CALIFORNIA CENTRAL VALLEY
FLOOD CONTROL
ASSOCIATION

October 30, 2015

Delivered Via E-mail: BDCPComments@icfi.com
BDCP/CA WaterFix Comments
P.O. 1919
Sacramento, CA 95812

Subject: **CCVFCA Comments on the Partially Recirculated Bay-Delta Conservation Plan EIR/EIS with New CA WaterFix Sub-Alternatives**

Dear ICFI Consultants:
On behalf of more than 75 members, the California Central Valley Flood Control Association ("CCVFCA"/"Association") submits these comments on the Draft Bay Delta Conservation Plan ("BDCP") with new CA WaterFix sub-alternatives and the accompanying Recirculated Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement ("RDEIR/SDEIS").

This consolidated set of comments is intended to provide a more comprehensive, representative flood management perspective, rather than comments of individual member agencies. However, these comments are also being submitted on behalf of the following reclamation districts that are members of the Association:

- Reclamation District 501
- Reclamation District 551
- Reclamation District 563
- Reclamation District 900
- Reclamation District 999
- Reclamation District 2060
- Reclamation District 2068

The following resource documents are hereby submitted as supplemental information utilized in preparation of these comments:

Exhibit A:
Dan Steiner and MBK Engineers, *Review of Bay Delta Conservation Program Modeling* (June 20, 2014);

Exhibit B:
MBK Engineers, *Technical Comments on Bay-Delta Conservation Plan Modeling* (July 29, 2014)

Exhibit C: MBK Engineers, *Technical Comments on Bay Delta Conservation Plan/CA WaterFix* (October 28, 2015)

Exhibit D: Delta Independent Science Board, *Review by the Delta Independent Science Board of the Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement* (September 30, 2015)

All of the comments and recommendations contained herein are proposed as alternatives and/or mitigation measures to reduce significant environmental impacts and should therefore be treated as such for purposes of responding to these comments pursuant to NEPA (40 CFR § 1503.4) and CEQA (14 CCR § 15088). Accordingly, the Association expects responses to all comments and recommendations contained herein.

I. INCORPORATION OF PREVIOUS COMMENTS BY REFERENCE

All of the extensive legal and technical comments on the 2014 Draft Bay Delta Conservation Plan (BDCP) and Environmental Impact Report/Environmental Impact Statement (EIR/EIS) contained in letters submitted by the following, as well as the October 29, 2015 letter by Reclamation District 551 are incorporated by reference herein.

1. Contra Costa Water District, July 25, 2014
2. North State Water Alliance, July 28, 2014
3. North Delta Water Agency, July 29, 2014
4. Local Agencies of the North Delta, July 29, 2014

CCVFCA anticipates that Contra Costa Water District, North State Water Alliance, North Delta Water Agency, and the Local Agencies of the North Delta will submit additional comments on the CA WaterFix RDEIR/SDEIS, and all of those comments are likewise incorporated herein by reference.

II. SUMMARY OF CCVFCA COMMENTS ON BDCP/WATERFIX

Key issues of concern CCVFCA has with BDCP/CA WaterFix project alternatives and associated EIR/EIS are:

1) ***Indecipherable*** - Document organization and relationships between BDCP analysis and CA WaterFix alternatives is confusing at best, and sometimes incomprehensible.

2) ***Conceptual*** – The project design/description is preliminary and subject to change, so the impact analysis conclusions are mostly conjecture based on limited facts or actual assessment.

3) ***Incomplete*** – Project operations rely on levee corridor through the Delta for conveyance to south Delta pumps, but comprehensive levee and flood protection analysis is deferred, and cost-sharing of levee maintenance is absent.

4) ***Pre-Determined*** – Submission of 404 permit to USACE and change of diversion petition to SWRCB appear to have already determined the outcome of the ongoing CEQA/NEPA environmental review process.

There is acknowledgment throughout the new CA WaterFix documents that the facilities construction under Alt. 4A would be identical to that of Alt. 4, with similar operations. (e.g., Water Supply chapter, page 4.3.1-1, lines 3-6, 2015 DREIR/DSEIS). Because the construction, operation, and impacts of the new CA WaterFix preferred alternative (Alt. 4A) is substantially similar to the prior preferred alternative (Alt. 4), most of the significant adverse impacts identified in the 2014 BDCP Alt. 4 still apply to CA WaterFix Alt. 4A.

In CCVFCA's view, the CA WaterFix project description and environmental analysis is a jumbled mess, resulting in a complex labyrinth that is hard to navigate, and even harder to decipher. The degree of difficulty is heightened by the fact that the new alternatives rely on modeling done for BDCP and continually refer back to BDCP alternatives for project description and environmental impact analysis.

For example, throughout the CA WaterFix chapters, the impact analysis and conclusions for Alt. 4A refer to BDCP Alt. 4, which then often refer readers to BDCP Alt. 1A for a description of how CEQA/NEPA conclusions and mitigation measures were determined.

Simply put, the Association finds that the description of CA Waterfix construction and operation is often internally inconsistent, preventing a full and meaningful disclosure of the scope, purpose, intensity, duration, and true effects in the RDEIR/SDEIS. This is not unexpected since the design is still at a very preliminary conceptual level according to the July 1, 2015 Conceptual Engineering Report by the Delta Habitat Conservation & Conveyance Program (DHCCP).

Finally, the Association joins in the Delta Independent Science Board's (ISB) recent assessment of CA WaterFix that the interdependence of water conveyance, levee maintenance, and habitat restoration in the Delta warrant an environmental impact assessment that is more complete, comprehensive, and comprehensible than the current RDEIR/SDEIS." Their following observations additionally capture additional inherent deficiencies:

- "The Current Draft contains a wealth of information but lacks completeness and clarity in applying science to far-reaching policy decisions." (09-30-15 cover letter)
- "It defers essential material to the Final EIR/EIS and retains a number of deficiencies from the Bay Delta ConservatIon Plan Draft EIR/EIS." (09-30-15 cover letter)

- "The missing content is needed for evaluation of the science that underpins the proposed project. Accordingly, the Current Draft fails to adequately inform weighty decisions about public policy." (Pg 4)
- "Far-reaching decisions should not hinge on environmental documents that few can grasp." (Pg 9)

III. ASSOCIATION HISTORY AND INTEREST IN BDCP

A. Association History

In existence since 1926, the Association was established to promote the common interests of its membership in maintaining effective flood control systems in California's Central Valley for the protection of life, property, and the environment. Association members include reclamation and levee districts, plus cities and counties with flood management responsibilities along the Sacramento and San Joaquin Federal Project and non-Project levee systems within the Sacramento-San Joaquin Delta.

B. Protection of Flood Management System

The Association's specific interest is assuring that the construction, mitigation, and operation activities proposed in BDCP/WaterFix alternatives will not in any way impede, diminish, or impair the flood flow capacity or functionality of the State and Delta's levee systems. These flood facilities are integrated and dependent on each other to operate as a system to protect people and property year-round, but particularly during flood events, and their public safety function must not be compromised.

IV. CENTRAL VALLEY FLOOD PROTECTION BACKGROUND

A. History of Reclamation in the California Central Valley

In 1850 Congress approved the Arkansas Act granting several states title to all of the Swamp and Overflowed Lands, including approximately 2 million acres in California. [1] The State considered the reclamation of these swampy lands essential because of their extraordinary fertility when drained (reclaimed) and also because they posed a significant public health risk due to outbreaks of malaria from the mosquito breeding. The State and Federal government therefore proceeded to actively encourage the reclamation of these lands for purposes of productive farming.

Historically, more than 40 percent of Northern California's runoff flowed to the Delta via the Sacramento, Feather, San Joaquin, and Mokelumne Rivers, with peak winter flows resulting in substantial flooding in the valley floor about every ten years. In its natural condition, about one-quarter of the Central Valley extending along more than 14 counties was subject to annual or

[1] Arkansas Swamp Lands Act, Act of September 28, 1850, codified at California Public Resources Code Section 7552, 7552.5.

periodic overflow, so the first flood-control projects were the low levees the farmers built to protect their lands from inundation.

Flood damage in the Sacramento Valley and Delta occurs almost entirely from rain floods, principally on Sacramento, Feather, Bear, Yuba, and American Rivers as well as Stony, Cache, and Putah Creeks, with smaller creeks also causing localized flooding. The Delta also experiences damaging floods along the San Joaquin River and its tributaries including the following stream groups: Mokelumne River, Calaveras River, Littlejohn Creek, Merced County, Madera County, and Fresno County. Currently, most snow-melt run-off is stored or diverted for beneficial uses or passes harmlessly to the ocean, but prolonged high-water stages can cause seepage through levees if they are not vigilantly maintained and improved to withstand the occasional flood event with excessive run-off draining through the Central Valley and Delta.

B. SRFCP Purpose and History

The Sacramento Valley and Delta now receives a substantially higher level of flood protection. Authorized by Congress in 1917, the Sacramento River Flood Control Project (SRFCP) and San Joaquin River Flood Control Project (SJRFCP) is a system of "Project levees" and flood bypasses designed and built by the U.S. Army Corps of Engineers (USACE/Corps) for three purposes:

1) Flood control;
2) Reclamation of marshy lands for farming and other productive uses;
3) Improvement of navigation.

By 1949, over 90 percent of the SRFCP and SJRFCP project works had been completed and in operation. Today, there are more than 1,600 miles of State-federal Project levees in the Central Valley, 385 miles of which are located in the Delta.

More than 700 miles of additional Delta levees are classified as "non-project." The key component of the SRFCP system, the Yolo Bypass, carries 80 percent of the water at the latitude of Sacramento during extreme floods. All of these Project and non-Project levees and flood bypasses serve to protect $70 billion in infrastructure in the Central Valley, including the State's water conveyance infrastructure.

