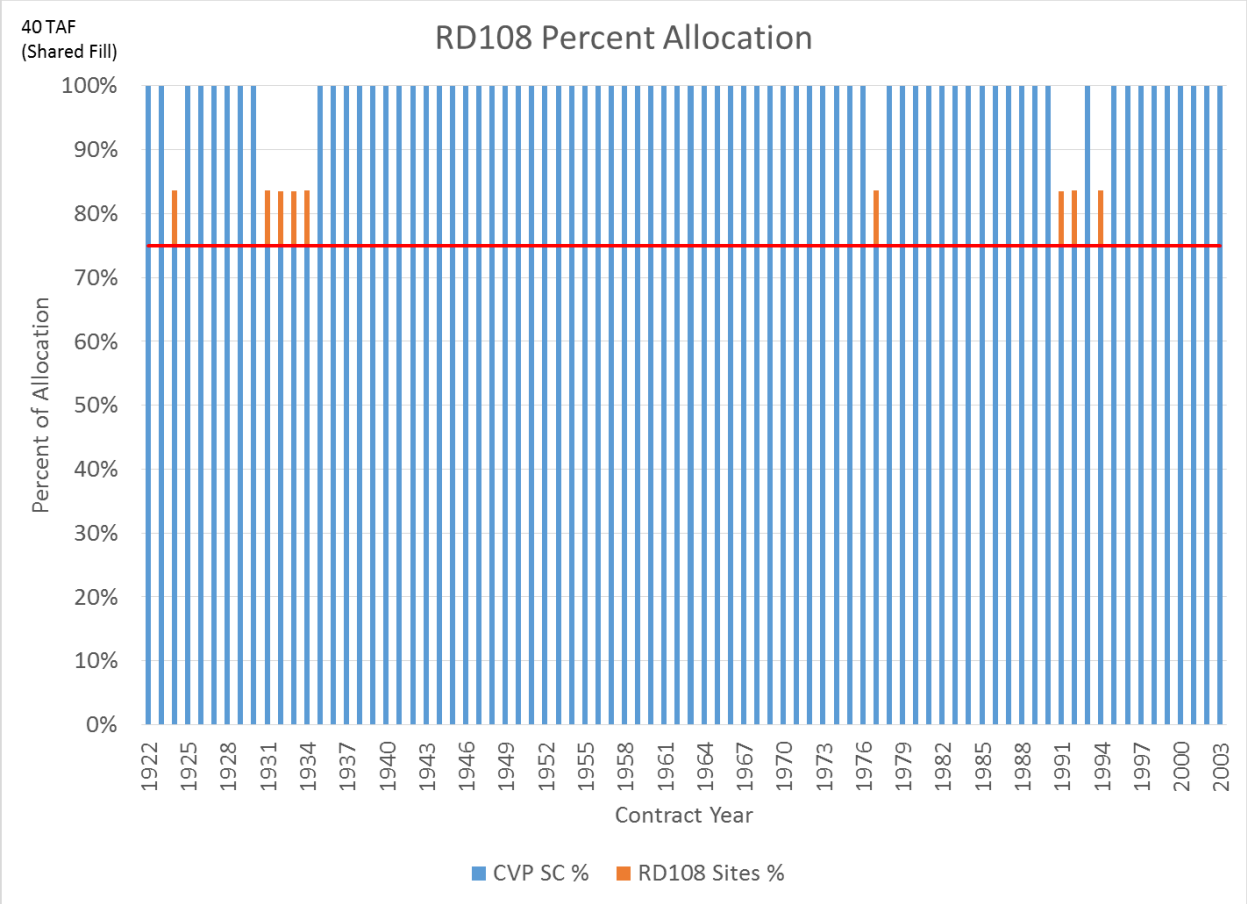

Figure G-4. Sites Reservoir Allocation to Meet RD 108 Delivery Target

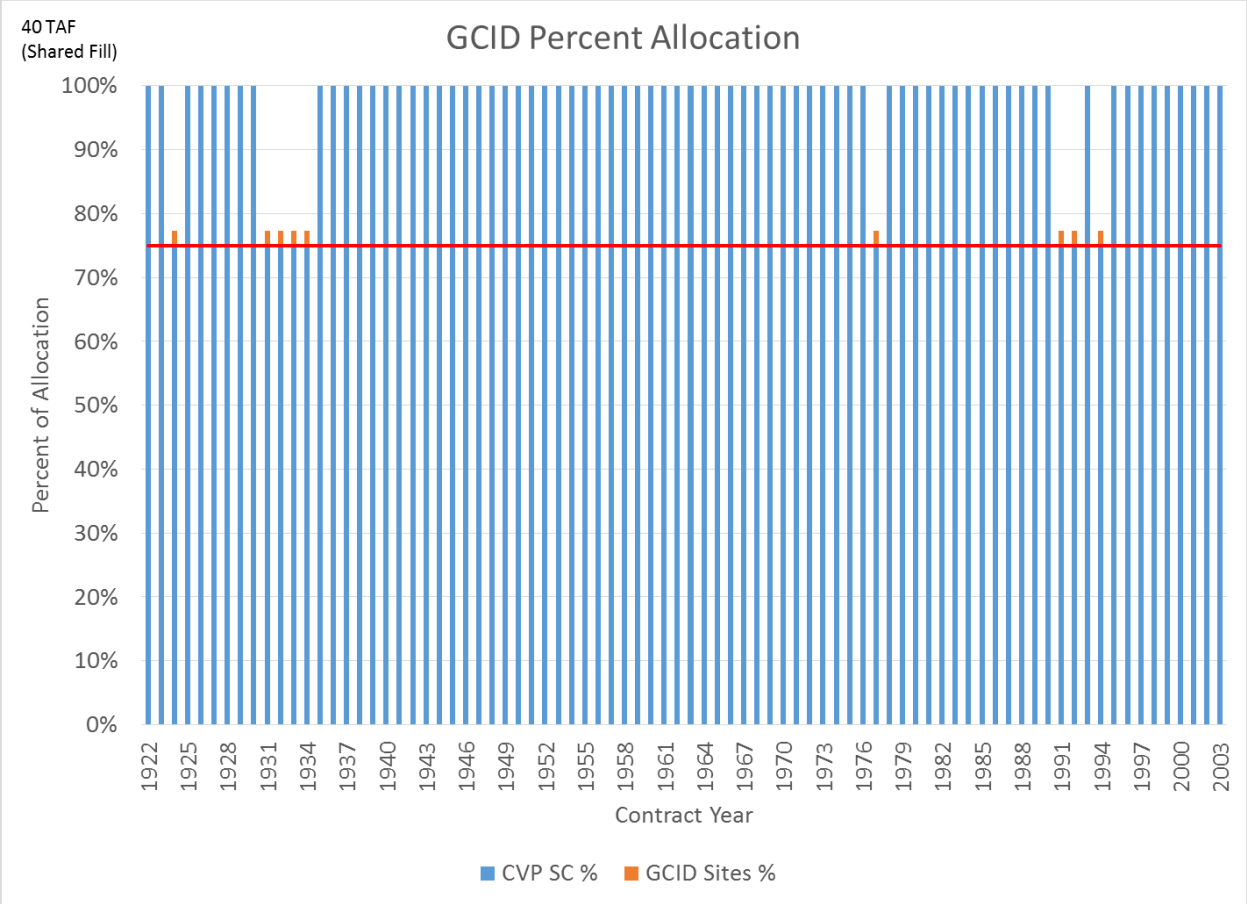

Figure G-5. Sites Reservoir Allocation to Meet GCID Delivery Target

South-of-Delta Water Demands

The parties that receive water from the NODOS project, and also have water supply contracts for either CVP or SWP water, have contract provisions for the conveyance of extra water through CVP or SWP facilities above their CVP or SWP allocations. It is assumed that South-of-the-Delta participants would leave water in Sites Reservoir storage during wet and above normal years when there is little or no capacity to convey water across the Delta. Conversely, when hydrologic conditions are dry or critically dry, they would call on the stored water and convey it across the Delta for dry year supply.

Ecosystem Benefits

The operation of the NODOS project to provide a variety of ecosystem benefits could allow for the potential development and administration of an ecosystem enhancement storage account that could be managed by either the Authority, the Federal government, or the State to provide water for ecosystem and water quality purposes. Such an account could provide a pool of dedicated storage to manage in cooperation with existing operations to improve coldwater conservation storage, stabilize river flows during critical fisheries periods, increase flows through certain watercourses and/or facilities (such as, Yolo Bypass), improve water quality, and/or enhance habitat restoration.

The following section summarizes how NODOS project operations, in cooperation with the CVP and SWP system facilities, could improve overall system flexibility and water supply reliability to support additional environmental benefits. Additional information developed and documented as part of the NODOS project is available on the DWR website (http://www.water.ca.gov/storage/northdelta/).

G.7 Cooperation with Central Valley Project and State Water Project

Under Alternative D, the NODOS project could be operated in cooperation with CVP and SWP operations to coordinate releases from Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake. Releases from Sites Reservoir could allow reduced releases from other reservoirs while still meeting requirements for minimum instream flow objectives, Sacramento River temperature requirements, and Delta salinity control assigned to CVP and SWP. Through this reduction in releases, storage could be conserved in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake to significantly increase operational flexibility to improve river water temperatures for fish survival, Delta water quality, water supply reliability, flood control, and recreation.

The following summarizes the anticipated primary benefits that could be realized through the provision of NODOS project water beyond that required to meet Authority member needs. The priorities and amount of water potentially allocated to achieving the benefits listed below will be identified as part of the development of the California Water Commission Water Storage Investment Program application and subsequent negotiations and agreements with interested participants. NODOS project operations could achieve multiple benefits over a wide range of hydrologic conditions.

