North-of-the-Delta Offstream Storage

Investigation Highlights

May 2014

PUBLIC SAFETY ENVIRONMENTAL STEWARDSHIP ECONOMIC STABILITY

INVESTIGATION HIGHLIGHTS
A Summary

• North-of-the-Delta Offstream Storage (NODOS) would provide a robust set of benefits, including water supply reliability for municipal and industrial uses, agriculture, and wildlife refuges; ecosystem enhancement actions to improve fish survival in major northern California rivers and the Sacramento-San Joaquin Delta (Delta); water quality improvements for Delta water users and estuarine species; flexible hydropower generation to support renewable energy sources such as wind and solar; recreation opportunities at the new reservoir and improved recreation at existing reservoirs; and local flood damage reduction below the new reservoir. Total water supply benefits would be up to 500 thousand acre-feet (TAF) per year on average and over 600 TAF per year during dry and critical years.

• The mix of NODOS benefits would also support improved flexibility and long-term viability of the Central Valley Project (CVP) and State Water Project (SWP). As the current drought is showing, flexibility of these projects is impaired during multiple dry years or droughts. In addition to providing the benefits described above, NODOS would improve CVP and SWP flexibility by increasing water in storage, including during drought conditions. Average annual improved storage would be up to 1.4 million acre-feet (MAF); annual drought period storage would be improved by up to 1.1 MAF.

• Estimated project cost ranges between $3.6 billion and $4.1 billion.

• Benefits would exceed costs. Net benefits, or the total economic value of annual benefits would exceed total annual costs by $61 million, $77 million, and $72 million for Alternatives A, B, and C respectively. The benefit-cost ratios for the three alternatives would be 1.32, 1.43, and 1.35 respectively.

• NODOS benefits would be resilient. A slightly modified operation and emphasis of objective priorities would be required with Bay Delta Conservation Plan (BDCP) conveyance and operations. The mix of water supply benefits would remain robust. NODOS operations would also be resilient to climate change effects, including potential changes in runoff and sea level rise. Total water supply benefits decreased by 4% in one BDCP scenario; and total water supply benefits increased or were unchanged in the climate change scenario and the BDCP with climate change scenario.

• Public benefits can be quantified for the benefit packages evaluated. The currently released reports do not include the final cost allocation, which would provide an approach to determining public and non-public investment needs. Even so, a preliminary cost allocation estimates the public benefit allocation at about 40%, including ecosystem restoration, water quality, water supply reliability for wildlife refuges, recreation, and flood damage reduction.

• The impacts of NODOS implementation are evaluated and potential mitigation measures are described in the Preliminary Administrative Draft (PAD) Environmental Impact Report (EIR). DWR is not soliciting and will not respond to comments submitted on this PADEIR, although any comments received will be retained and may be considered during preparation of a future public draft EIR.

• The Governor's California Water Action Plan (Water Action Plan) directs the California Department of Water Resources (DWR) to work with the Legislature, U.S. Bureau of Reclamation (Reclamation), and Sites Project Joint Powers Authority (JPA) to help facilitate a funding partnership in support of a financeable, multi-benefit storage project.

Introduction

The Governor's Water Action Plan and the current drought have re-energized discussions of the need for more storage. The Water Action Plan presents water challenges facing California and lays out three over-arching goals: reliability, restoration, and resilience. One of ten actions to meet these goals is, *"expand water storage capacity and improve groundwater management."* This document highlights how NODOS would improve the reliability, restoration, and resilience of California's water resources to support the Water Action Plan goals.

Five documents associated with the NODOS Investigation are available online at http://www.water.ca.gov/storage:

- NODOS Investigation Highlights (this report), by DWR
- NODOS Preliminary Administrative Draft EIR, by DWR
- NODOS Investigation 2013 Progress Report, by Reclamation and DWR
- NODOS Preliminary Design and Cost Estimate Report, by DWR
- NODOS Sensitivity Analysis of Operations with the BDCP Technical Memorandum, by the Sites Project JPA

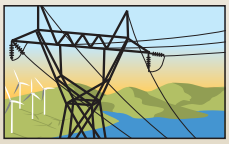
This document highlights important information from these planning documents, which comprise most of the administrative drafts of the environmental and feasibility reports being prepared for the investigation.