This comprehensive system of SPFC flood control facilities is the largest flood management system in California. Collectively, the facilities, lands, programs, conditions, and mode of O&M for the State-federal flood protection system in the Central Valley are referred to as the State Plan of Flood Control (SPFC).[2]

[2] Public Resources Code (PRC) Section 5096.805 (j). A complete description of these assets and resources has been compiled by DWR into the *State Plan of Flood Control Descriptive Document,* available at http://www.water.ca.gov/cvfmp/docs/DRAFT_SPFC_Descriptive_Doc_20100115.pdf

V. RISKS TO FLOOD CONTROL PURPOSE, FUNCTION, EFFECTIVENESS

In 1953, the SPFC works were transferred to California with a memorandum of understanding (MOU) confirming the State's obligation to operate and maintain all completed works/facilities and to hold the federal government harmless.[3] In addition, the State has signed assurance agreements with the U.S. Army Corps of Engineers to maintain the San Joaquin River Flood Control Project in accordance with the 1955 MOU.

Jurisdiction and authority throughout the drainage basin and for the 1.7 million acres within the state's Sacramento and San Joaquin Drainage District (SSJDD) is the responsibility of the Central Valley Flood Protection Board (CVFPB/Board).[4] Created by State legislation in 1913, the SSJDD holds the property rights on about 18,000 parcels of SPFC lands, some going back to 1900.[5] Annual inspections of the SPFC levee system are conducted twice annually by DWR.[6]

This comprehensive interconnected system of levees is absolutely critical to public health and safety, including the protection of the region's transportation, agriculture, business, homes, and even water conveyance.[7] Levees in the Delta (Plan Area) provide this protection at all times, during two daily high tides and seasonal high-flow events.

Under California law, no modification to the SPFC system (encroachment or project) may be constructed on or near the Sacramento and San Joaquin Rivers or their tributaries until plans have been reviewed and the projects have been approved or a permit issued by the CVFPB.[8] The Board authorizes use of the SPFC facilities by issuing encroachment permits only *if the project is compatible with the flood system and will not hamper the State's O&M responsibilities.*

The, BDCP/WaterFix alternatives and RDEIR/SDEIS must embrace – as a fundamental permit condition – the requirement that the existing level of flood protection be maintained to protect people, property, infrastructure, habitat, and conveyance. As most public agencies within the Delta are constantly upgrading their level of flood protection, it is also essential that BDCP does not create a new barrier to future ability to increase local level of flood protection.

---

[3] 1953 Memorandum of Understanding (USACE and The Reclamation Board, 1953) and Supplements. Available at ftp://ftp.water.ca.gov/mailout/CVFPB%20Outgoing/Orientation%20Materials/Item%203C%20-%20LM%20Assurance%20Agreements/Example%201%20-%20srfcp_mou_1953%20--%20jsp%20copy.pdf.

[4] Authority rests in the Flood Protection Board pursuant to assurance agreements with the USACE and the USACE Operation and Maintenance Manuals under Code of Federal Regulations, Title 33, Section 208.10 and United States Code, Title 33, Section 408

[5] Central Valley Flood Protection Board webpage, "Sacramento-San Joaquin Drainage District Jurisdiction Maps." Available at http://www.cvfpb.ca.gov/cvfpb/ssjdd_maps/

[6] 2013 Inspection and Local Maintaining Agency Report of the Central Valley State-Federal Flood Projection System (providing that "DWR, under the authority of Water Code § 8360, § 8370, and § 8371, performs a verification inspection of the maintenance of the SRFCP levees performed by the local responsible agencies, and reports to the USACE periodically regarding the status of levee maintenance accomplished under the provisions of Title 33, Code of Federal Regulations (CFR), Section 208.10. While there are no specific water code provisions directing DWR to inspect and report on Maintenance of the San Joaquin River Flood Control System, DWR has performed inspections and provided reports for many years as a matter of practice that is consistent with Title 33, CFR.") Available at http://cdec.water.ca.gov/current_reports.html.

[7] DWR *A Framework for Department of Water Resources Integrated Flood Management Investments in the Delta and Suisun Marsh* (September 24, 2013)

[8] Central Valley Flood Protection Board , A Century of Progress: Central Valley Flood Protection Board 1911-2011 (2011). Available at http://www.cvfpb.ca.gov/Publications/DWR100Years_05.pdf

All three of the new diversion intakes and the five barges in BDCP/WaterFix alternatives are encroachments on SPFC facilities, requiring permit approvals from the USACE, CVFPB, and local reclamation districts.

A. Fails To Analyze Increased Flood Risks From Substantial Alteration the Location, Configuration, and Purpose of SPFC

Following are specific examples of CM1 construction actions (not including mitigation measures) that may impact (adversely or beneficially) existing flood protection facilities and system design flow capacities:

- Construct 3 intakes on Sacramento River eastside levee within 4 mile stretch (possibly moving these levees too?);
- Erect at least eight in-water cofferdams in Sacramento River and several Delta channels (three intakes and five barge loading facilities);
- Construct cutoff walls down middle of levees to prevent seepage;
- Increase sediment loading and removal at intake locations;
- At each of the three intakes, install 12 large gravity collector box conduits through the levee prism to convey flow to the sedimentation system on the landside (total of 36 levee penetrations);
- Construct 5 barge landings on levees;
- Permanent barrier at the head of Old River;
- Modify approximately six miles of levees, on either a temporary or permanent basis;
- Blocking, re-aligning, re-routing, and removal of state highways, county and private roads with levees underneath pavement;
- Removal and local storage/disposal of approximately 30.7 million cubic yards of tunnel muck;
- Removal and local storage/disposal of approximately 8 million cubic yards of dredged material; and
- Installation of power lines over existing levees.

Following are impacts related to BDCP/WaterFix activities that specifically require more analysis, disclosure, and mitigation than what is provided in the current Draft:

- Damage to levee integrity and stability from tunnel muck haulage and other construction activities (that go way beyond the design and intended use of these rural facilities), seepage and erosion scour, intensive pile driving, and increased subsidence and sink holes from CM1 dewatering;
- Deflection and obstruction of flood flows in selected Delta channels due to cofferdam construction for three intakes and five barges, levee reconfigurations, sediment loading, and other construction activities that may redirect flows and alter flood risks throughout the ten-year construction timeframe;
- Impairment of ditches, pumps and other interior drainage facilities vital to the maintenance of low-lying Delta lands through the discharge from CM1 dewatering activities, disconnecting interconnected drainage systems, and seepage waters exceeding existing local capacity;

- Obstruction of levee maintenance, flood fighting and emergency response activities through the clogging of Delta levee roadways and channels with construction traffic and equipment, and through the monopolization of barges and repair materials;
- Interference with long-standing levee maintenance and repair programs in the Delta through usurpation of habitat mitigation opportunities on which these programs depend;
- Cumulative effects on the flood control system, particularly SPFC facilities and operations.
- Regulatory constraints on implementing mitigation (e.g., USACE's no vegetation on project levees policy, obtaining anticipated dredging permits);
- Impacts reducing the current level of flood protection achieved with recent Prop. 13, 1E, and 84 investments;
- FEMA building requirements and NFIP flood insurance eligibility;
- Evacuation plans for communities (residents, businesses, schools, tourists, etc) in the Plan Area.
- Financial impacts to RDs in the Plan Area (e.g., reduced assessment revenues during the 10-year construction, increased maintenance costs to deal with seepage/erosion damage, increased drainage pumping costs);
- Increase in FEMA flood insurance rates and building restrictions, or PL 84-99 eligibility problems as a result of BDCP/WaterFix project construction.

The Association requests that the BDCP/WaterFix project alternatives and RDEIR/SDEIS be revised to address the multiple levee integrity and general flood control challenges above and be recirculated again for public review and comment.[9] In addition, prior to final certification of the EIR/EIS, DWR should execute a binding agreement with the Central Valley Flood Protection Board (CVFPB) and local RDs to:

1) Establish general principles and guidelines for any proposed alterations of flood control facilities in the Plan Area, particularly those affecting the State Plan of Flood Control's (SPFC) location, configuration, purpose, and functionality;
2) Design and operate BDCP/WaterFix conveyance construction and operation to be consistent and complementary to the modifications of the SPFC and other flood protection facilities currently being planned in the Central Valley Flood Protection Plan (CVFPP) process, including Regional Plans;
3) Avoid impacts that reduce the level of flood protection recently achieved from the construction of flood protection projects in the Plan Area that were financed with local, State and Federal funding (i.e., Prop. 1E and 84, WRRDA appropriations) as well as projects planned for implementation in the near future pursuant to the CVFPP or U.S. Army Corps of Engineers' ongoing feasibility studies in the Plan Area.

---

[9] PRC Section 21092.1 and Guidelines Section 15088.5 require an EIR to be re-circulated whenever significant new information has been added to the EIR after the draft has been available for review, but prior to certification of the final EIR. The addition of these omissions and providing the required analysis, disclosure, and mitigation would constitute significant new information.

B. Cofferdams and In-Water Intakes Create Additional Construction Impacts

According to the BDCP/WaterFix documents, several encroachments into the Sacramento River and tributary Delta channels associated with the 10-year construction of CM1 will occur, including eight separate cofferdams in the Sacramento River and tributaries.

The three new intakes alone will occupy a total of 7.5 acres of the Sacramento River between river miles 37 and 41, leaving only about 380-580 feet open for flood flows in this four-mile stretch during the 4-6 year construction period. Yet, the EIR/EIS for BDCP/WaterFix alternatives assumes there will be no reduction in flood capacity because both of the permitting agencies will require the project to be flood-neutral and will therefore require mitigations such as setting back the levees on the other side of the river.

The setback of levees as CA WaterFix construction mitigation or USACE 408 permit requirement is no small undertaking. Setting back the Project levee on the Westside of the Sacramento River as mitigation for CM1 temporary cofferdams and permanent intakes could also include seepage berms, relief wells, and cutoff (slurry) walls. In some cases, setback levees can themselves alter the flood flows, creating additional impacts that must be mitigated by project proponents.[10]

Glossing over the setback of the Westside levee represents a significant omission of environmental impacts, because such an action would require the condemnation of significant number of acres, houses and businesses. Permanent crops and county roads will also be affected, causing even greater disruptions to agriculture and transportation than those disclosed in the RDEIR/SDEIS.

One option to reduce adverse impacts to levees is to phase construction, building only one intake and/or one tunnel at a time instead of concurrently.