In drought conditions, the NODOS project could:

- Provide water for local Colusa Basin and other project participant needs (including potential State and associated environmental needs)
- Increase coldwater pool conservation in Trinity Lake, Shasta Lake, Lake Oroville, and Folsom Lake
- Help regulate Sacramento River summer flows for best use of cold water for control of temperature conditions adverse to anadromous fish
- Increase water supply to CVP and SWP water users participating in the NODOS project

In non-drought hydrologic conditions, the NODOS project water could:

- Provide water for local Colusa Basin and other project participant needs (including potential State and associated environmental needs)
- Provide (via upstream actions) incidental Delta water quality improvements in the summer and fall
- Improve (via upstream actions) flows for Delta fisheries habitat based on the X2 location

- Stabilize Sacramento River fall flows for improving spawning and rearing success of anadromous fish
- Increase water supply to CVP and SWP water users participating in the NODOS project
- Provide water to the Yolo Bypass to support salmon migration and summer food production for delta smelt
- Provide water for Incremental Level 4 refuge deliveries

The summary of Alternative D proposed operations in Table G-1 (located at the end of this document) shows the types of beneficiary operations under drought and other hydrologic conditions, and priorities assumed for various seasonal operations. It is intended that storage and associated releases could be adaptively managed to support operational actions found to produce the greatest benefits over time.

Additional descriptions of potential actions that could be done in cooperation with the CVP and SWP operations are provided below.

Shasta Lake Coldwater Pool and Sacramento River Temperature Control

Maximum benefits could be realized assuming Sites Reservoir and Shasta Lake were operated in cooperation to increase Shasta Lake storage and preserve a greater volume of coldwater pool storage. This additional cold water could improve operational flexibility to provide releases to maintain appropriate water temperatures in the Sacramento River during summer months and in drought years.

Through releases from Sites Reservoir to meet TCCA and GCID irrigation diversions and equivalent reductions in CVP Shasta Lake releases, demands on Shasta Lake storage could be reduced and the coldwater pool maintained for a longer time at higher levels than are currently achievable. Shasta Lake release patterns could be shifted in season and between adjacent years to improve coldwater storage and flow management for salmon and other species using the portion of the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam as habitat.

Stabilize Upper Sacramento River Fall Flows

Additional storage in Shasta Lake could be used to stabilize fall flows between Keswick Dam and Red Bluff to avoid abrupt reductions. This could reduce adverse conditions for spawning fall-run Chinook salmon (such as, dewatering of redds and scour damage).

Sacramento River Diversion Reductions at Red Bluff and Hamilton City

The NODOS project could allow Shasta Lake to provide increased Sacramento River flows in spring through fall by reducing Sacramento River diversions into T-C Canal and GCID Main Canal during the irrigation season. This could be achieved through exchange with releases from Sites Reservoir to meet CVP T-C Canal and GCID Main Canal contract demands, and could provide multiple benefits to anadromous fish and estuarine-dependent species by providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.

Folsom Lake Coldwater Pool Improvement and Supply Reliability

NODOS project operations, in cooperation with Folsom Lake, could improve the reliability of coldwater carryover storage at Folsom Lake, stabilize flows in the American River, and help maintain suitable water temperatures in the lower American River. Additional summer releases from Sites Reservoir could reduce the need for releases from Folsom Lake, resulting in increased carryover storage. Sites Reservoir releases could also provide additional Delta outflow and reduce short-term emergency flow reliance on Folsom Lake releases to maintain Delta water quality. Provision of NODOS project water to American River basin water users could also help increase the reliability of supplies to M&I users.

Delta Outflow Improvement

Sites Reservoir releases for upstream actions could provide supplemental Delta outflow during summer and fall months to help manage Delta X2 salinity position, protect estuarine habitat, reduce entrainment risk, and improve food availability for anadromous fishes and other estuarine-dependent species. Increasing Delta outflow could help maintain the X2 position west of Collinsville and improve food availability for estuarine species, including delta smelt.

Water Quality

Releases from Sites Reservoir for upstream actions could augment Delta outflow for the purpose of improving control of salinity intrusion and could improve water quality.

Lake Oroville Coldwater Pool Improvement

Sites Reservoir releases could increase the reliability of coldwater pool storage in Lake Oroville to reduce lower Feather River water temperatures for juvenile steelhead and spring-run Chinook salmon over-summer rearing, and fall-run Chinook salmon. Higher and more stables flows in the lower Feather River at critical times could also minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.

G.8 Work Cited

del Rosario, R. B., Y. J. Redler, K. Newman, P. L. Brandes, T. Sommer, K. Reece, R. Vincik. 2013. “Migration Patterns of Juvenile winter-run-sized Chinook Salmon (*Oncorhynchus tshawytscha*) through the Sacramento–San Joaquin Delta.” *San Francisco Estuary and Watershed Science*. Vol. 11(1).

Table G-1. Description of Proposed Sites Project Authority Seasonal Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
General Operation															
Conveyance	Diversions at Red Bluff (T-C Canal), at Hamilton City (GCID Main Canal), and at the proposed Delevan Pipeline could occur in any month. Diversions of excess flows would only be allowed once SWRCB D-1641, CVPIA 3406(b)(2), 2008 USFWS biological opinion, and 2009 NMFS biological opinion requirements were met and SWP Article 21 demands were satisfied, and other excess Delta flow diversions (e.g., Freeport Regional Water Project, Los Vaqueros Reservoir, cities of Fairfield, Vacaville, and Benicia) were satisfied. Diversions would be restricted by Sacramento River bypass criteria at Red Bluff, Hamilton City, Wilkins Slough, and Freeport, and restrictions associated with protecting fish outmigration-related pulse flows. Shading highlights the period in which diversion operations would occur, with the November through March season shaded the heaviest.	n/a	n/a												
Seasonal Storage Operation	Fill Sites Reservoir during excess flow events throughout the winter and spring, and drain during peak release periods throughout the summer and fall. The months in which the high and low storage points would occur in the typical seasonal cycle are indicated.	n/a	n/a	Fill Cycle High Point			Drain Cycle Low Point							Fill Cycle	
Water Supply Operations															
Sites Project Authority	Provide storage releases to participating TCCA districts on an as-needed basis to supplement CVP Agricultural Water Service Contract deliveries. Provide storage releases to GCID and RD 108 to supplement CVP Settlement Contract deliveries. Provide supplemental water supplies to project participants outside the Sacramento Valley to improve water supply reliability.	SPA-1	AN,BN,D,C												
Incremental Level 4 Water Supply for Wildlife Refuges	Provide water toward meeting Incremental Level 4 wildlife refuge water needs north-of-the-Delta and south-of-the-Delta to supplement refuges supplies up to Level 4 criteria (CVPIA). Shading highlights period in which transfer operations would occur.	AVG-3	AN,BN,D												
Water Quality Operation															
Water Quality	Upstream release actions would improve water quality conditions by augmenting Delta inflow and outflow. Operations could augment Delta flows above base D1641 operations for up to 6 months. Shading highlights period in which Delta benefits could be augmented.	AVG-1	AN,BN,D												
Hydropower Operation															
Flexible Hydropower Generation	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.	n/a	ALL												
Ecosystem Enhancement Storage Account (EESA) Actions/Operation															
EESA-1: Shasta Coldwater Pool	Improve the reliability of coldwater pool storage in Shasta Lake to increase operational flexibility to provide suitable water temperatures in the Sacramento River. This action would operationally translate into the increase of Shasta Lake May storage levels and improved retention of coldwater Pool storage, with particular emphasis on Below Normal, Dry, and Critical water year types.	DP-1	BN, D, C												
EESA-2: Sacramento River Flows for Temperature Control	Provide releases from Shasta Dam of appropriate water temperatures, and subsequently from Keswick Dam, to improve water temperatures year-round at levels suitable for all species and life stages of anadromous salmonids in the Sacramento River between Keswick Dam and Red Bluff Diversion Dam, with particular emphasis on the months of highest potential water temperature-related impacts (i.e., July through November) during Below Normal, Dry, and Critical water year types.	DP-2	BN, D, C												
EESA-3: Folsom Lake Coldwater Pool	Increase the availability of coldwater pool storage in Folsom Lake, by increasing May storage and retaining coldwater pool storage, to allow additional operational flexibility to provide suitable water temperatures in the lower American River. This action would use additional coldwater pool storage by providing releases from Folsom Dam (and subsequently from Nimbus Dam) to help provide water temperatures at levels suitable for juvenile steelhead over-summer rearing and fall-run Chinook salmon spawning in the lower American River from May through November during all water year types.	DP-2	D, C												
EESA-4: Stabilize American River Flows	Stabilize flows in the lower American River to minimize dewatering of fall-run Chinook salmon redds (i.e., October through March) and steelhead redds (i.e., January through May), and reduce juvenile anadromous salmonids isolation events, particularly from October through June. Reduce the reliance upon Folsom Lake as a “real-time first response facility” to meet Delta objectives and demands, particularly from January through August, to reduce flow fluctuation and water temperature-related impacts to fall-run Chinook salmon and steelhead in the lower American River.	DP-2	ALL												

Table G-1. Description of Proposed Sites Project Authority Seasonal Operations

Objective	Detail of Operation	Priority of Operation[a]	Year Type Most Suitable for Operation[b]	Months Most Suitable for Operation[c]											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EESA-5: Habitat Improvement (Summer/Fall)	Upstream release actions could provide supplemental flow during summer and fall months (i.e., May through December) to improve X2 position and increase estuarine habitat, reduce entrainment, and improve food availability for anadromous fishes and other estuarine-dependent species (e.g., delta smelt, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*). Shading highlights period in which flow would be augmented (operation coordinated with Water Quality action).	AVG-2	ALL												
EESA-6: Lake Oroville Coldwater Pool	Improve the reliability of coldwater pool storage in Lake Oroville to improve water temperature suitability for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River from May through November during all water year types. Provide releases from Oroville Dam to maintain water temperatures at levels suitable for juvenile steelhead and spring-run Chinook salmon over-summer rearing and fall-run Chinook salmon spawning in the lower Feather River. Stabilize flows in the lower Feather River to minimize redd dewatering, juvenile stranding, and isolation of anadromous salmonids.	DP-2	BN, D, C												
EESA-7: Stabilize Sacramento River Fall Flows	Stabilize flows in the Sacramento River between Keswick Dam and the Red Bluff Diversion Dam to minimize dewatering of fall-run Chinook salmon redds (for the spawning and embryo incubation life stage periods extending from October through March), particularly during fall months. Avoid abrupt changes. Operations would be limited to not adversely impact coldwater pool operations in dry and critical years. Shading highlights period of greatest effect on stabilization or flows on a daily basis.	AVG-1	AN,BN,D												
EESA-8: Sacramento River Diversion Reduction at Red Bluff and Hamilton City	Provide increased flows from spring through fall in the lower Sacramento River by reducing diversions at Red Bluff Diversion Dam (into the T-C Canal) and at Hamilton City (into the GCID Main Canal), and by providing supplemental flows at the proposed Delevan Pipeline Intake/Discharge Facilities. This action would provide multiple benefits to riverine and estuarine habitats, and to anadromous fishes and estuarine-dependent species (e.g., delta smelt, splittail, longfin smelt, Sacramento splittail, starry flounder, and *Crangon franciscorum*) by reducing entrainment, providing or augmenting transport flows, increasing habitat availability, increasing productivity, and improving nutrient transport and food availability.	n/a	ALL												

[a] Priority of operation “DP” indicates that the operational priority has a driest period’s emphasis and “AVG” indicates an average-to-wet hydrologic emphasis. The number 1-4 indicates priority within the associated hydrologic emphasis. “n/a” indicates that operations are not or cannot be easily defined within the priority structure of the scenario. “SPA” indicates Sites Project Authority operation on an as-needed basis subject to storage availability.