Offstream storage reservoirs located north-of-the-Delta have been studied since the 1940s. The CALFED Bay-Delta Program (CALFED), a cooperative Federal and State agency partnership, recommended further study of NODOS in 2000. DWR and Reclamation are nearing completion of a Feasibility Study, including an EIR/EIS and Feasibility Report, in cooperation with local and regional water interests.

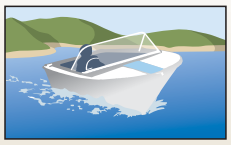
An initial step in the NODOS Investigation was consideration of problems and needs in the study area, which defined the NODOS planning objectives. The project objectives and portfolio of benefits are shown in Figure 1. Additionally, operational flexibility would be supported by additional water in storage. Operational flexibility of the SWP and CVP systems has diminished over time. Contractual commitments to water users, as well as water quality and fish survival requirements, have all increased since California's two largest water projects were built. These increasing demands on the systems have resulted in less water in storage. The CVP and SWP systems have become increasingly inflexible—a "loss of resiliency," as described in the California Water Plan Update. As the reservoirs are operated to meet these increasing commitments, additional stressors are anticipated. Climate change effects will require increased reservoir releases to maintain Delta salinity and to control water temperatures downstream of existing reservoirs.

NODOS would take advantage of existing water facilities, including Tehama-Colusa Canal, as shown here.

Figure 1. Summary of NODOS Objectives and Benefits Portfolio



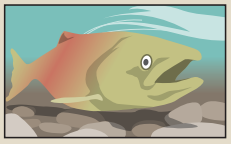
Flexible Generation
Sites Reservoir would provide flexible power generation, which can quickly ramp up or down to support wind and solar generation.



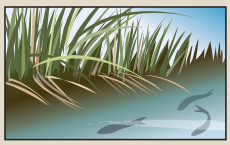
Recreation
Sites Reservoir would provide opportunities for hiking, camping, fishing, and boating.

Water Supply Reliability
The reliability of water supplies would be improved by Sites Reservoir and the added flexibility for operating the systems.

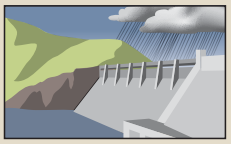
M&I and Agricultural Water Quality
Sites Reservoir would improve water quality by dedicated releases to reduce the average electrical conductivity (indication of salinity) and the concentrations of total dissolved solids, chlorides, and bromides within the Delta.



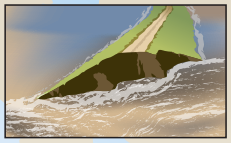
Ecosystem Improvements
Sites Reservoir would dedicate storage to improve cold water management in existing reservoirs and flow and temperature conditions in Northern California rivers and the Delta to support fish survival.



Environmental Water Quality Improvements
Sites Reservoir would release water to the Sacramento River to improve Delta water quality for ecosystem functions.



Flood Risk Reduction
Sites Reservoir would improve flood protection for the local areas downstream of the proposed reservoir.



Emergency Response
Sites Reservoir would provide emergency water supply or make releases to supplement flushing flows, as conditions warrant.

Note: Map not to scale

Through a robust plan formulation process, many reservoir locations were considered and Sites Reservoir was selected as the preferred location alternative. A range of reservoir sizes, various conveyances, and operational scenarios were also considered. The operation of Sites Reservoir is an essential part of the NODOS investigation. The NODOS alternatives evaluated in detail are depicted in Figure 2.