C. Disrupts Levee Inspections, Maintenance, And Improvements For A Decade

Local Reclamation Districts (RDs) are responsible for daily inspection of levee conditions for issues such as cracks, slippage, encroachments, seepage, burrowing animals, etc., as well as for performing routine maintenance activities on and around the levees in order to meet USACE and FEMA levee standards. DWR conducts levee inspections twice a year and the USACE conducts more extensive Periodic Inspections every 5 years of the SPFC project levees.

Over the 10-year Project construction period, local RDs, DWR, and USACE will be unable to conduct levee inspections, conduct levee maintenance or construct repairs or improvements due to competition or blockage by BDCP/WaterFix construction activities and equipment staging. In addition, during an emergency, RDs and other responders may not be able to provide floodfighting if they are denied access to an area or are unable to stage equipment.

[10] *See, e.g.*, DWR, Sutter Bypass RMA2 Model Report (Construction of setback levees not recommended because"Model results indicate that although peak water levels in the Feather River are reduced significantly by the setback levee, water levels in the Sutter Bypass increased as a result of the revised levee configuration.")

Disruptions to the routine levee inspection and maintenance, as well as RD drainage and floodfighitng responsibilities will mostly be hindered due to the multi-year construction of two forebays and the 60.2 miles of main tunnels and 13.7 miles of northern tunnels connecting to the three new intakes, which will prevent access to large areas of an extensive construction zone.

In some cases, DWR may need to assume all levee maintenance and floodfighting responsibilities for several reaches of levees, particularly if there are not enough remaining landowners to sustain funding of levee maintenance and island drainage after lands are condemned for CM1 construction.

DWR should consider phasing construction and immediately engage local RDs, the CVFPB, DWR's levee inspection branch, and USACE to negotiate a memorandum of agreement (MOA) between these entities as to how levee inspections and annual levee maintenance will be performed during the 10-year construction of CM1 amid the planned staging of construction equipment, construction traffic, and/or road re-routing.

D. Dewatering Discharges and Drainage Disconnections Increase Inundation

As stated in the EIR/EIS *Groundwater Chapter*, the existing drainage facilities in the Plan Area are "intricate networks" of canals, ditches, pipes, and pumps which means they have been carefully designed to function as a system and located to work with gravity and the natural land contours and drainage patterns that exist on the Delta islands. Therefore, any disconnection potentially renders the whole system inoperable.

Because EIR/EIS confirms that successful agriculture is dependent on the operation of this drainage system and clearly states the islands will become flooded without the drainage systems functioning properly, the seepage, runoff, and dewatering discharges during CM1 construction are significant and adverse impacts to the ongoing flood maintenance responsibilities or RDs and to agricultural productivity of lands.

We could not find data on existing conditions for seepage areas where construction is planned, despite this information being readily available, including in DWR Bulletin 125 seepage investigations on Delta islands. In addition, the July 1, 2015 Conceptual Engineering Report by DHCCP[11] acknowledges that geotechnical information for the proposed tunnel alignment is currently limited and the estimated flood levels to be used in the design for each conveyance option facility is still be developed.

BDCP/WaterFix alternatives, including Preferred Alternatives 4/4A, would involve extensive excavation, grading, stockpiling, soil compaction, and dewatering, resulting in temporary and long-term alteration and disruption of drainage patterns, paths, and facilities. These alternatives assume being able to discharge the dewatering volumes into local irrigation/drainage ditches, but there is NO EXTRA CAPACITY in these local facilities and therefore CANNOT be used by BDCP/WaterFix project.

---

[11] Delta Habitat Conservation & Conveyance Program (DHCCP), *Conceptual Engineering Report: Modified Pipeline/Tunnel Option – Clifton Court Forebay Pumping Plant*, Volume 1, (July 1, 2015)

Increased water volumes from 24/7 dewatering discharged into the rivers and waterways would increase surface water elevations locally, and erosion and scour on adjacent levees may create adverse impact depending on the velocities and volumes of water being discharged. The impacts associated with the water quality from dewatering discharges and to tunnel muck storage/disposal should also be acknowledged and mitigated in either the *Water Supply* or *Agricultural Resources* Chapters of the EIR/EIS. Mitigation should specify that before more stress/increases in peak flows can be added to Delta rivers or tributaries, the project proponent (DWR/USBR) will need to pay for actions to improve the current flood capacity in some channels and drainage ditches prior to CM1 construction.

CCVFCA recommends the EIR/EIS:

- Examine existing conditions in terms of interconnected drainage systems and whether CM1 construction will disconnect or disrupt the existing drainage facilities' ability to function/drain effectively;
- Identify specific discharge locations, how many locations, the capacity of the discharge location or what its capacity availability is based on local usage/needs (winter drainage or summer irrigation)
- Quantify the daily discharge rates and volumes from CM1 dewatering;
- Identify how long dewatering and subsequent discharges will occur at each location;
- Identify and analyze the additional drainage maintenance works and costs BDCP will need to assume in order to keep the drainage facilities functioning and able to accommodate the increased dewatering discharges.

E. Construction Dewatering Increases Delta Land Subsidence

Primarily limited to interior portions of the Central Delta, land subsidence has slowed in recent years in the Delta, which has allowed landowners and reclamation districts to keep pace with it and manage it over time. However, according to the EIR/EIS Chapters on *Geology* and *Soils* CM1 construction could potentially increase Delta subsidence and sinkholes as a result of the widespread and intensive 2/47 dewatering that will occur during the 10-year construction period.

With dewatering pumps placed every 50 to 75 feet around the entire perimeter of all the CM1 facilities under construction, each pumping between 240 to 10,500 gallons per minute, the EIR/EIS estimates the groundwater will be lowered 10-20 feet for a 2,600-foot radius from each pump. However, because CA WaterFix is still at a preliminary conceptual design level, we could find no studies or references to any evidence to support how the lowered groundwater depth or the radius of influence were determined, so they appear to be nothing more than professional guesstimates without any factual surveys or technical analysis to verify these claims.

This amount of intensive, long-term dewatering has the potential to destabilize the soils, resulting in sink holes and subsidence in a large area in the North Delta where the intakes and forebay with connecting pipelines will be built as well as the length of the 34-mile-long twin tunnels. Damage to the existing interconnected drainage and irrigation systems due to sinking land will increase localized flooding of crops, fruit packing sheds, and homes if drainage systems cannot perform as designed and built. These individual and cumulative impacts need to be analyzed, disclosed, and mitigated.

The chapter should also include a map depicting the levees and drainage facilities (ditches/pipes/canals/pumping stations) that are expected to experience subsidence or liquefaction due to dewatering activities.

F. Extensive and Concurrent Pile Driving Could Destabilize Levees

Concerns over levee stability and their performance during a seismic event are some of the primary reasons Project Proponents state for building the new facilities in CM1. Intensive and sustained ground-shaking from hundreds of construction trucks on levee roads 24/7 and 700 pile-driver strikes driving in more than 1,000 total piles for construction of the three new North Delta intakes[12] will adversely affect the stability of the nearby levees.

The sustained intensive localized vibration for such a long duration as contemplated in the CM1 construction description could cause stress fractures and possibly levee failures, but is not acknowledged as an adverse impact or mitigated.

We could find no technical analyses, data, or scientific research evaluating how the excessive pile driving described in CM1 will affect the integrity and stability of nearby levees; most of which are SPFC Project levees. Failure to conduct a rigorous analysis in accordance with NEPA § 1502.13(a) of the potential risk of levee failure and effects on the overall performance of the SPFC in a high water flood event is a glaring and serious omission that needs to be corrected in the EIR/EIS and again recirculated for public review and comment.

The cumulative effects of pile driving and dewatering on reducing levee stability and increasing land subsidence/sink holes in the CM1 construction area should be acknowledged and mitigated pursuant to CEQA/NEPA. A map should be included in the EIR/EIS *Surface Water Chapter* depicting the locations of all pile driving for CM1 facilities (including but not limited to intakes, forebays, pipelines, tunnels, shafts, sedimentation basins, barge loading facilities, etc.) and the radius of influence for any related subsidence.

To reduce the impacts to levees, the Association recommends the addition of a mitigation measure requiring the construction of new diversion intakes and tunnels be phased, installing one at a time, instead of building concurrently as proposed in BDCP/WaterFix alternatives.

G. Heavy Construction Vehicles and Increased Traffic Volumes Significantly Erode Integrity of Local Levees and SPFC

The lack of knowledge of existing conditions in the Plan Area is particularly evident in the *Transportation Chapter*. The chapter fails to acknowledge that most of the roads and highways in the Delta are in fact pavement on top of a levee (both project and non-project levees). Consequently, the transportation study only analyzed two things: road surface conditions and traffic patterns/volume (level of service) and therefore failed to analyze, disclose impacts, or

[12] Representing a total of 700,000 total pile drive strikes just for the 3 intakes

provide mitigation for the daily wear and tear on levees that the thousands of construction trucks on Delta roads 24/7 for ten long years will cause.

The amount of construction truck activity over 10 years exceeds the weight and traffic volume that current levees upon which much of the construction trucks will travel over are designed and will degrade them to a point of reducing their stability which could result in a levee failure during CM1 construction.

As noted by the Central Valley Flood Protection Board's and Delta Stewardship Council's 2014 comments on the BDCP, this simple, qualitative traffic analysis provided by the BDCP EIR/EIS will not adequately assess the potential for damage to levees that are underneath the roads. The Board correctly explains the potential for impacts to the levees themselves, including the possibility of "deformation and crest depression due to non-uniform settlement and damage to levee slopes due to use of levee hinge points for vehicle turn-outs."

The local Reclamation District (RD) is responsible for the regular inspection of levee conditions (cracks, slippage, encroachments, seepage, burrowing animals, etc.) and for performing routine maintenance activities on and around the levees in order to meet USACE and FEMA levee standards. Their efforts will be hindered by any blockage or access issues caused by construction activities and extensive truck traffic. Indeed, the construction activities and extensive truck traffic may lead to a need for more frequent inspections, the cost and manpower requirements of which have not been disclosed, analyzed, or mitigated in the EIS/EIR.

From a public safety standpoint, it is critical for DHCCP consultants to immediately consult with local RDs, the CVFPB, DWR's levee inspection branch, and the USACE to discuss drafting a specific mitigation measure to deal with the effects that staging of construction equipment, construction traffic, and/or road re-routing will have on levee inspections and routine levee maintenance to be performed during the 10-year construction period.