[b] Year type most suitable for operation is the D1641 40-30-30 year types that are reflected in operations studies; operations in these year types occur when supplies would be available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

[c] The heavier shaded parts of each bar highlight the months in which conditions would be most suitable to the operations; the lighter shaded parts of each bar highlight the months that would be less suitable to the operations; operations in these months would occur when supplies are available in Sites Reservoir to support the operation, when the operations criteria in the scenario allow for prioritization of the operations, and when conditions are suitable for developing the benefit associated with the operation.

AN = Above Normal
AVG = Average
BN = Below Normal
C = Critical
D = Dry
DP = Driest periods
GCID = Glenn-Colusa Irrigation District
NMFS = National Marine Fisheries Service
USFWS = U.S. Fish and Wildlife Service

Acronyms and Other Abbreviations

Authority	Sites Project Authority
CALFED	CALFED Bay-Delta Program
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
DWR	California Department of Water Resources
GCID	Glenn-Colusa Irrigation District
M&I	municipal and industrial
MAF	million acre-foot (feet)
NODOS	North-of-Delta Offstream Storage
Operations Plan	Sites Reservoir Project Operations Plan
RD 108	Reclamation District 108
Reclamation	Bureau of Reclamation
SRSC	Sacramento River Settlement Contractor
SVI	Sacramento Valley 40-30-30 water year type index
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
T-C Canal	Tehama-Colusa Canal
TCCA	Tehama-Colusa Canal Authority
TRR	Terminal Regulating Reservoir

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Attachment A
Summary CalSim-II Investigatory Model Results

Attachment A

Summary CalSim-II Investigatory Model Results

Modeling was conducted using the CalSim-II model to evaluate potential Proposed Alternative operations to provide water for participating Authority members, operate in cooperation with the CVP and SWP systems, and supply water for ecosystem and water quality benefits. The Proposed Alternative modeling tiers off NODOS project Alternative C modeling conducted previously by DWR, which assumes projected year 2020 level of development conditions.

The figures included in this appendix present CalSim-II results for the NODOS No Action Alternative (NAA), NODOS Alternative C (ALT_C), and Alternative D.

Additional information developed and documented as part of the NODOS project is available on the DWR website (http://www.water.ca.gov/storage/northdelta/).

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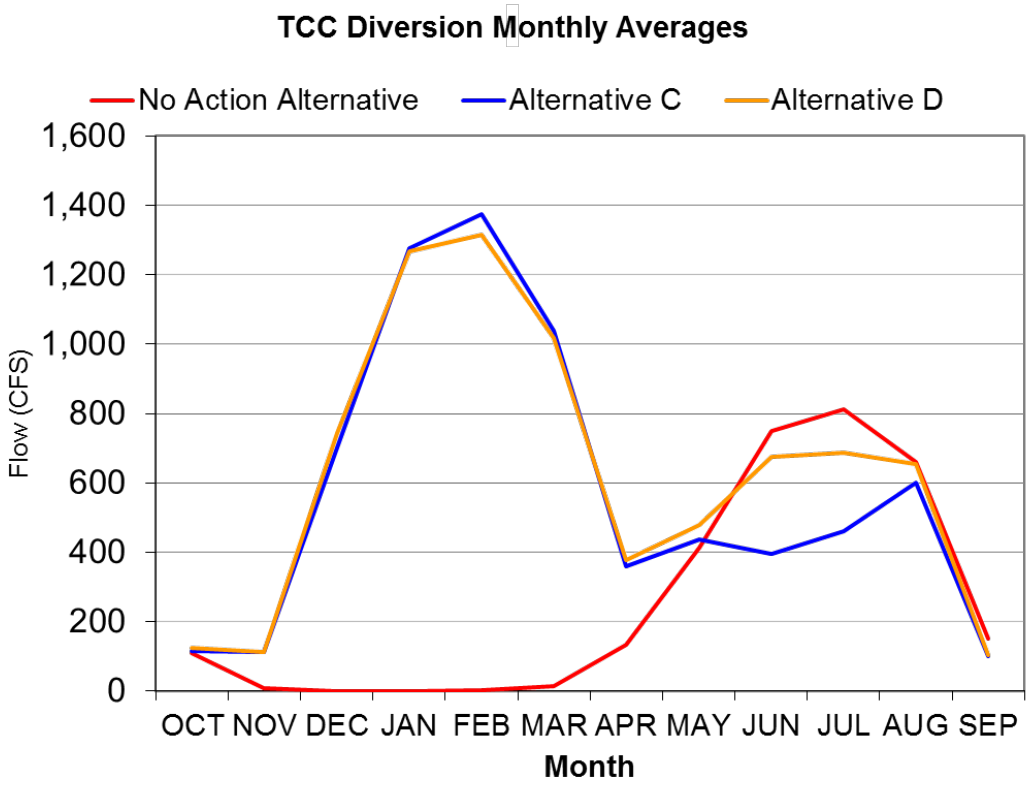

TCC Diversion Monthly Averages
No Action Alternative
Alternative C
Alternative D
1,600
1,400
1,200
1,000
800
600
400
200
0
Flow (CFS)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

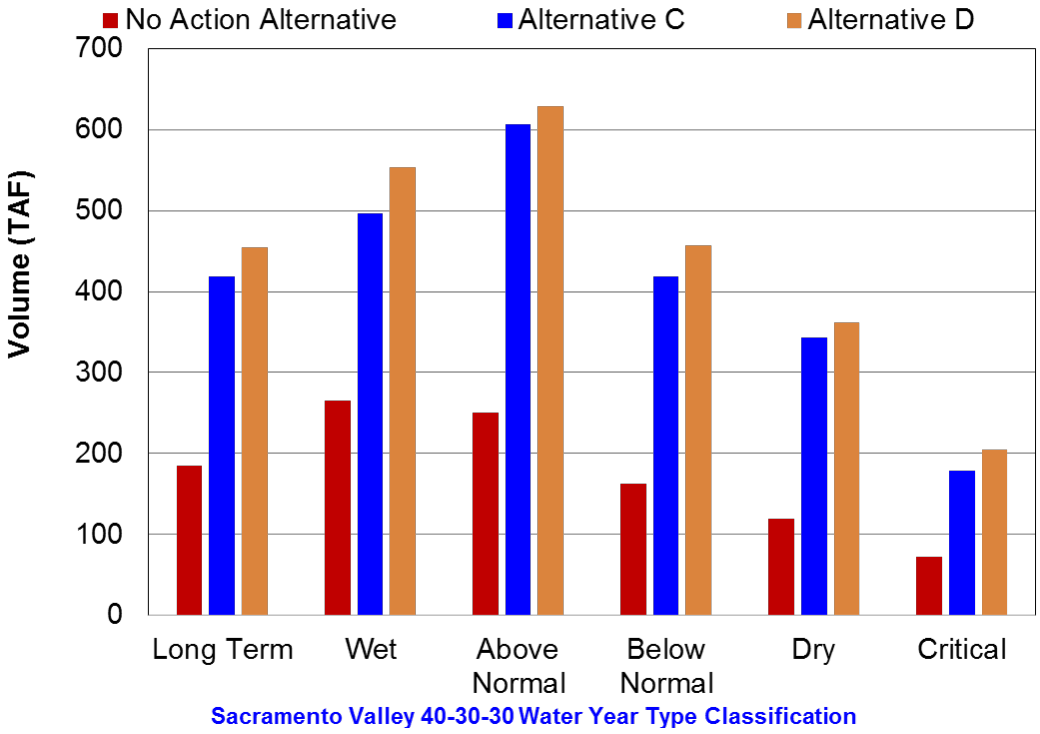
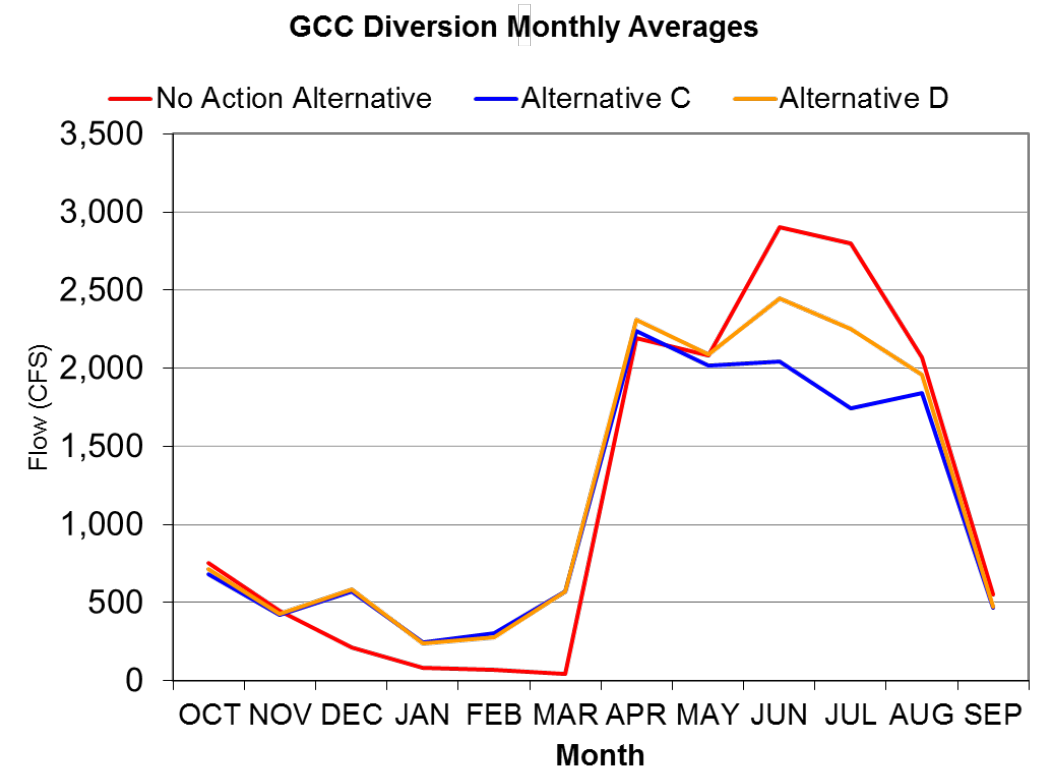