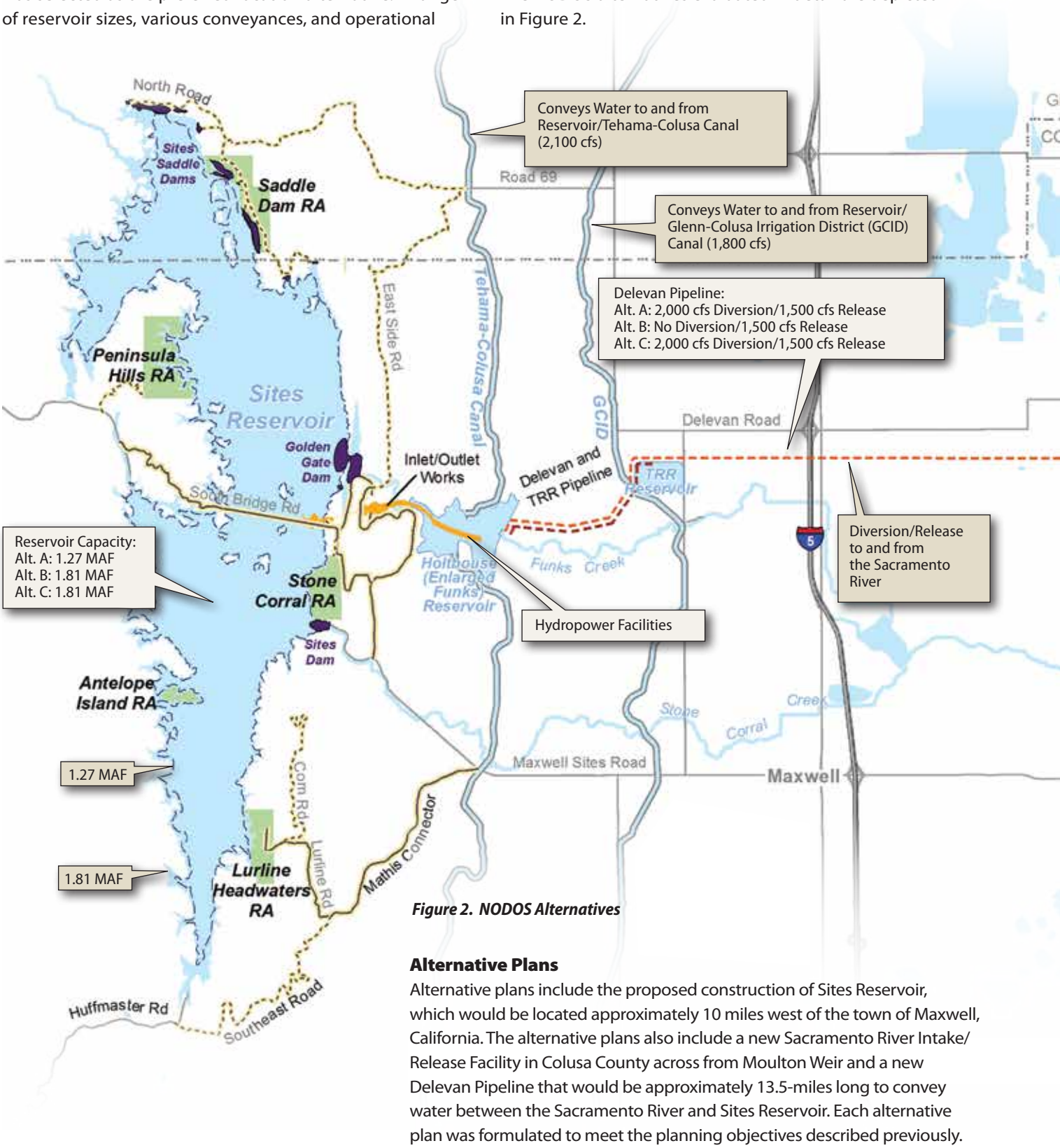
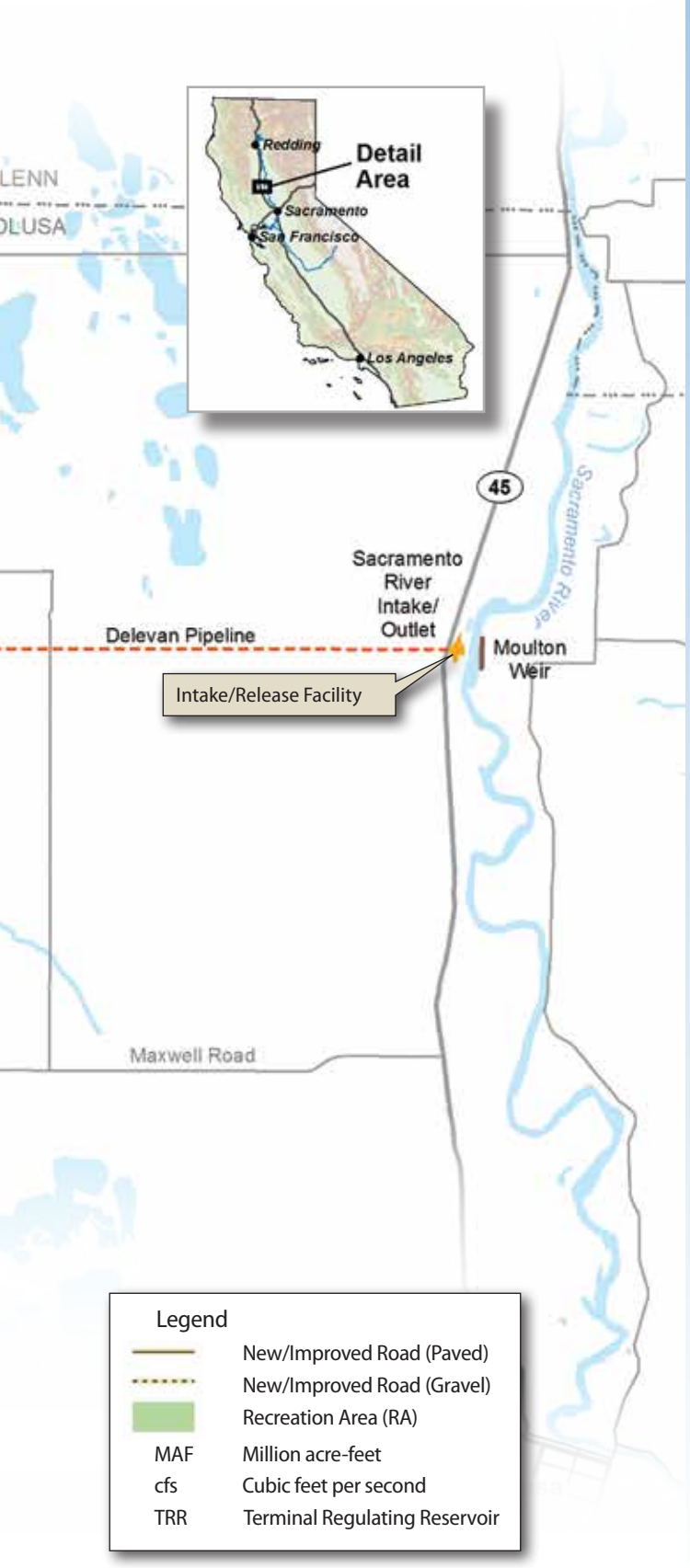