All of the levees to be used during CM1 construction will need to be stabilized and fortified every spring during all 10 construction years and will need to meet the same level of public safety condition the levee was in prior to implementation of construction <u>at no cost to the local levee maintaining agency, landowners, or county governments</u> once CM1 is completed. CVFPB's regulations, Title 23, contain general guidelines on levee maintenance and restoration to a certain condition that must be followed; however in order for RDs to provide the lead agency with more specific mitigation measures they will need more specific construction and project details such as (but not limited to):

1) The number of construction vehicles/equipment expected to drive on roadways in the Plan Area;
2) The approximate weight of vehicles expected to frequently drive on roadways in the Plan Area;
3) The approximate start and end date for heavy construction traffic usage;
4) Whether construction traffic will be 24/7 or be limited to certain days and hours on all roadways identified for use in the Plan Area;
5) Provide results from studies and analyses conducted that have tested the weight and multiple load tolerance levels of existing levees underneath roadways to be heavily used in CM1 construction.

Technical studies should immediately be conducted and a new CEQA/NEPA Impact added to the *Transportation Chapter* disclosing the level of impacts CM1 construction traffic will create on levees underneath roads proposed for use in the Plan Area. A map should also be added to the chapter depicting which SPFC Project and non-project levees that will be impacted by increased traffic volumes.

H. Sediment Loading Reduces Flood Flow Capacity

CM1 conveyance construction is expected to increase sediment loading and place fill (dirt) in waterways in the Plan Area, which is also described in the 404 permit submitted to the USACE for the CA WaterFix project. Increased sediment amounts in most described areas would result in reduced flood capacity and higher risks of overtopping.

Based on our experience, the amount of in-water dredging the BDCP/WaterFix alternatives expect to conduct in order to prevent overloading of sediment is unrealistic and infeasible from a regulatory permitting standpoint. Therefore, the reduction in sediment impacts that the EIR/EIS claims is overly optimistic and more severe impacts to flood flow capacity are likely to occur as a result of the multiple CM1 construction activities (eight temporary cofferdams, three permanent in-water intakes, five multi-year barges, 24/7 dewatering for 10 years).

Project proponents should conduct an analysis of the multiple activities increasing sediment in areas of the Plan Area with specific emphasis on the cumulative impacts to flood control facilities, O&M costs and activities.

I. Emergency Response And Flood Recovery Conflicts

Risk from levee failures can be reduced, but not eliminated, so being prepared for a flood emergency is the best defense. This requires having an effective strategy for preventing failures with ongoing levee improvements and maintenance, protocols for responding with emergency flood fighting activities, and a plan for levee repair and local recovery after the flood event.

Based on the flood history in the Delta, the BDCP/WaterFix project is guaranteed to experience at least one major flood event during the 10-year construction period. In addition to modification of the SPFC levee system, BDCP/WaterFix preferred alternatives propose extensive alteration of the existing Delta road configuration, including re-routing and blocking local roads and highway segments. EIR/EIS fails to analyze these impediments to a safe and timely evacuation during a flood or other emergency.

The inability to quickly floodfight and repair a damaged levee will result in loss of life and property in the area protected by that levee, and could have the domino effect of causing neighboring levee failures if CM1 construction activities/equipment prevent access to the levee break or key floodfighting personnel and supplies.
DWR should identify through MOUs with local emergency response agencies a clear chain of command regarding who pays for what, coordination of response and funding, and cooperative effort to pursue federal reimbursements for recovery; and to mutually develop a flood emergency

response plan that addresses floodfighting, worksite and community evacuation, and levee repairs.

VI. CEQA/NEPA DEFICIENCIES

A. Inadequate Project Description

A proper environmental analysis of a project of this size and scope requires an accurate, stable, and finite description of all major project components and the existing baseline conditions. Otherwise, the public cannot determine the true nature and extent of the actual impacts likely to be caused by the Project.
However, a recent DWR engineering report discloses that CA Waterfix design is still at a very preliminary conceptual level:

- alignment and alignment features are "preliminary and subject to change"
- alignment and alignment features will ultimately "need to be verified as part of additional investigations and detailed design."
- the facility locations, dimensions, and elevations (both topographic and facility) are "approximate" and "subject to change"
- geotechnical information for the proposed tunnel alignment is currently limited, so preliminary designs will be refined "once adequate geotechnical investigations have been performed."

A specific example of the preliminary stage that one of the project components, borrow/fill availability is described in the DWR engineering report: "At this point in project development, sufficient geotechnical information is not available to fully assess the suitability of borrow areas near the MPTO/CCO alignment to determine if adequate quantities of borrow material are actually available." The report further acknowledges, "Additional explorations, land ownership considerations, and engineering analyses are needed to better define the actual borrow sites and associated borrow quantities that will be used for the work."

CCVFCA contends that this information is readily available, but Project Proponents simply have not spent the time or money to collect such data despite being in the 9th year of project planning. For instance, CA WaterFix could find a great deal of baseline data on the system of levees in the Plan Area in the technical documents included as part of the CVFPP.

NEPA requires that the proposal in an EIS is properly defined (§ 1502.4(a)). Under CEQA, the fundamental purpose of an EIR "is to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action."[13]

Unfortunately, trying to decipher the description of the project's new alternatives is particularly daunting. For instance, the conclusions for Alt. 4A often refer to BDCP 4 impact analysis, which then refers readers to BDCP sections n BDCP Alt. 1A. Frankly, the project is a jumbled mess, resulting in a complex labyrinth that has created an even higher level of navigation difficulty and

[13] (CEQA Guidelines §15003(d), citing *People ex rel. Department of Public Works v. Bosio* 1975

fails to substantiate environmental conclusions, as pointed out in several reviews by scientific panels.[14]

B. Uncertainties Confounded by Significant Analytical Omissions and Data Gaps

Under CEQA the lead agency's factual conclusions must be supported by substantial evidence – facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts (CEQA Guidelines §15384(b)). Speculation does not constitute substantial evidence, and unsubstantiated narrative or expert opinion asserting nothing more than "it is reasonable to assume" that something "potentially may occur" is not analysis supported by factual evidence (e.g.; 2,600 dewatering radius).

There are too many chapters and individual impact statements that rely on conjecture instead of providing evidence to support the CEQA/NEPA conclusions to list them all. The following are general examples of the extensive amount of environmental analysis that is lacking from the Delta ISB's review of CA Waterfix:

- "the Current Draft fails to consider how levee failures would affect the short-term and long-term water operations spelled out in Table 4.1-2." (Pg 7)
- "The Current Draft does not evaluate how the proposed project may affect estimates of the assets that the levees protect." (Pg 8)
- "Neither the Previous Draft nor the Current Draft, however, provides a resource chapter about Delta levees." (Pg 8)
- "Although sensitivity modeling was used to address the effects of changes in the footprint and other minor changes of the revised project, full model runs were not carried out to assess the overall effects of the specific changes." (Pg 11)
- "Current draft generally neglects recent literature, suggesting a loose interpretation of 'best available science.'" (Pg 11)
- "Confounding interactions that may enhance or undermine the effectiveness of proposed actions were overlooked." (Pg 12)

A specific example of where more details are needed is the removal of groundwater during CM1 dewatering activities, with the intent to discharge into local drainage infrastructure or directly to the rivers and sloughs, resulting in a localized increase in flows and water surface elevations. Only passing reference is made, but few details provided, regarding dispersion facilities being used to reduce the potential for channel erosion due to discharge of dewatering flows.

---

[14] See, e.g.,: 1) September 30, 2015, *Review of the Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (California WaterFix)* conducted by Delta Independent Science Board; 2) National Academy of Science Panel to Review California's Draft Bay Delta Conservation Plan, 2011, *A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan* ("The lack of an appropriate structure creates the impression that the entire effort is little more than a post-hoc rationalization of a previously selected group of facilities, including an isolated conveyance facility, and other measures for achieving goals and objectives that are not clearly specified.") http://www.nap.edu/openbook.php?record_id=13148; 3) Delta Independent Science Board, *Review of the Draft EIR/EIS for the Bay Delta Conservation Plan* (May 15, 2014), . ("The DEIR/DEIS provides an exhausting wealth of information about the Delta and the likely impacts of the proposed alternatives. However, this wealth of information and data is not organized in a way that can usefully inform difficult public and policy discussions.") http://deltacouncil.ca.gov/sites/default/files/documents/files/Item_9_Attachment_3.pdf.

Knowing the dewatering discharge amounts and velocities is critical for the reclamation districts to determine if the design or dispersal facilities being proposed by BDCP will be effective in reducing the level of adverse impacts. We are extremely concerned by the repeated assumptions throughout all EIR/EIS chapters we reviewed that all the mitigation measures will be fully implemented and will in fact work, without any supporting evidentiary in the record.

The analysis should also discuss well-known prior seepage and levee boil impacts from fairly recent inundation of Prospect Island and subsequent landowner lawsuits against the USBR,[15] or how Liberty Island levees quickly deteriorated and crumbled when they were not immediately fixed after a breach.

The following Alt. 4/4A mitigation habitat activities were not analyzed as adverse effects on flood control, but will significantly increase RD costs and create regulatory compliance problems for levee maintenance and island drainage:

- "increase burrow availability for for burrow-dependent species"
- "planting elderberry shrubs in high-density clusters"
- "site valley elderberry longhorn beetle habitat restoration within drainages"

Currently, CM1 as proposed will require the three new North Delta intakes to undergo some operational fish screen testing prior to full pumping – but only *after* all three North Delta diversions have been built. If these never-before-used screens do not function as planned, then this gamble will end up a losing proposition for the Delta fisheries, Delta-as-Place, or CVP/SWP Delta water contractors (who will be stuck with long-term payments on a very expensive stranded asset).