October-September TCC Diversion Averages
No Action Alternative
Alternative C
Alternative D
700
600
500
400
300
200
100
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-1


GCC Diversion Monthly Averages
No Action Alternative
Alternative C
Alternative D
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Flow (CFS)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

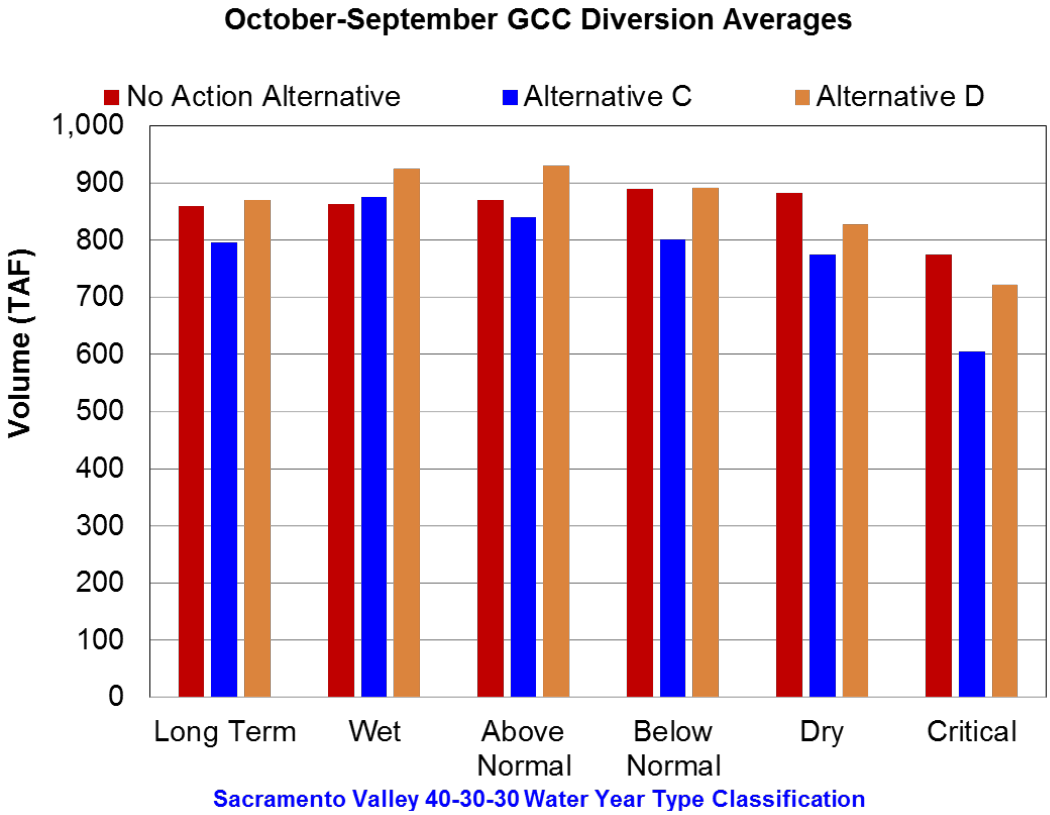
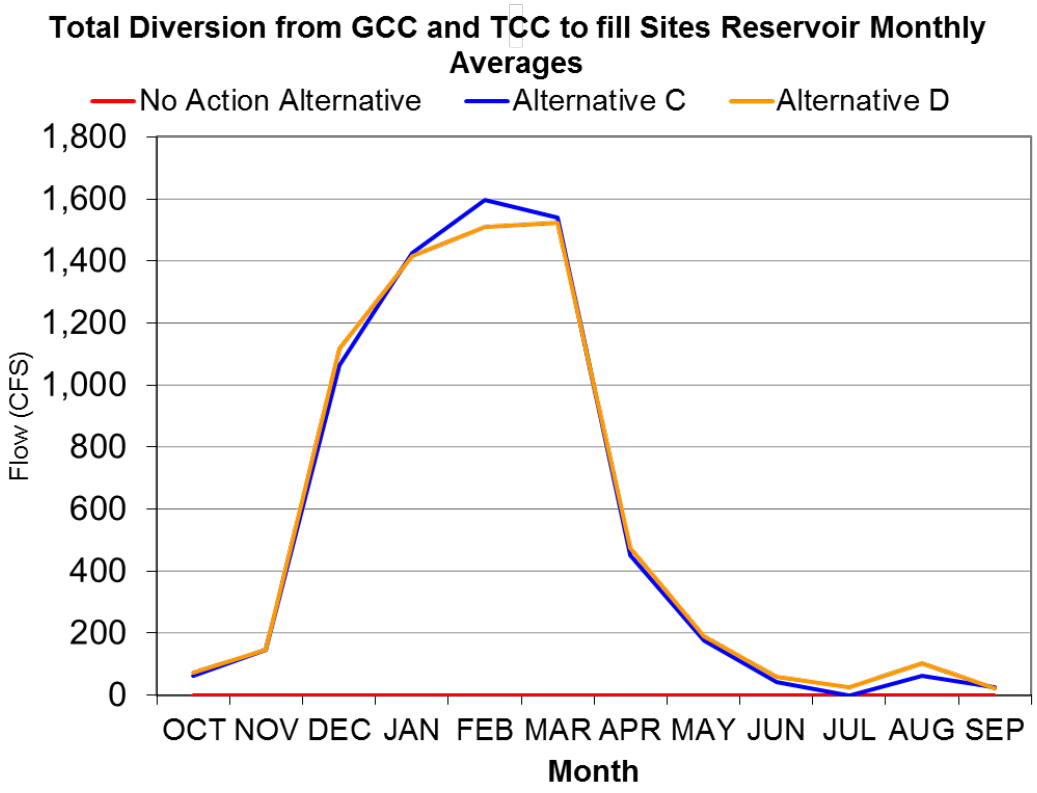

October-September GCC Diversion Averages
No Action Alternative
Alternative C
Alternative D
1,000
900
800
700
600
500
400
300
200
100
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-2


Total Diversion from GCC and TCC to fill Sites Reservoir Monthly Averages
No Action Alternative
Alternative C
Alternative D
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Flow (CFS)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

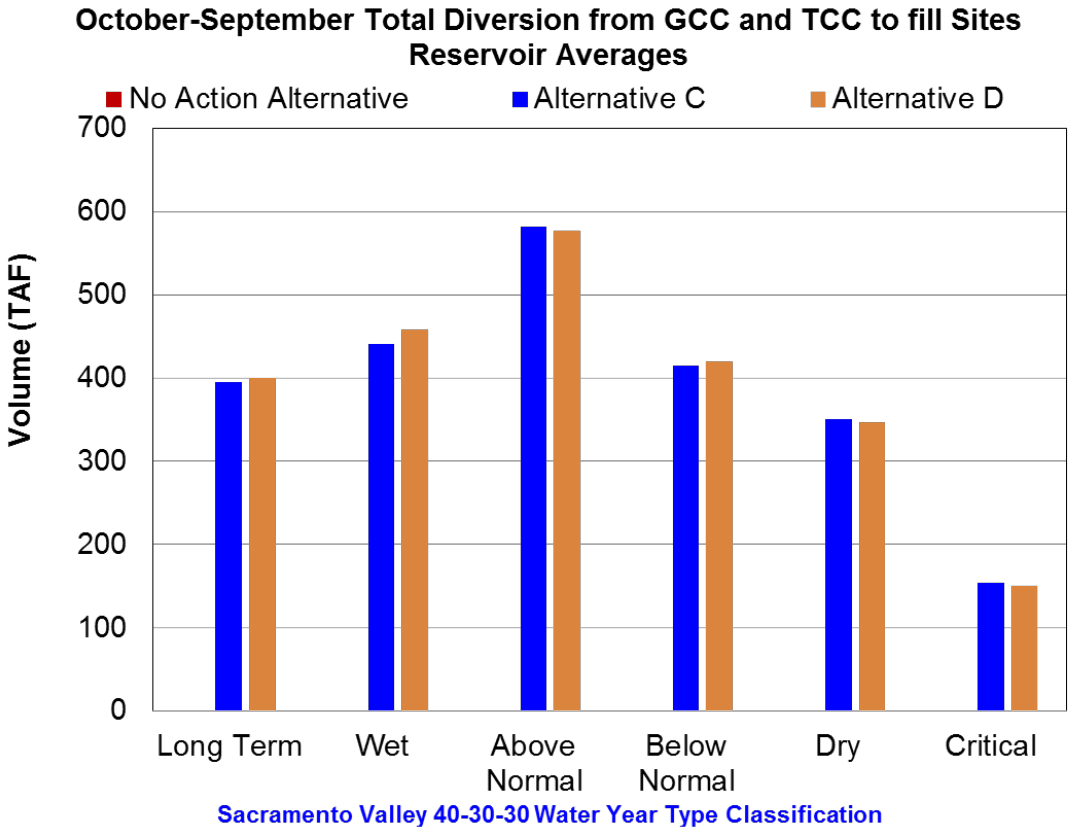
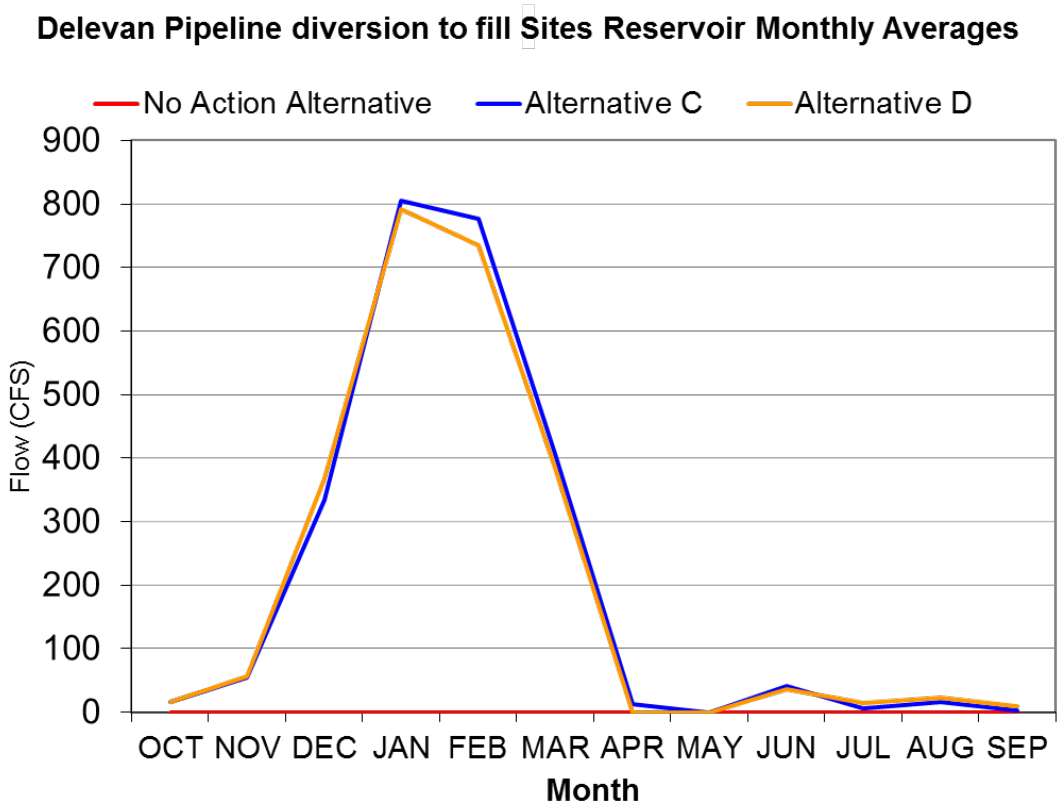