Figure 2. NODOS Alternatives

Alternative Plans

Alternative plans include the proposed construction of Sites Reservoir, which would be located approximately 10 miles west of the town of Maxwell, California. The alternative plans also include a new Sacramento River Intake/ Release Facility in Colusa County across from Moulton Weir and a new Delevan Pipeline that would be approximately 13.5-miles long to convey water between the Sacramento River and Sites Reservoir. Each alternative plan was formulated to meet the planning objectives described previously.



ALTERNATIVE PLANS

No Project/No Action Alternative

No actions would be taken to provide storage north of the Delta to meet the planning objectives.

ALTERNATIVE A:

1.27 MAF Sites Reservoir with Delevan Pipeline

- 1.27 MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal
- New Delevan Pipeline (2,000-cfs diversion/1,500-cfs release)
- New hydropower facilities
- Ecosystem enhancement actions to support anadromous and endemic fish populations

ALTERNATIVE B:

1.81 MAF Sites Reservoir with Release-only Delevan Pipeline

- 1.81 MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal
- New release–only Delevan Pipeline (1,500-cfs release)
- New hydropower facilities
- Ecosystem enhancement actions to support anadromous and endemic fish populations

ALTERNATIVE C:

1.81 MAF Sites Reservoir with Delevan Pipeline

- 1.81 MAF Sites Reservoir with conveyance to and from the reservoir provided by the existing Tehama-Colusa Canal and Glenn-Colusa Irrigation District Canal
- New Delevan Pipeline (2,000-cfs diversion/1,500-cfs release)
- New hydropower facilities
- Ecosystem enhancement actions to support anadromous and endemic fish populations