It is important to point out a fact that is rarely discussed in BDCP/WaterFix alternatives – SIZE matters. The average size of the Delta's agricultural water diversion intakes is about 12 inches with a 10-15 cfs capacity (mostly siphon, not pumps) while the urban intakes are less than 300 cfs. The precedent for the size selected for CM1 is the Glenn-Colusa Irrigation District's (GCID) 3,000 cfs intake. However, GCID's facilities are not located in a tidal estuary, do not have to screen for smelt, and were not without their own problems.[16]

To reduce the level of adverse impacts, the preferred alternative (4/4A) should be modified to either delay CEQA/NEPA analysis until the project is at a 60% design level, or require phasing of construction for the intakes and two main tunnels. To address uncertainties, the original the Peripheral Canal conveyance project approved by the State Legislature in 1980 (SB 200 and ACA 90), required the intakes to be installed one at a time and environmental impacts analyzed for two years before proceeding with further construction. The extreme amount of risk warrants a similar phased construction approach so that the altered Delta hydraulic and surface water elevation changes to flood protection, and local water supply and quality can be analyzed and mitigated before building the other intakes/tunnel. Governor Jerry Brown's Administration obviously agreed to this precautionary approach the first time around and should do no less with CA WaterFix.

---

[15] See, e.g., *Islands, Inc. V. U.S. Bureau Of Reclam., Dept. Interior* 64 F.Supp.2d 966 (1999)

[16] These problems ultimately resulted in a very expensive redesign of fish screens and forebay. See chronology in *U.S.A. v. Glenn-Colusa Irrigation District* CVS-91-1074-DFL-JFM (1991)

C. Overly Optimistic CEQA/NEPA Impact Conclusions and Mitigations

CEQA conclusions lack credibility because they are typically general and vague in making optimistic assumptions without site-specific identification of where, for how long impacts will occur, or who will be impacted. Will reclamation district have increased pumping costs due to additional discharges by BDCP activities? Will there still be sufficient capacity for adjacent landowners to discharge their drainage? Will BDCP's use of local drainage facilities require approval or permitting by owners/operators of the drainage system?

The RDEIR/SDEIS fails to specify the scientific background on how these assumptions were made. Where are these assumptions anticipated to occur? Are these impacts anticipated to occur more frequently than existing conditions? If so, how much more often and when?

The Delta ISB had the following to say about the "unwarranted optimism" that continues to persist in CA WaterFix:

- "The level of certainty seems optimistic, and it is unclear whether there are any contingency plans in case things don't work out as planned. This problem persists from the Previous Draft." (Pg 17)
- "Here, as in many other places, measures are assumed to function as planned, with no evidence to support the assumptions." (Pg 17)
- "This conclusion is built on questionable assumptions;" (Pg 8)
- "A scientific basis for this statement is lacking, and an adaptive or risk-based management framework is not offered for the likely event that such optimism is unfulfilled." (Pg 10)
- "The literature does not support this assumption." (Pg 18)

D. Deferral of Analysis and Mitigation

In order to approve a project, the lead agencies must identify feasible mitigation measures or alternatives that would avoid or substantially lessen any significant adverse environmental effects of the project.[17] The mitigation measures must also be specific and mandatory, such that they are fully enforceable.

The EIR/EIS cannot defer the determination of the scope and nature of significant impacts until future studies and reports are prepared without including specific performance standards, timeframes for completion, and a commitment to mitigate. However, many Alt. 4/4A Mitigation Measures fail to set specific performance standards or criteria for surveying, relocating, repairing, replacing, compensating, or restoring the impacted resource.

Misleading conclusions and missing impacts associated with Alt 4A that would affect flood management adversely are common throughout the EIR/EIS, mostly because studies about the existing baseline conditions and the Project's impacts are deferred to a later time

[17] Cal. Pub. Res. Code § 21002

The amount of environmental analysis that is deferred to a later date identified by the Delta ISB is concerning to CCVFCA:

- "It defers essential material to the Final EIR/EIS" (09-3-15 cover letter)
- "overall incompleteness through deferral of content to the Final EIR/EIS" (Pg 4)
- "modeling of the effects of levee failure would be presented in the Final Report." (Pg 4)
- "The Current Draft does not demonstrate consideration of recently available climate science, and it defers to the Final Report analysis of future system operations under potential climate and sea-level conditions." (Pg 11)

The Association contends that when it comes to flood control impacts, it is reckless to assume that the details of mitigation will be fleshed out at an unknown future date.

Finally, because CA WaterFix alternatives/project is still at a preliminary conceptual level, the Draft EIR/S inappropriately bifurcates the proposed project from disclosing legally required mitigation actions that are likely to be required once the Project reaches a 60% design level and submits a 408 permit application to the U.S. Army Corps of Engineers (USACE). This results in an incomplete picture of the environmental impacts for the decision maker to evaluate.

Section 408 requires permission whenever a person or project will "take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, obstruct by fastening vessels thereto or otherwise, or in any manner whatever impair the usefulness of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, or other work built by the United States, or any piece of plant, floating or otherwise, used in the construction of such work under the control of the United States, in whole or in part, for the preservation and improvement of any of its navigable waters or to prevent floods, or as boundary marks, tide gauges, surveying stations, buoys, or other established marks, nor remove for ballast or other purposes any stone or other material composing such works." Because many of the activities in CA WaterFix alternatives involve modification of Project levees (authorized for flood protection or navigational purposes by Congress), section 408 permission will be required.

Under section 408, USACE may grant permission for the encroachment "when in the judgment of [USACE] such occupation or use will not be injurious to the public interest and will not impair the usefulness of such work." In evaluating projects to determine whether they are injurious to the public interest, USACE always looks at the change to the water surface elevation as a result of the project. Where the water surface elevation increases by even a tenth of a foot, USACE requires that the impact be mitigated by (i) addition of other projects to lower the water surface elevation (e.g., a setback levee) or (ii) strengthening of the levees impacted by the rise in water. Each of these means that if there is a water surface elevation increase, then there will need to be additional projects to off-set these impacts as required by Federal law.

But the Draft EIR/S fails to identify these specific projects, or the additional environmental impacts associated with their implementation, even though these potential additional projects and impacts are all foreseeable based on actions required in other similar projects such as the new in-river water supply intakes at Freeport and Stockton. For this reason, the Draft EIR/S is inadequate, must be supplemented, and must be recirculated.

E. Inadequate Modeling

The RDEIR/SDEIS retains a number of deficiencies from the BDCP, including the use of flawed models and failure to conduct full model runs for the new CA WaterFix alternatives.

Refer to MBK Engineers' October 25, 2015 Technical Comments on the Bay Delta Conservation Plan/California Water Fix memorandum for more detailed comments on modeling deficiency issues.

The Delta ISB also pointed out the following issues with the modeling:

- "Although sensitivity modeling was used to address the effects of changes in the footprint and other minor changes of the revised project, full model runs were not carried out to assess the overall effects of the specific changes." (Pg 11)
- "Consequently, modeling that would help bracket ranges of uncertainties or (more importantly) assess propagation of uncertainties is still inadequate." (Pg 11)
- "the Current Draft is probably outdated in its information on climate change and sea-level rise." (Pg 11)
- "the failure to consider how climate change and sea-level rise could affect the outcomes of the proposed project is a concern that carries over from our 2014 review and is accentuated by the current drought" (Pg 8)

F. Water Use Disclosure

The restoration of floodplain, tidal wetlands, and other habitat restoration actions anticipated to be implemented through separate permits for CA EcoRestore will require extensive amounts of water, particularly implementation of CM2 to inundate the Yolo Bypass more frequently and for longer duration. According to the BDCP/WaterFix Effects Analysis, CM2 will result in the diversion of approximately 650,000af of Sacramento River water into the Yolo Bypass between November and mid-May through an operable gate with a total capacity of 6,000 cfs in order to benefit fish.

Since CA WaterFix alternatives anticipate implementation of CM2/Yolo Bypass-Fremont Weir project, the current RDEIR/SDEIS should identify the volume of water to be utilized for this related SWP/CVP project, whose water rights will be used to provide that diversion, and how removal of 6,000 cfs upstream of new intakes with affect WaterFix water operations. The CA WaterFix alternative and RDEIR/SDEIS *Water Supply Chapter* should also disclose the impacts to the SWP/CVP contractor water supplies that would presumably be supplying the water from storage needed to inundate the Yolo Bypass for fish.

In addition, the following CA WaterFix operational assumptions disclosed in the DHCCP Conceptual Engineering Report (July 1, 2015) require disclosure and analysis:

- Must be able to deliver up to 9,000 cfs from north Delta intakes at the low water level in the Sacramento River;
- Must be able to deliver 9,000 cfs flow rate 99% of the time;

- Operating volume of the new North Clifton Court Forebay (NCCF) is significantly less than the existing Clifton Court Forebay.

The cumulative effects analysis in the CA WaterFix alternatives and EIR/EIS *Water Supply* Chapter should identify how much water (and whose water) will be used for construction, operation, and ongoing management of CA EcoRestore habitat restoration projects and the BDCP/WaterFix north Delta intake water operations.

G. Scope of Cumulative Impacts is Insufficient

The RDEIR/SDEIS Cumulative Impacts Analysis does not provide any sort of comprehensive discussion or analysis of how impacts associated with CA WaterFix mitigation measures and BDCP conservation measures, or CA EcoRestore projects relate to each other. How other foreseeable projects (e.g., CA EcoRestore, BiOps, CVFPP, etc.) will affect this proposal or how the activities and effects of individual conservation and mitigation measure will react to each other, conflict with other, or complement each other should be disclosed.

The habitat projects and activities being proposed as mitigation for construction of CA WaterFix conveyance facilities and the new water operations combined with the CA EcoRestore projects anticipated in the Plan Area have the potential to create redirected impacts and increased O&M costs for reclamation districts with responsibility for maintaining levees in the Plan Area. In general, higher water levels along a floodway will require taller levees, and changes in the Delta hydrodynamics will require increased armoring of levees to protect against erosion and seepage. Examples of the many cumulative adverse impacts in the Plan Area (Delta) the EIR/EIS should specifically describe, analyze, and quantify include:

- Cumulative impacts to levee stability and Delta flood risk from CM1 pile driving, dewatering lowering groundwater 10-20 feet, sediment loading, 9 cofferdams in the Sacramento River and tributaries, and damage from erosion, seepage, and overtopping;
- Cumulative impacts to Delta agriculture from land conversion, seepage damage, water quality degradation, soil contamination (salinity absorption), blocked access to parcels, and reduce water elevations (surface and groundwater) stranding diversion intakes and wells;
- Cumulative impacts to in-Delta water supply (agriculture and drinking water) from 7 significant and "unavoidable" adverse impacts identified in *Water Quality Chapter 8*.