October-September Total Diversion from GCC and TCC to fill Sites Reservoir Averages
No Action Alternative
Alternative C
Alternative D
700
600
500
400
300
200
100
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-3


Delevan Pipeline diversion to fill Sites Reservoir Monthly Averages
No Action Alternative
Alternative C
Alternative D
900
800
700
600
500
400
300
200
100
0
Flow (CFS)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

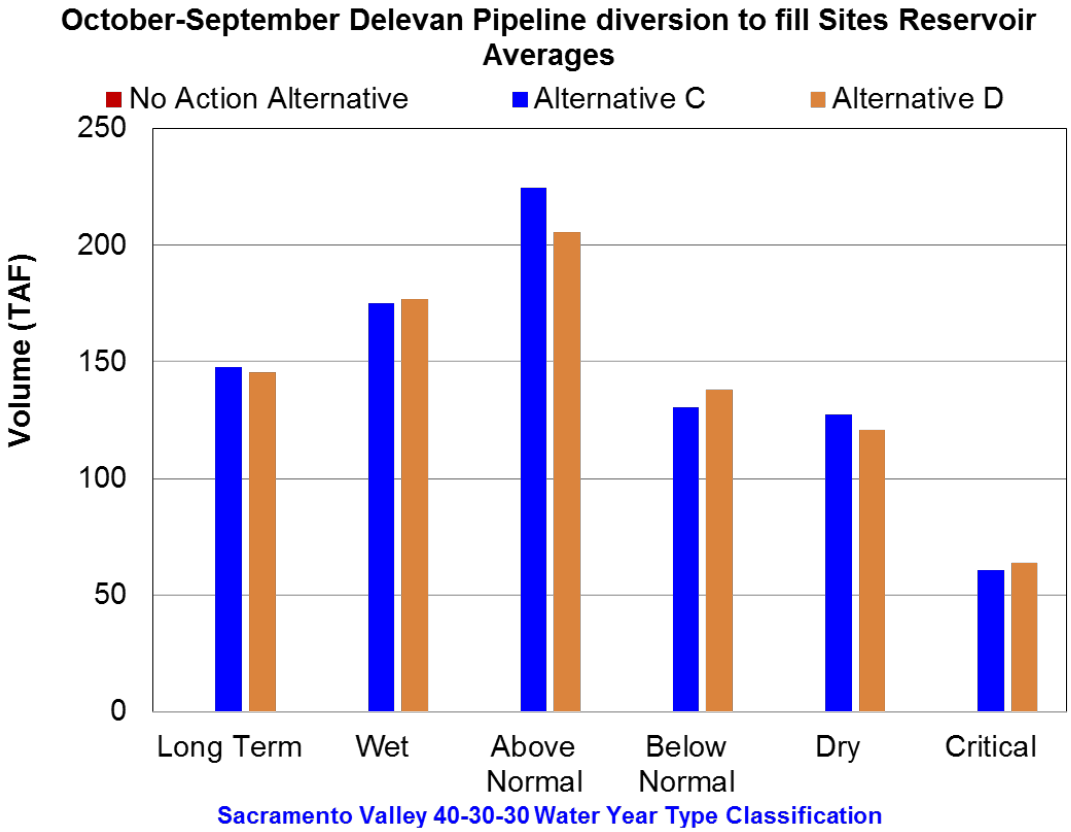
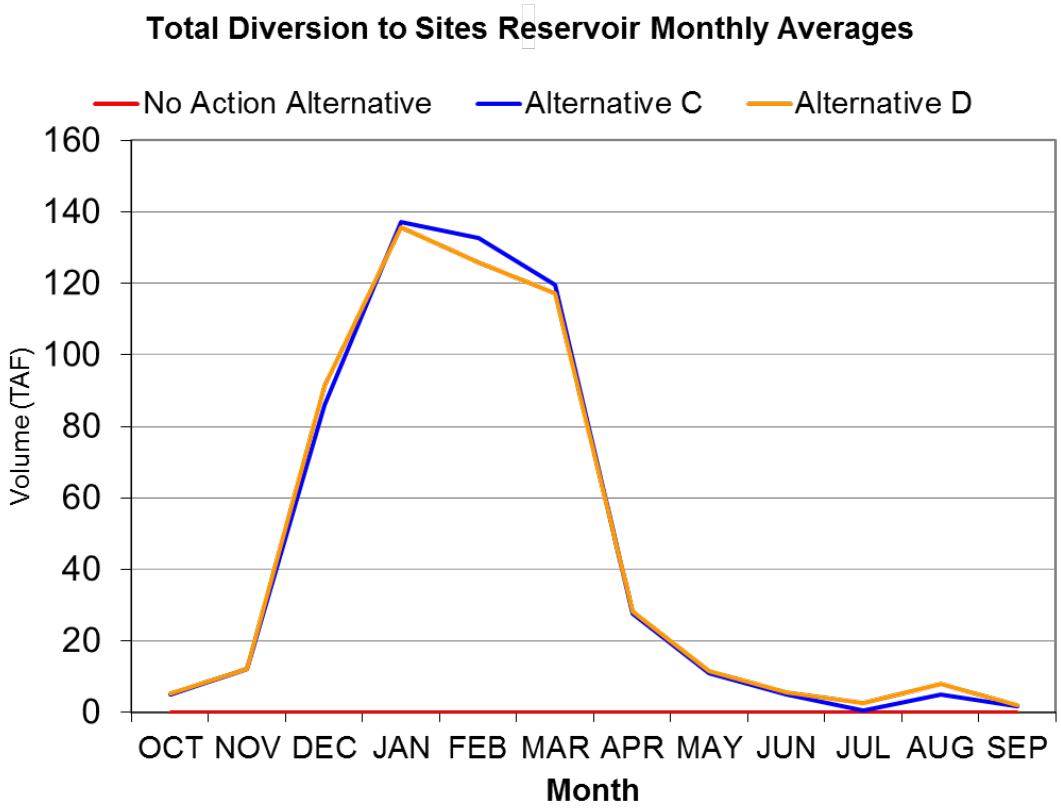

October-September Delevan Pipeline diversion to fill Sites Reservoir Averages
No Action Alternative
Alternative C
Alternative D
250
200
150
100
50
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-4


Total Diversion to Sites Reservoir Monthly Averages
No Action Alternative
Alternative C
Alternative D
Volume (TAF)
160
140
120
100
80
60
40
20
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