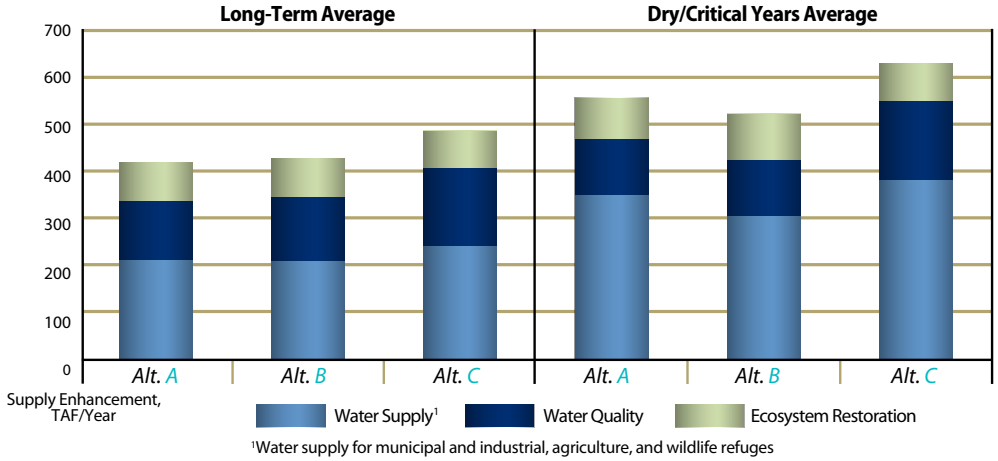
Alternatives Considered and Eliminated From Further Detailed Analysis

Initially, 52 alternative reservoir locations were considered before identifying Sites Reservoir as the preferred location for additional storage. The iterative plan formulation and screening process is documented in the NODOS Preliminary Administrative Draft Environmental Impact Report (2014) and the Progress Report (2013).

Benefits

NODOS benefits focus on reliability, restoration, and resilience for much of California. Benefits would occur from Trinity to San Diego counties (north to south) and Butte to Santa Clara counties (east to west), as well as in the Sacramento-San Joaquin Delta. Water supply benefits are described in three purpose categories: water supply reliability (labeled as water supply), water quality, and ecosystem restoration. Figure 3 shows the quantities of water supply (in thousands of acre-feet (TAF)) dedicated to these purposes for the three alternatives.

Figure 3. NODOS would increase water supply for multiple purposes



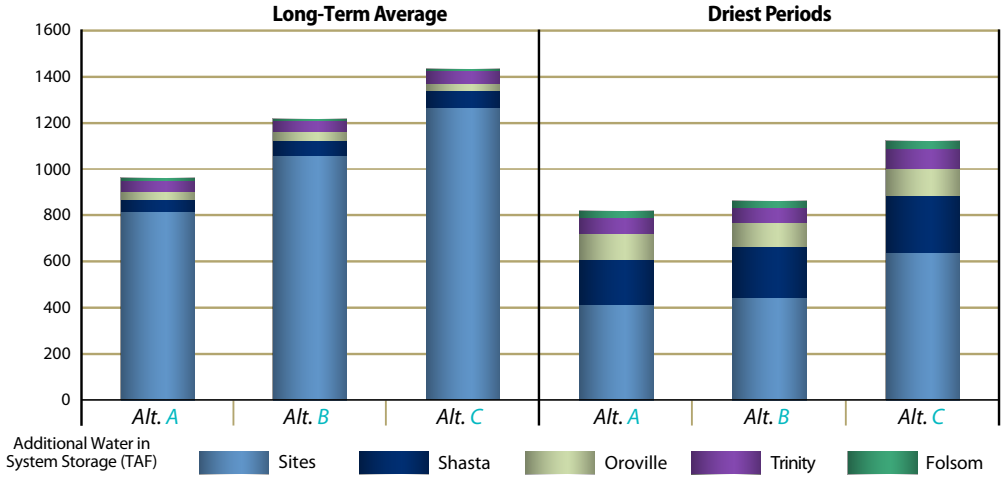
Reliability

Reliability would be improved for all three water supply purposes: water supply, water quality, and restoration. Water supply reliability would be improved for municipal and industrial, agriculture, and wildlife refuge users. Water quality would be improved by providing dedicated supplemental Delta outflow. Restoration water supply would be dedicated to support actions in the Delta and its tributaries.

Average annual water supplies would range from 400 to almost 500 TAF per year. The proposed reservoir's operations have been designed to emphasize supplies during drier conditions. Consequently, when the State is experiencing dry conditions (during Dry and Critical years), water supplies would increase to from 500 to over 600 TAF per year. In addition to these water benefits, flexible hydropower generation to support renewable energy sources such as wind and solar would be included.