The failure to adequately analyze the cumulative impacts was also pointed out by the Delta ISB:

- "The proposed project is part of the broader array of management actions in the Delta and should be considered in that broader context." (Pg 18)
- "the Current Draft fails to consider how levee failures would affect the short-term and long-term water operations spelled out in Table 4.1-2." (Pg 7)
- "What are the cumulative impacts of wetland losses in the Delta? What is the tipping point beyond which further wetland losses must be avoided?" (Pg 18)
- "Up to 14 years of construction activities were predicted for some areas (e.g., San Joaquin Co.); this would have cumulative impacts (e.g., dewatering would affect soil

compaction, soil carbon, microbial functions, wildlife populations, and invasive species)." (Pg 19)

H. Adaptive Management, Funding, and Mitigation Commitments are Vague

Under CEQA, an EIR must be sufficiently descriptive and specific to allow the public to clearly understand exactly how significant effects will be mitigated so they can weigh in on the adequacy of such measures. Unfortunately, neither the BDCP nor the CA WaterFix EIR/EIS documents meet CEQA or NEPA requirements in terms of assurances necessary for adaptive management, funding, or mitigation measure commitments.

Fundamental concerns regarding the effectiveness of adaptive management and mitigation measures due to vague descriptions and deferred commitments were noted by the Delta ISB:

- "The lack of substantive treatment of adaptive management in the Current Draft indicates that it is not considered a high priority or the proposer have been unable to develop a substantive idea of how adaptive management would work for the project." (Pg 5)
- "We did not find examples of how adaptive management would be applied to assessing – and finding ways to reduce – the environmental impacts of project construction and operations." (Pg 5)
- "The missing details also include commitments and funding needed for science-based adaptive management and restoration to be developed, and more importantly, to be effective." (Pg 6)
- "The Current Draft does little more than promise that collaborations will occur and that adaptive management will be implemented." (Pg 6)
- "The test will be whether the measures will be undertaken as planned, be as effective as hoped, and continue long enough to fully mitigate effects. This is where adaptive management and having contingency plans in place becomes critically important. It is not apparent that the mitigation plans include these components." (Pg 13)
- "Monitoring is mentioned, but details of organization, intent, and resources seem lacking. Adequate funding to support monitoring, collaborative science, and adaptive management is a chronic problem." (Pg 15)

Finally, environmental conclusions in the RDEIR/SDEIS simply stating that future projects/actions/designs will comply with applicable law does not constitute avoidance of all impacts and does not suffice to replace mitigation. All of the EIR/EIS Chapters we reviewed also had many examples where the adverse impacts identified in the title and description were left unmitigated in the CEQA Conclusion.

VII. COORDINATION WITH FLOOD MANAGEMENT AGENCIES, PLANNING EFFORTS, AND DELTA PROTECTION LAWS

A. Central Valley Flood Protection Plan Coordination and Compliance

To safeguard at-risk people, properties and communities, the State of California holds the responsibility for a system of levees, weirs, bypasses and other risk-management facilities.

Collectively, these State-federal flood protection works –as well as their associated lands, programs, conditions, and mode of operations and maintenance – make up the State Plan of Flood Control (SPFC).[18] The SPFC system and local Delta levees provide flood protection during major storms to over 2 million people in 14 counties and an estimated $70 billion worth of urban and agricultural development.

According to the National Oceanic and Atmospheric Association, every year floods cause an estimated $2 billion in property damage, and California's Central Valley has been identified in one of the nation's highest risk categories. California voters approved more than $4 billion in bond money for flood infrastructure after Hurricane Katrina raised public awareness to the dangers of levee failures, allowing state and local partnerships to diligently improve the level of flood protection in the Sacramento and San Joaquin River watersheds.

The BDCP indicates several portions of the SPFC facilities will be removed, built on, vegetated, inundated, moved, or breached in order to construct new SWP water conveyance facilities and restore habitat as project mitigation. However, the BDCP/WaterFix alternatives fail to describe how the BDCP/WaterFix actions will either complement or conflict with the hundreds of flood protection projects identified in Regional Plans developed as part of the Central Valley Flood Protection Plan. These are costly omissions if BDCP/WaterFix preferred alternatives increase Sate's liability exposure or conflict with flood investments identified during CVFPP implementation.

There are also ongoing cooperative flood control projects within the Plan Area in various phases of funding and implementation coordination between the USACE, CVFPB, and local RDs. Yet, the public and decision makers are not informed of this or told how BDCP/WaterFix will ultimately integrate projects slated for the same or adjacent levee locations.

B. USACE PL 84-99 Requirements, Including Levee Vegetation Policies

Many of the individual actions contained in the BDCP's habitat conservation measures and CA WaterFix mitigation measures propose planting "riparian" vegetation to benefit aquatic and terrestrial species, including modification of channel geometry to accommodate new riparian habitats on the water side of levees to improve conditions along salmon migration routes.

The Army Corps has "minimum" standards for maintaining vegetation-free buffer zones on all SPFC Project Levees, but fails to analyze the "feasibility" of vegetating project levees or the possibility that these mitigation mesures cannot be achieved due to conflicts with the Army Corps' levee vegetation policies..

CA WaterFix habitat mitigation measures must be carefully designed to avoid encroachment onto Project levees and not assume that the vegetation objective of BDCP/WaterFix habitat proposals can be accommodated during the USACE's 408 permitting process.

---

[18] A complete description of these assets and resources has been compiled by DWR into the *State Plan of Flood Control Descriptive Document,* available at http://www.water.ca.gov/cvfmp/docs/DRAFT_SPFC_Descriptive_Doc_20100115.pdf

DWR should coordinate with the CVFPB to develop an appropriate strategy for how the BDCP/WaterFix modifications of the SPFC project levees will ensure compliance with USACE's PL 84-99 and other conditions contained in the 1953 MOU between CVFPB and USACE. Mitigation measures should include payment of all levee repair/rehabilitation costs for any project or non-project levees in the USACE RIP (PL 84-99) program that will have vegetation plantings pursuant to implementation of BDCP/WaterFix alternatives.

Finally, the Association recommends DWR immediately engage with the CVFPB and local RDs to execute binding agreements (MOU) for SWP/CVP's funding of the ongoing maintenance of all new vegetation within the footprint of a flood control easement. MOU should consider requiring vegetation management commitment by DWR to: 1) maintain the safety, functionality, and structural integrity of the flood facility; 2) ensure accessibility for surveillance, monitoring, inspection, maintenance, and flood-fighting is retained; 3) conduct periodic clearing of some types of vegetation; and submit annual updates to CVFPB on levee vegetation management with particular attention to any instances where maintenance is falling behind and affecting the reliability of SPFC flood control structures.

C. CVFPB Encroachment Permit

Under California law, no modification to the federal/State flood control system (SPFC), encroachment, or project may be constructed on or near the Sacramento and San Joaquin Rivers or their tributaries without the explicit approval of the Central Valley Flood Protection Board. Recent legislation has increased the board's encroachment enforcement authority to remove such encroachments if necessary.

The construction description for CM1 water conveyance facilities indicates numerous work areas and activities that are planned on or near flood control facilities in the Board's jurisdiction, including roads and highways that have SPFC project levees underneath that are to be moved, blocked, driven on in excess of current conditions or have construction equipment staged on or next to the levee.

A commitment to enter into binding agreements (MOU) with the CVFPB and Local Maintaining Agencies/RDs should be inserted as a condition of the Project permits to memorialize how staging of construction equipment, construction traffic, and/or road re-routing will occur and negotiate permit conditions prior to any construction activities. The MOU should also require development of a floodfighting and evacuation plan, provide funding to RD for increased levee maintenance and drainage costs, a levee maintenance schedule, and other mitigation measures necessary to ensure the reliability of the flood protection infrastructure to perform in a high water event.

D. Compliance with Delta Statutes

Changes to the BDCP/WaterFix project require additional disclosures explaining how compliance with various Delta statutes has changed. For instance, the 2009 Delta Reform Act (Water Code §85320(b)) declares that the BDCP (which includes CA WaterFix alternatives) is not eligible for state funding if project analysis fails to:

- Comply with CA NCCP laws;
- Include a reasonable range of flow criteria, rates of diversion, or identify the remaining water available for export;
- Include a reasonable range of alternatives;
- Include potential effects of climate change, possible sea level rise up to 55 inches, and possible changes in total precipitation and runoff patterns on the conveyance alternatives and habitat restoration activities;
- Include the potential effects on Sacramento and San Joaquin River flood management;
- Describe the resilience and recovery of conveyance alternatives in the event of catastrophic loss from flood, earthquake, or other natural disaster.

In addition the Delta Reform Act established several other standards that BDCP/WaterFix should describe, including but not limited to:

- Cannot be incorporated into the Delta Plan unless the project is approved as a HCP/NCCP (WC§ 85320(e));
- Must include a transparent, real-time operational decision-making process to ensure biological performance measures area achieved (WC§85321);
- Requires any SWP/CVP change in the point of diversion order to include appropriate Delta flow criteria and to reimburse SWRCB for costs (WC§ 85086);
- Prohibits commencement of construction for any diversion, conveyance, or other facility until the SWRCB issues an order approving a change in point of diversion for SWP/CVP (WC§85088);
- Prohibits construction of new Delta conveyance facilities until contracts from persons/entities to receive water from SWP/CVP have been entered into to pay for the costs of environmental review, planning, design, construction, and mitigation of new conveyance facilities (WC§85089).

The Delta ISB 2015 Review suggested, "more details on the governance operations (such as the Real Time Operations process) would be useful."

VIII. ECONOMIC ANALYSIS AND FISCAL ASSURANCES

A. Conduct Comprehensive and Unbiased Economic Evaluation of BDCP

To be credible, DWR should undertake objective and comprehensive cost-benefit and socioeconomic analyses. The new effort must be consistent with government economic analysis standards for public water projects;[19]and independently peer-reviewed for accuracy and efficacy of the methodology, assumptions, models, and results.

DWR's Economic Analysis Guidebook specifically states: "DWR should also broaden the economic analysis to include regional economic development (RED) or other social effects

[19] "Economics and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (P&G) and the "Department of Water Resources Economic Analysis Guidebook."