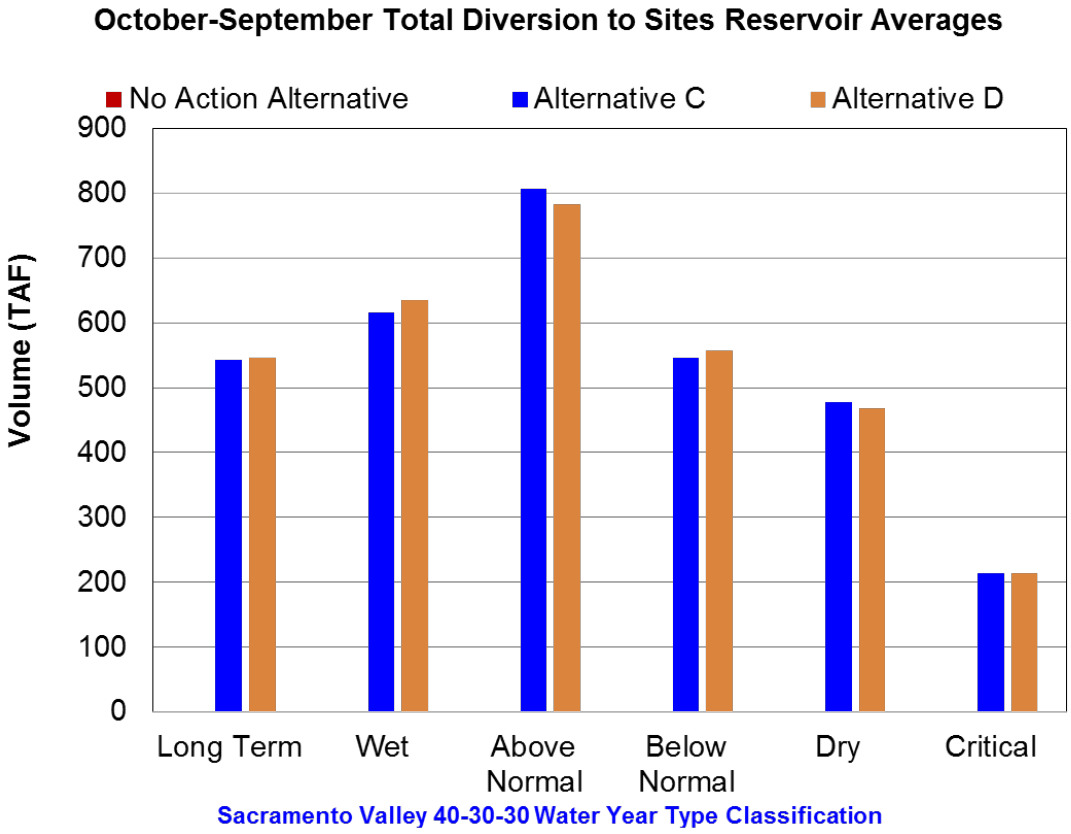
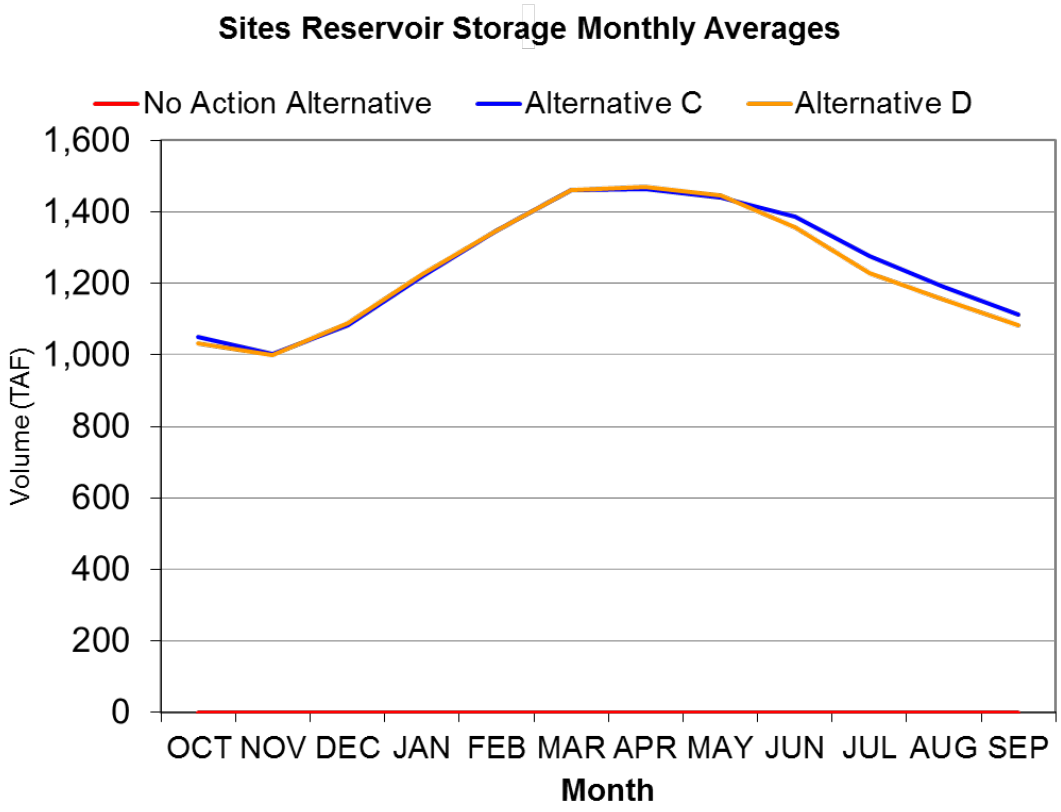

October-September Total Diversion to Sites Reservoir Averages
No Action Alternative
Alternative C
Alternative D
Volume (TAF)
900
800
700
600
500
400
300
200
100
0
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-5


Sites Reservoir Storage Monthly Averages
No Action Alternative
Alternative C
Alternative D
1,600
1,400
1,200
1,000
800
600
400
200
0
Volume (TAF)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

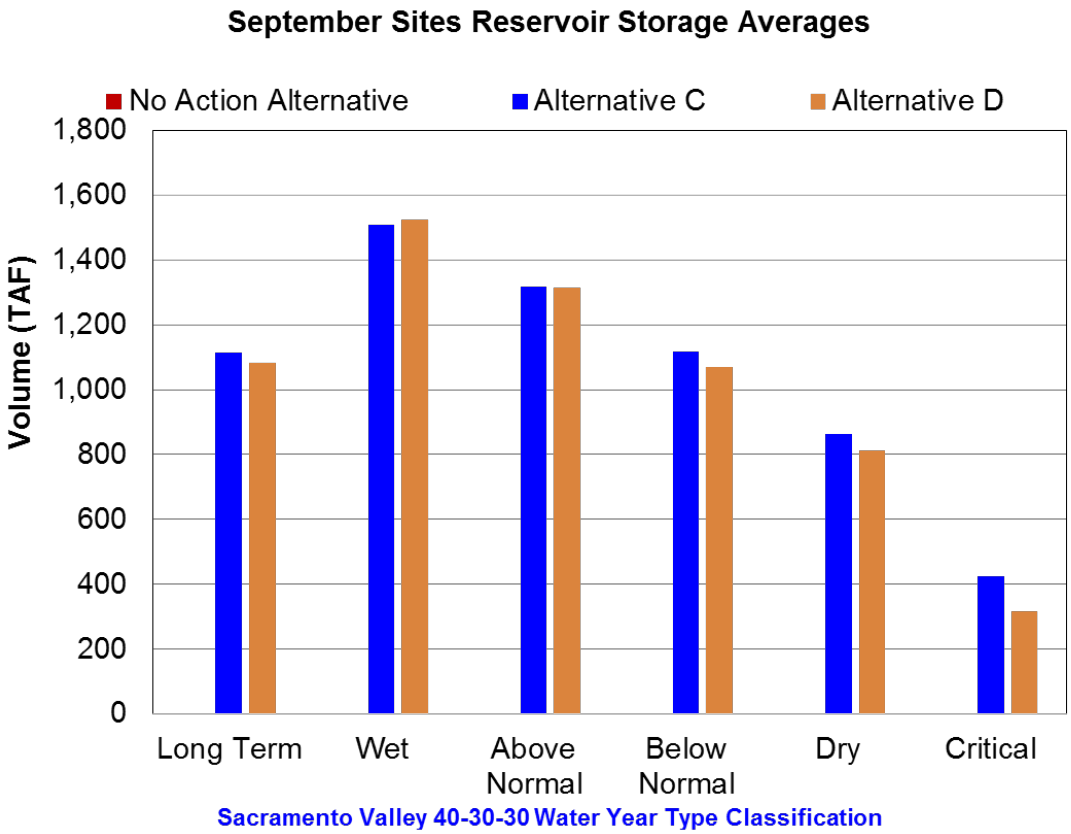
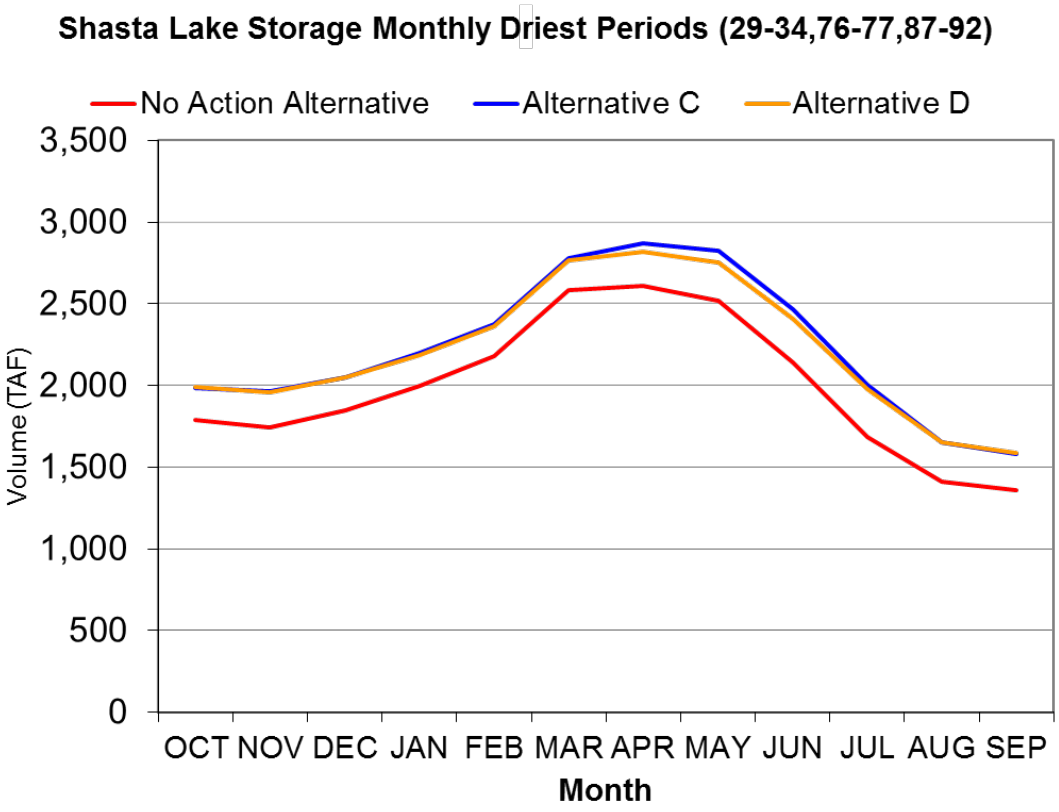

September Sites Reservoir Storage Averages
No Action Alternative
Alternative C
Alternative D
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-6


Shasta Lake Storage Monthly Driest Periods (29-34,76-77,87-92)
No Action Alternative
Alternative C
Alternative D
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Volume (TAF)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