NODOS also would support a more robust water system by improving storage conditions in reservoirs north-of-the-Delta (NOD). Figure 4 shows that NODOS would increase the average NOD storage by about 1.0 MAF/year to 1.4 MAF/year; during driest periods (droughts), storage would be improved by over 800 TAF (17% system storage improvement) to 1.1 MAF (23% system storage improvement). Having this additional water in the existing reservoirs would improve fishery conditions below those dams and the viability of the CVP and SWP systems.

Figure 4. NODOS would increase system flexibility through additional water in system storage

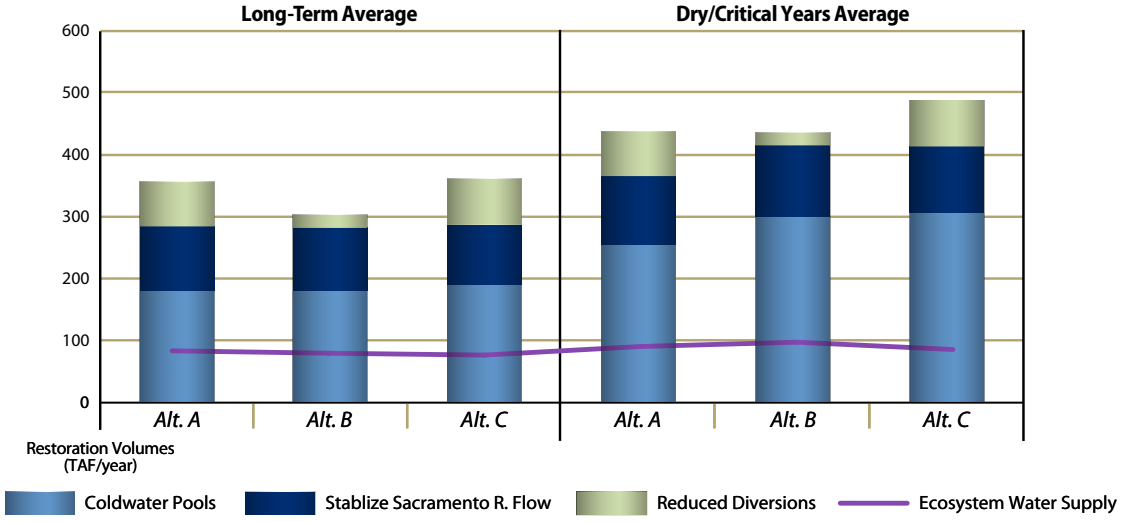


Restoration

Storage from NODOS would provide a source of additional water within the SWP and CVP systems that could be used to facilitate several ecosystem restoration actions to improve conditions in the Delta and Sacramento River watershed. Restoration would be accomplished by providing improved streamflow and lower water temperatures below existing reservoirs and in the Delta to support ecosystem needs. NODOS would improve ecosystem conditions by: increasing the reliability of coldwater pool storage at Shasta Lake (and by extension Trinity Lake), Lake Oroville, and Folsom Lake; providing supplemental releases from Shasta Lake to improve the temperature regime of the Upper Sacramento River; providing stable flow regimes in the Sacramento and American rivers to improve egg survival and fish habitat; increasing the flexibility of the SWP and CVP to meet salinity standards and improving salinity conditions in the Delta with dedicated releases to support estuarine fish species; and providing increased flows (Spring–Fall) in the lower Sacramento River by reducing diversions at Red Bluff and Hamilton City and by providing supplemental flows at the new Delevan Pipeline.

The volumes of water associated with most NODOS restoration actions are shown in Figure 5. Average coldwater pool augmentation at Shasta, Trinity, Oroville, and Folsom would range from 180 TAF/year to 190 TAF/year, while during drier conditions (i.e. Dry and Critical years), coldwater pools would be improved by 250 TAF/year to 300 TAF/year. Supplemental Sacramento River stability flows and reduced diversions are also shown, with average total volumes of water ranging from 300 TAF/year to 350 TAF/year and drier conditions volume ranging from 430 TAF/year to 480 TAF/year. Also shown in Figure 5 is the dedicated restoration water supply quantity from Figure 3, indicating NODOS project efficiencies in providing the ecosystem actions. Much of the restoration water volume would be used again for other purposes. Restoration volumes would be almost four to over five times the restoration water supply.