(OSE) accounts, which can significantly assist in the decision-making process. The RED account is particularly important if a proposed plan will have significantly different effects upon regions that might otherwise be irrelevant to the NED national perspective." As described in comments herein, the BDCP/WaterFix alternatives certainly represent different benefits and impacts between Northern and Southern California, which should be accounted for as RED or OSE – but is not accounted for in this way.

A new, more comprehensive cost-benefit analysis should analyze the costs of such things as:

- The Mitigation Monitoring Plan, including the hundreds of individual actions called for in the *Avoidance and Minimization Measures* (Plan Appendix 3.C);

- The Monitoring and Adaptive Management Program;
- Management contingency assumptions;
- Payment of in-lieu property assessments for lands associated with CM1 (Water Code § 85089(b)) and for mitigation lands transferred from private to public property in the Plan Area.
- Redirected improvement and O&M costs for flood control infrastructure impacted by implementation of BDCP conveyance and habitat restoration projects.

A significant potential fiscal impact that should specifically be addressed in a new economic analysis is the State's exposure, both DWR and CVFPB, to tort liability related to CA WaterFix construction and operation of facilities on SPFC project levees.

Inverse condemnation liability gives private individuals a pathway to recover for disproportionate damages caused by public improvements projects.[20] After the 1986 storms and subsequent levee failures, a lawsuit involving some 3,000 plaintiffs claiming damages from a SPFC Project levee failure which resulted in evacuations, deaths, and hundreds of millions of property damage was filed against the State (*Paterno v. State of California*).[21]

Key factors in assessing the "reasonableness" of the risk inherent to the state's levee project included the large size of the project, the lack of direct benefit to the plaintiffs from the project, the feasibility of alternatives, and the fact that the state benefitted as a whole from the decision not to fund the levee improvements that would have prevented the breach,[22] with foreseeability a supplemental issue considered.

The appellate decision also cited case law stating that a public entity is a proper defendant in an action for inverse condemnation if the entity "substantially participated in the planning, approval, construction, or operation of a public project or improvement that proximately caused injury to private property. So long as the plaintiffs can show substantial participation, it is immaterial 'which sovereign hold title or has the responsibility for operation of the project.'"[23]

In the case of CA WaterFix, the purpose of this project is increasing water supply in export Service Areas, so there are no direct benefits to residents in the Delta that pay assessments for levee maintenance and improvements. In addition, many of the project components propose a

---

[20] *Locklin v. City of Lafayette*, (1994) 7 Cal.4th 327 at 367
[21] *Paterno v. State of California*, (2003) 113 Cal. App. 4th 998; 6 Cal.Rptr.3d 854 (2004)
[22] *Id*. at 1017; Locklin, 7 Cal 4th at 368-369.
[23] *Paterno*, citing *Arreola,* 99 Cal.App.4th at p. 761

substantial amount of moving, modifying, or building on SPFC levees, so meets the large size criteria. However, CA WaterFix fails to include feasible alternatives to maintain or improve flood protection, such as cost-sharing in the funding of ongoing maintenance and improvement of levees needed for all BDCP/WaterFix alternatives that rely on dual conveyance with a path towards the South Delta pumps. The Association and many others, including the Delta ISB, have recommended BDCP/WaterFix include maintenance of levees as a critical project component.

In 2003, the State of California settled the case for $467 million after the Third Appellate Court concluded in an appeal of the inverse condemnation lawsuit that the State was liable as the party responsible for the SRFCP facilities. The court agreed that the *Paterno* plaintiffs' damages were "directly caused by an unreasonable State plan which resulted in the failure" of the levee, therefore finding the State liable to pay for these damages.[24] Therefore, the significant financial exposure to the State (DWR/CVFPB) from liability should be disclosed and analyzed in a new, more comprehensive economic analysis.

B. Redirected Financial Burdens Not Analyzed or Mitigated

Neither the Plan's finance chapter nor the EIR/EIS provide any sort of cost analysis of the annual budgets for Reclamation Districts in the Delta in order to evaluate the fiscal ability of districts to weather redirected financial impacts from BDCP/WaterFix actions affecting their revenues and operating budgets.

For instance, changes to channel hydrodynamics and flows as well as water elevations and volumes, as proposed in many of the CM1 mitigation measures could create additional costs to reclamation districts from erosion and seepage damage that may require additional rocking, large land-side berms, or other levee improvements to mitigate the impacts. At the very least, seepage monitoring will need to be installed and addressed in locations surrounding new aquatic habitat areas, which adds to the projects costs not analyzed in the BDCP/WaterFix economic analysis.

Finally, the reclamation and levee districts that operate and maintain most flood protection and control infrastructure in the Delta rely on the local assessment roll as their primary direct funding source, and it would be highly inequitable to leave them to protect new levee improvements or higher maintenance costs associated with CM1 construction, operation, and mitigation actions. CCVFCA requests a mitigation measure be added requiring DWR to pay for all additional O&M or other related district costs (i.e., higher electricity costs for drainage pumping, levee improvements to add freeboard due to sediment increases raising water surface elevations, wave fetch erosion damage from open water/tidal habitat restoration, etc.) incurred by reclamation districts as a result of implementation of any CA WaterFix actions. These costs must have own section and budget line item in the BDCP/WaterFix's Annual Work Plan and Budget.

IX. CONCLUSION

The very preliminary conceptual nature of the BDCP/CA WaterFix project alternatives, results in a failure to assess numerous significant impacts and development of CEQA/NEPA conclusions

[24] *Id.*

that are primarily based on conjecture. In addition, the environmental and public safety impacts are nearly impossible to decipher due to the disjointed document organization and presentation; and therefore fails to satisfy the most basic requirement of CEQA – to inform the public about the environmental consequences of a proposed decision or project.

As pointed out by the Delta Independent Science Board, the CA WaterFix project alternatives and RDEIR/SDEIS lack completeness, defer essential material to the Final EIR/EIS, and retain a number of deficiencies inherent in the 2014 BDCP DEIR/DEIS.

These limiting factors prevent CCVFCA, its member agencies, and the general public from fully understanding the true scope, severity, and duration of potential environmental and economic effects associated with the construction, permitting, operation, and mitigation of BDCP/WaterFix project components.

The substantial inadequacies of the BDCP/WaterFix alternatives and RDEIR/SDEIS fail to protect people and property in the Plan Area or meet the legal requirements for state and federal endangered species, environmental assessment, or various Delta protection laws. Therefore, the Association requests the State to revise per comments contained herein and once again recirculate the Plan and EIR/EIS for public review and comment.

Respectfully,

Melinda Terry, Executive Director
CA Central Valley Flood Control Association

Review of Bay Delta Conservation Program Modeling

by Daniel B. Steiner, Consulting Engineer and MBK Engineers

Technical Appendix

Contents

1 Introduction 5
2 Review of BDCP CalSim II Modeling 6
2.1 Climate Change 6
Implementation of Climate Change 6
CalSim II Assumptions 6
Regulatory requirements 7
Model Results 7
Inflow and Reservoir Storage in the Sacramento River Basin 7
Carryover Storage in the Sacramento River Basin 9
Inflow and Carryover Storage in the San Joaquin River Basin 11
SWP Water Supply 13
CVP/SWP Exports 17
Joint Point of Diversion 18
San Luis Reservoir Operations 19
Sacramento River Temperature 19
Conclusions regarding Climate Change Assumptions and Implementation 21
2.2 BDCP Operation 21
Description of the BDCP Project 21
High Outflow Scenario (HOS or H4) Results 23
North Delta Diversion Intakes 26
CVP/SWP Exports 26
Delta Outflow 31
CVP/SWP Reservoir Carryover Storage 31
San Luis Reservoir Operations 32
CVP Water Supply 35
SWP Water Supply 38
Freemont Weir Modifications and Yolo Bypass Inundation 40
Sacramento River Temperature 42
Conclusions regarding CalSim II modeling of BDCP Alternative 4 42
BDCP's "High Outflow Scenario" is not sufficiently defined for analysis. 43
Simulated operation of BDCP's dual conveyance, coordinating proposed North Delta diversion facilities with existing south Delta diversion facilities, is inconsistent with the project description. 43
BDCP modeling contains numerous coding and data issues that skew the analysis and conflict with actual real-time operational objectives and constraints 43
3 INDEPENDENT MODELING 44
3.1 Changes to CalSim II Assumptions 44

Revisions approved by DWR and Reclamation for the 2013 baseline 44
Additional Revisions to CalSim II Assumptions 45
San Joaquin River Basin 45
Folsom Lake Flood Control Diagram 46
Feather River Rice Decomposition Demand 46
Dynamic EBMUD Diversion at Freeport 46
Wilkins Slough Minimum Flow Requirement 46
CVP M&I Demands 47
Yuba Accord Water Transfer 47
Los Vaqueros Reservoir 47
3.2 Changes to BDCP Operations 47
San Luis Reservoir Rule-Curve Logic Change 47
Upstream Storage Release to Fill San Luis Reservoir Above Needed Supply 47
Delivery allocation adjustment for CVP SOD Ag service and M&I contractors 48
Folsom/Shasta Balance 48
North Delta Diversion Bypass Criteria 48
Delta Cross Channel Gate Reoperation in October 48
Wilkins Slough minimum flow requirement 49
3.3 Alternative 4 Modeling results 50
CVP/SWP Delta Exports 51
Delta Outflow 55
Carryover Storage 55
San Luis Reservoir Operations 58
CVP Water Supply 58
SWP Water Supply 61
4 Comparing Independent Modeling and BDCP Modeling 63
Delta Exports 63
Delta Outflow 64
Reservoir Storage 65
North Delta Diversions 66
Delta flows below the NDD facility 67
Sacramento River water entering the Central Delta 69
Conclusions regarding BDCP effects 72