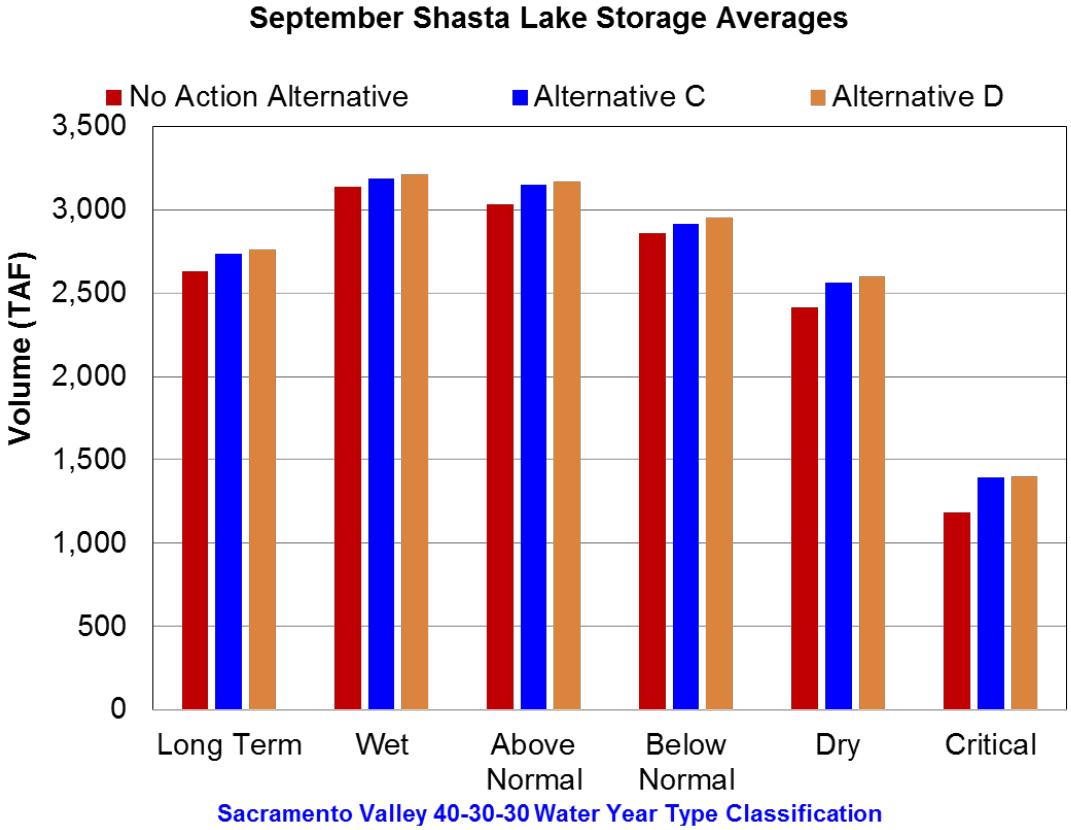
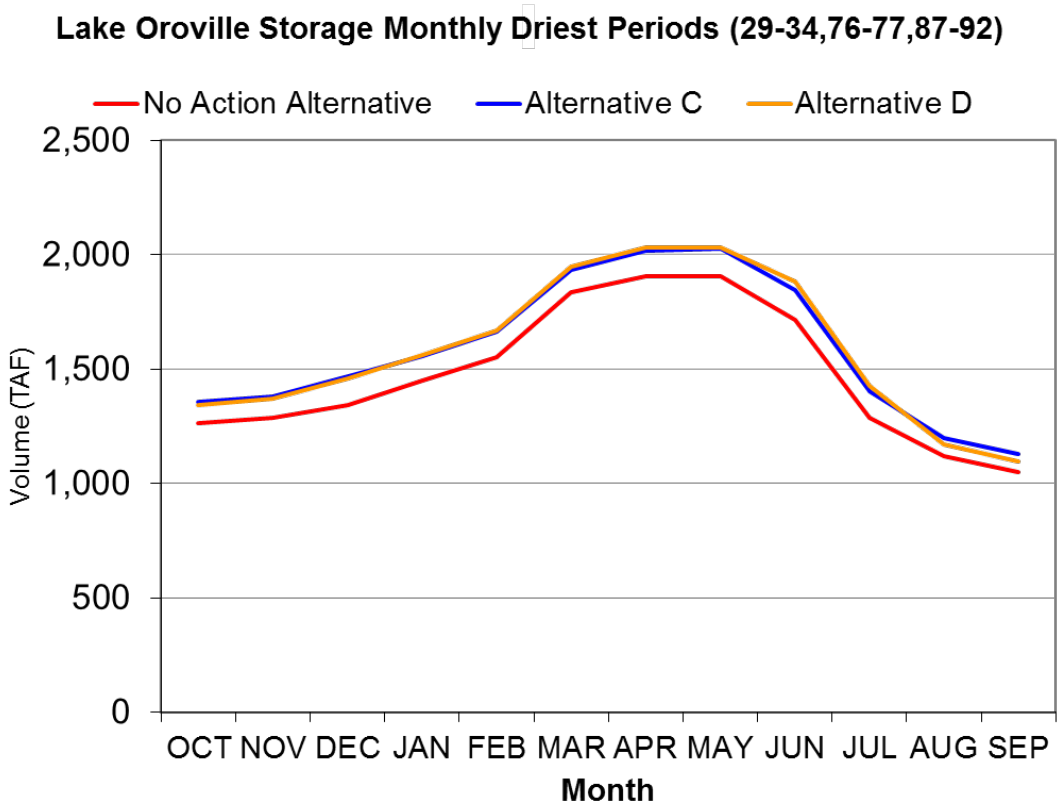

September Shasta Lake Storage Averages
No Action Alternative
Alternative C
Alternative D
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-7


Lake Oroville Storage Monthly Driest Periods (29-34,76-77,87-92)
No Action Alternative
Alternative C
Alternative D
2,500
2,000
1,500
1,000
500
0
Volume (TAF)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

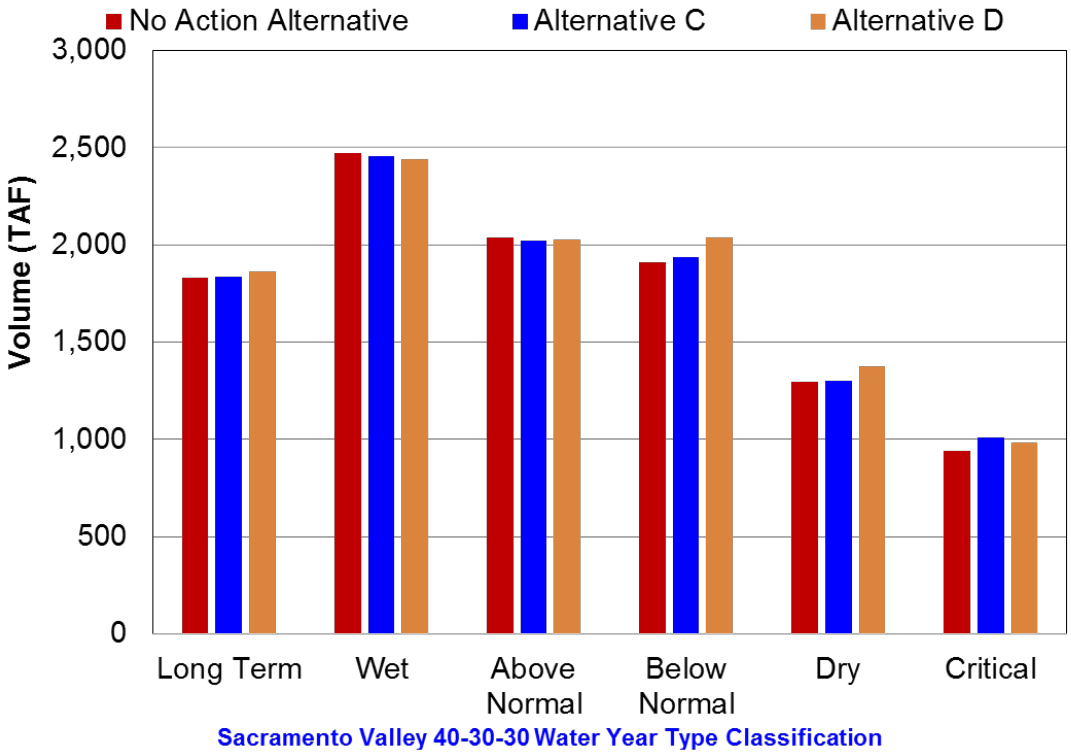
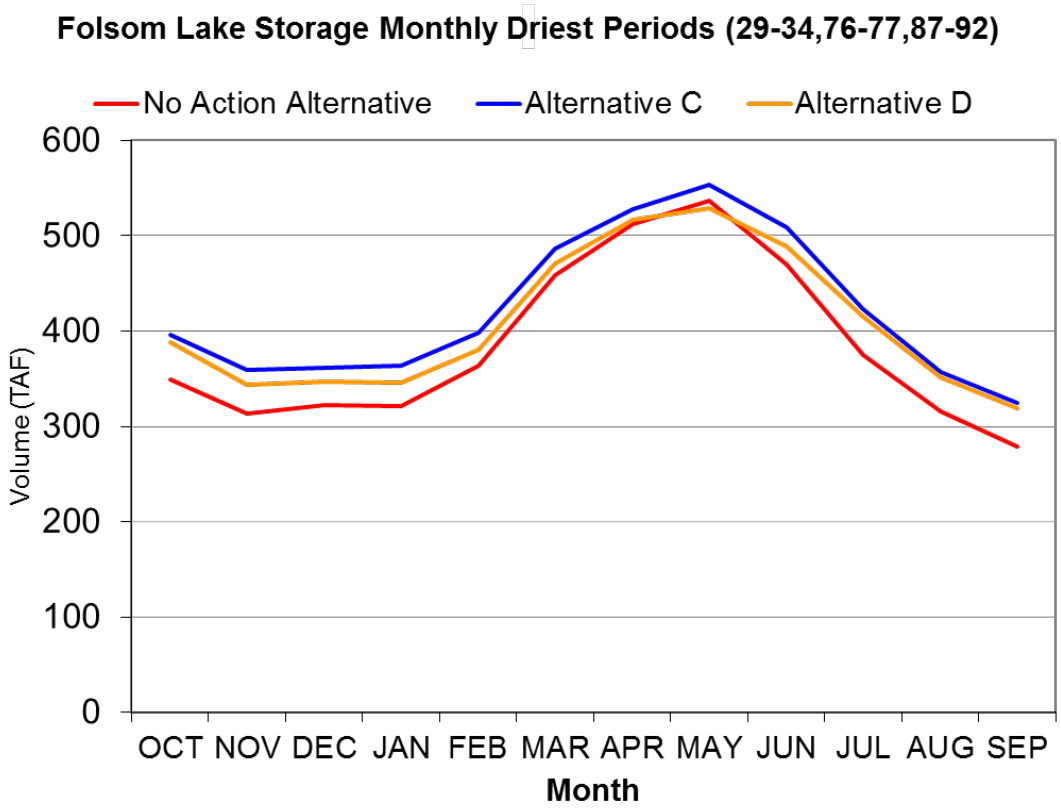