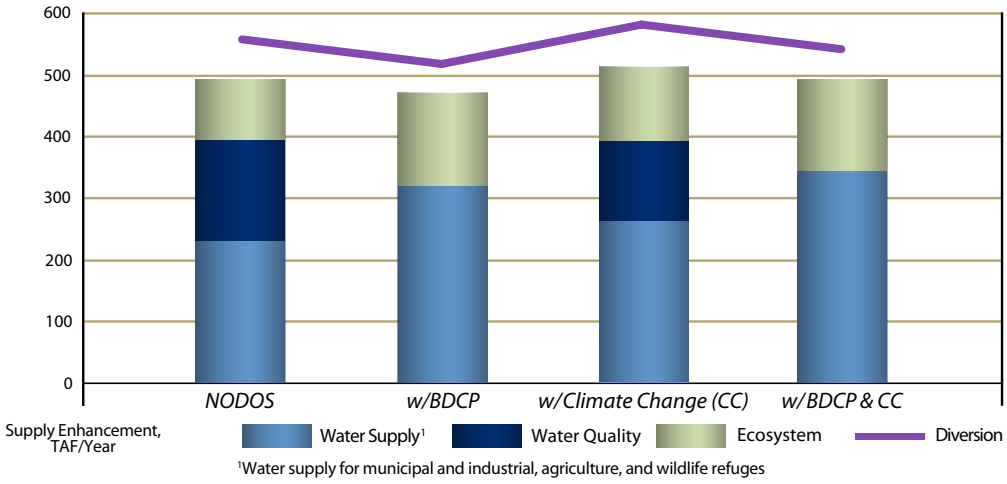
Figure 5. NODOS would provide Ecosystem Restoration Action Volumes



Resilience

The NODOS Investigation evaluated NODOS performance with potential alternative futures, including four climate change scenarios and three BDCP conveyance and operations scenarios. While the operations of NODOS were modified to accommodate alternative futures (particularly with BDCP), sensitivity studies indicate that NODOS performance would be resilient. Figure 6 shows a comparison of NODOS performance (Alternative C) with alternative futures. For example, water diversion to fill NODOS would be reduced by 7% with BDCP, increased by 4% with climate change and sea level rise, and decreased by 3% with both climate change and BDCP. NODOS water quality actions would not be needed with the BDCP scenarios because BDCP would provide significant water quality improvements with its north Delta diversion location. With BDCP, NODOS water would be shifted for uses supporting restoration and increasing water supply reliability. Both water supply reliability and restoration benefits would be increased with each alternative future as compared to the No Action future. Total benefits would be decreased by 4% with BDCP, increased by 4% with climate change, and unchanged with both.

Figure 6. NODOS would be resilient with alternative futures



Benefits and Costs

A comparison of the project benefits and costs indicates economic feasibility, as shown in Table 1. Total estimated project costs range from $3.6 billion to $4.1 billion, resulting in annual costs (including construction, interest during construction, and operations and maintenance) of $178 million to $204 million. The value of annual benefits would range from $249 million to $276 million, resulting in benefit-cost ratios (i.e. Total Benefits/ Total Costs) of 1.32, 1.43, and 1.35 for alternatives A, B, and C respectively. Net Benefits would range from $61 million to $77 million per year.

A NODOS Value Planning Study has identified up to $600 million in total project savings. Proposals for cost savings include use of roller-compacted concrete for the main dams, moving or modifying various reservoir-related structures, and refining pipeline conveyance designs. These cost saving proposals will be considered and incorporated in the NODOS Feasibility Report.

Table 1. Preliminary estimated NODOS benefits and costs ($Million, 2013 dollars)

	Alternative A	Alternative B	Alternative C
Total Project Cost	3,823	3,623	4,140
Annual Cost (C)	189	178	204
Annual Benefits (B)	249	255	276
Annual Net Benefits (B–C)	61	77	72
Benefit-Cost Ratio (B/C)	1.32	1.43	1.35

Next Steps

The impacts of NODOS implementation are evaluated and potential mitigation measures are described in The Preliminary Administrative Draft EIR. DWR is not soliciting and will not respond to comments submitted on this PADEIR, although any comments received will be retained and may be considered during preparation of a future public draft EIR. DWR will work with the Legislature, Reclamation, and the Sites Project JPA to help facilitate a funding partnership in support of a financeable multi-benefit offstream storage project.

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