September Lake Oroville Storage Averages
No Action Alternative
Alternative C
Alternative D
3,000
2,500
2,000
1,500
1,000
500
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-8


Folsom Lake Storage Monthly Driest Periods (29-34,76-77,87-92)
No Action Alternative
Alternative C
Alternative D
600
500
400
300
200
100
0
Volume (TAF)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

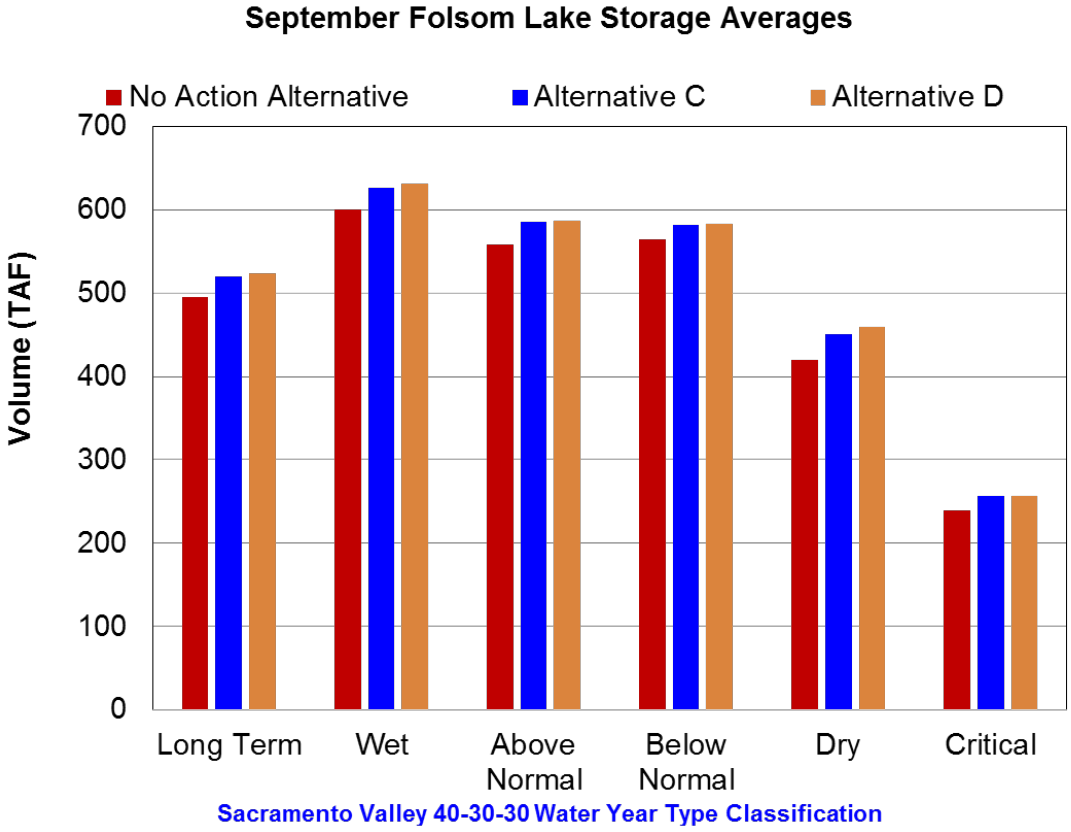
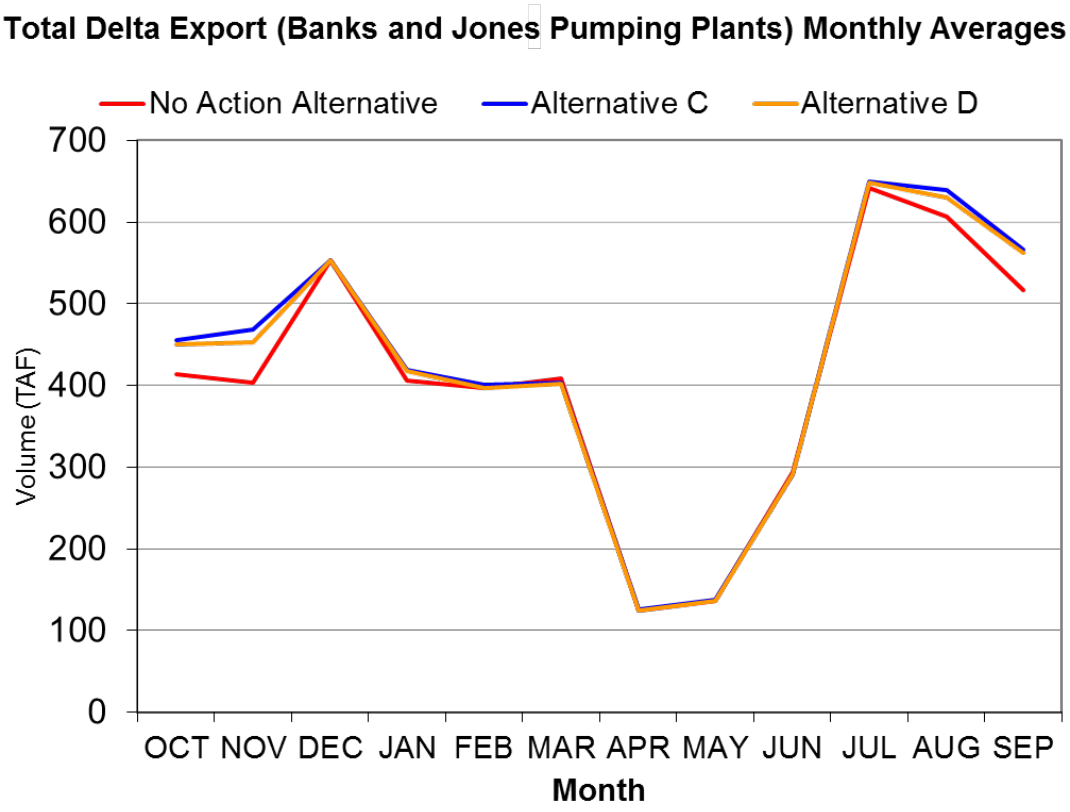

September Folsom Lake Storage Averages
No Action Alternative
Alternative C
Alternative D
700
600
500
400
300
200
100
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-9


Total Delta Export (Banks and Jones Pumping Plants) Monthly Averages
No Action Alternative
Alternative C
Alternative D
700
600
500
400
300
200
100
0
Volume (TAF)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Month

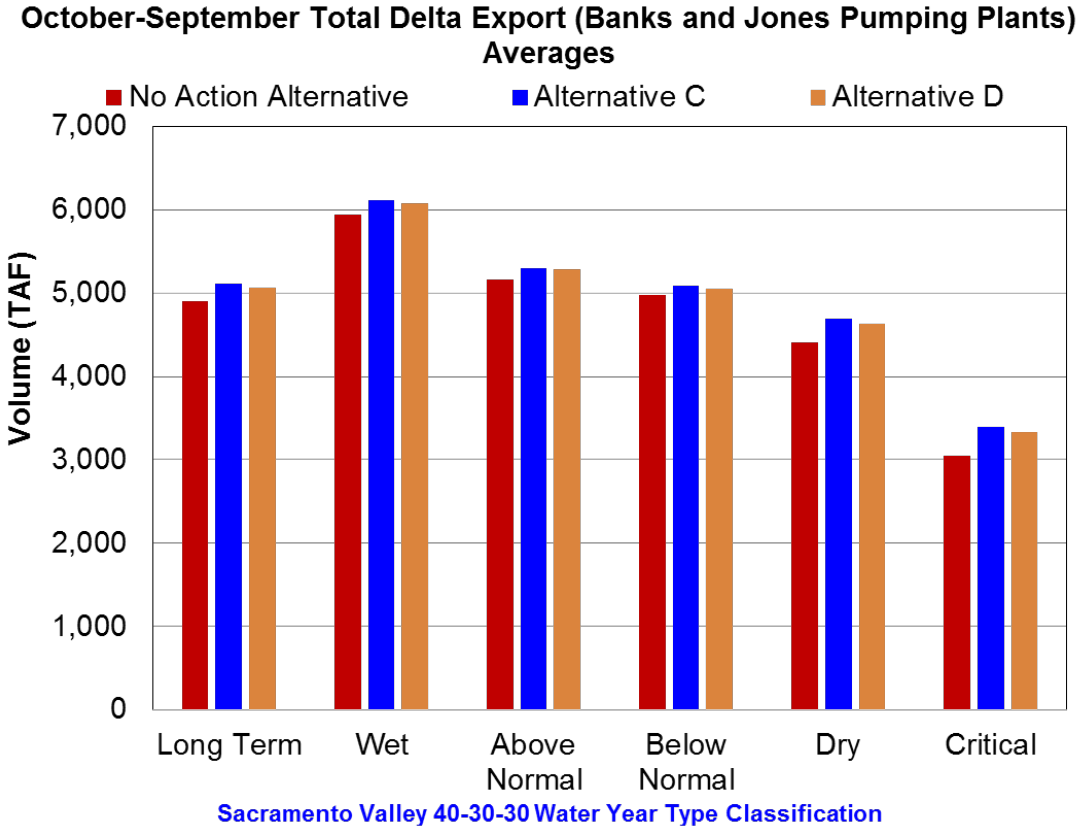

October-September Total Delta Export (Banks and Jones Pumping Plants) Averages
No Action Alternative
Alternative C
Alternative D
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Volume (TAF)
Long Term
Wet
Above Normal
Below Normal
Dry
Critical
Sacramento Valley 40-30-30 Water Year Type Classification

Figure GA-10