Figures

Figure 1. Projected Inflow to Trinity, Shasta, Oroville, and Folsom Reservoirs – NAA, NAA-ELT and NAA-LLT 9
Figure 2. Projected Shasta Reservoir Carryover Storage, NAA, NAA-ELT and NAA-LLT 10
Figure 3. Projected Inflow to Millerton Lake –NAA, NAA-ELT and NAA-LLT 11
Figure 4. Millerton Reservoir Carryover Storage, NAA, NAA-ELT and NAA-LLT Scenarios 12
Figure 5. CVP Water Service Contractor Delivery Summary 14
Figure 6. CVP Contractor Delivery Summary for Contractors with Shasta Criteria Allocations 15
Figure 7. SWP Delta Delivery Summary 16
Figure 8. CVP Exports at Jones PP, NAA, NAA-ELT and NAA-LLT 17

Figure 9. Total CVP/SWP Exports, NAA, NAA-ELT and NAA-LLT 18
Figure 10. Cross Valley Canal Wheeling at Banks 19
Figure 11. San Luis Reservoir Storage – NAA, NAA-ELT and NAA-LLT 19
Figure 12. Temperature Exceedance Sacramento River at Bend Bridge Existing, No Action Alternative, ELT 20
Figure 13. Temperature Exceedance Sacramento River at Bend Bridge Existing, No Action Alternative, LLT 21
Figure 14. Changes in Feather River Flow, Alt 4 H4 ELT minus NAA-ELT 24
Figure 15. Changes in Oroville Storage, Alt 4 H4 ELT minus NAA-ELT 24
Figure 16. Changes in Delta Outflow, Alt 4 H4 ELT minus NAA-ELT 25
Figure 17. Changes in Delta Export, Alt 4 H4 ELT minus NAA-ELT 25
Figure 18. Changes in CVP and SWP Deliveries, Alt 4 H4 ELT minus NAA-ELT 25
Figure 19. NDD, Bypass Requirement, Bypass Flow, and Excess Sacramento R. flow for Alt 4-ELT 26
Figure 20. Change in CVP (Jones) and SWP (Banks) Exports (Alt 4-ELT minus NAA-ELT) 27
Figure 21. Change in Conveyance Source of Exports (Alt 4-ELT minus NAA-ELT) 28
Figure 22. Alt 4-ELT North Delta Diversion Versus South Delta Diversion for July, August, and September 29
Figure 23. South Delta Diversion at Banks 30
Figure 24. Delta Outflow Change (Alt 4-ELT minus NAA-ELT) 31
Figure 25. Trinity Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type 33
Figure 26. Shasta Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type 33
Figure 27. Oroville Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type 34
Figure 28. Folsom Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type 34
Figure 29. Federal Share of San Luis Reservoir (Alt 4-ELT and NAA-ELT) 35
Figure 30. State Share of San Luis Reservoir (Alt 4-ELT and NAA-ELT) 35
Figure 31. CVP Service Contract Deliveries (Alt 4-ELT and NAA-ELT) 37
Figure 32. SWP Contract Deliveries (Alt 4-ELT and NAA-ELT) 39
Figure 33. Fremont Weir vs. Sacramento River NAA-ELT 40
Figure 34. Fremont Weir vs. Sacramento River Alt 4-ELT 41
Figure 35. Average Fremont Weir Flow to Bypass by Water Year Type NAA-ELT 41
Figure 36. Average Fremont Weir Flow to Bypass by Water Year Alt 4 ELT minus NAA-ELT 41
Figure 37. Annual Change in Fremont Weir Flow to Bypass Alt 4-ELT minus NAA-ELT 42
Figure 38. Sacramento River Temperature at Bend Bridge NAA-ELT and Alt 4-ELT 42
Figure 39. Alt 4 Features 50
Figure 40. Change in Delta Exports at Jones Alt 4 minus FNA 51
Figure 41. Change in Delta Exports at Banks Alt 4 minus FNA 52
Figure 42. Change in CVP Delta Exports at Banks Alt 4 minus FNA 52
Figure 43. Change in Conveyance Source of Exports (Alt 4 minus FNA) 53
Figure 44. Alt 4 North Delta Diversion Versus South Delta Diversion for July, August, and September 54
Figure 45. Changes in Delta Outflow (Alt 4 minus FNA) 55
Figure 46. Trinity Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type 56
Figure 47. Shasta Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type 56
Figure 48. Oroville Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type 57
Figure 49. Folsom Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type 57
Figure 50. SWP San Luis 58

Figure 51. CVP San Luis 58
Figure 52. CVP Water Supply Delivery and Allocation 60
Figure 53. SWP Delivery for Alt 4 and FNA....62
Figure 54. Result Difference: Delta Exports 63
Figure 55. Result Difference: South Delta Diversion 64
Figure 56. Result Difference: North Delta Diversion 64
Figure 57. Result Difference: Net Delta Outflow....65
Figure 58. Result Difference: Shasta Storage 65
Figure 59. Result Difference: Folsom Storage 66
Figure 60. NDD, and Sacramento River Flow 66
Figure 61. Sacramento River below Hood....68
Figure 62. Flow through Delta Cross Channel and Georgiana Slough versus Sacramento River Flow at Hood 69
Figure 63. Cross Channel Flow 70
Figure 64. Flow through Delta Cross Channel and Georgiana Slough....71

Tables

Table 1. Scenarios used to evaluate climate change 6
Table 2. CVP Water Service Contractor Allocation Summary 12
Table 3. CVP Delivery Summary (Alt 4-ELT and NAA-ELT)....36
Table 4. SWP Delivery Summary (Alt 4-ELT and NAA-ELT)....38
Table 5. CVP Delivery Summary 59
Table 6. SWP Delivery Summary 61

1 INTRODUCTION

For a little more than a year, Dan Steiner and MBK Engineers (independent analysts) have been responding to questions from stakeholders[1] regarding the Bay Delta Conservation Plan (BDCP). Initially, the independent analysts were asked to review the CalSim II modeling studies performed as part of the BDCP (hereafter "BDCP studies" or "BDCP modeling") to help various parties understand the BDCP Alternatives and their potential implications. Stakeholders requested a review and assessment of the approach undertaken by the BDCP modelers and the results that were derived.

The initial review led the independent analysts to conclude that the BDCP modeling provides very limited useful information to illustrate how the BDCP may affect the Bay-Delta watershed system. To determine the effects of the BDCP, the independent analyst revised the CalSim II model to depict a more accurate version of current and future benchmark hydrology and operations upon which to contrast BDCP Alternatives. Significant effort was given to coordinate with or inform Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) managers and modeling staff of the independent model modifications, assumptions, and our findings, and at times we used their guidance and direction to refine our analysis.

This technical appendix summarizes: (1) the independent review of the CalSim II modeling publicly released for the BDCP's Draft Environmental Impact Report/Statement (EIRS), (2) the corrections and revisions made to the assumptions in the CalSim II model, and (3) comparisons between the BDCP and independent modeling results. The detailed information in this appendix is summarized in our main report.

[1] The entities who funded this report are Contra Costa Water District, East Bay Municipal Utility District, Friant Water Authority, Northern California Water Association, North Delta Water Agency, San Joaquin River Exchange Contractors Water Authority, San Joaquin Tributaries Authority, and Tehama Colusa Canal Authority.

2 REVIEW OF BDCP CALSIM II MODELING

2.1 Climate Change

Implementation of Climate Change

The analysis presented in the BDCP Documents attempts to incorporate the effects of climate change at two future climate periods: the early long term (ELT) at approximately the year 2025; and the late long term (LLT) at approximately 2060. As described in the BDCP documents[2], other analytical tools were used to determine anticipated changes to precipitation and air temperature that is expected to occur under ELT and LLT conditions. Projected precipitation and temperature was then used to determine how much water is expected to flow into the upstream reservoirs and downstream accretions/depletions over an 82-year period of variable hydrology; these time series were then used as inputs into the CalSim II operations model. A second aspect of climate change, the anticipated amount of sea level rise, is incorporated into the CalSim II model by modifying a subroutine that determines salinity within the Delta based on flows within Delta channels. The effects of sea level rise will manifest as a need for additional outflow when water quality is controlling operations to prevent seawater intrusion.

This report does not review the analytical processes by which reservoir inflows and runoff were developed, nor does it evaluate the modified flow-salinity relationships that are assumed due to sea level rise; those items could be the focus of another independent review. This review is limited to evaluating how the modified flows were incorporated into CalSim II and whether the operation of the CVP and SWP water system in response to the modified flows and the modified flow-salinity relationship is reasonable for the ELT and LLT conditions. This work reviews the assumed underlying hydrology and simulated operation of the CVP/SWP, assumed regulatory requirements, and the resultant water delivery reliability.

CalSim II Assumptions

To assess climate change, the three without Project (or "baseline" or "no action") modeling scenarios were reviewed: No Action Alternative (NAA)[3], No Action Alternative at the Early Long Term (NAA – ELT), and No Action Alternative at the Late Long Term (NAA –LLT). Assumptions for NAA, NAA-ELT, and NAA-LLT are provided in the Draft EIR[4]. The only difference between these scenarios is the climate-related changes made for the ELT and LLT conditions (Table 1).

Table 1. Scenarios used to evaluate climate change

	Climate Change Assumptions	
Scenario	**Hydrology**	**Sea Level Rise**
No Action Alternative (NAA)	None	None
No Action Alternative at Early Long Term (NAA-ELT)	Modified reservoir inflows and runoff for expected conditions at 2025	15 cm
No Action Alternative at Early Long Term (NAA-LLT)	Modified reservoir inflows and runoff for expected conditions at 2060	45 cm

[2] BDCP EIR/EIS Appendix 5A, Section A and BDCP HCP/NCCP Appendix 5.A.2
[3] NAA is also called the Existing Biological Conditions number 2 (EBC-2) in the Draft Plan.
[4] BDCP EIR/EIS Appendix 5A, Section B, Table B-8

The differences between the NAA and NAA-ELT reveal the effects of the climate change assumptions under ELT conditions; similarly, the differences between the NAA and NAA-LLT reveal the effects of the climate change assumptions under LLT conditions.

Regulatory requirements

Each of the no action alternatives assumes the same regulatory requirements, generally representing the existing regulatory environment at the time of study formulation (February 2009), including Stanislaus ROP NFMS BO (June 2009) Actions III.1.2 and III.1.3, Trinity Preferred EIS Alternative, NMFS 2004 Winter-run BO, NMFS BO (June 2009) Action I.2.1, SWRCB WR90-5, CVPIA (b)(2) flows, NMFS BO (June 2009) Action I.2.2, ARFM NMFS BO (June 2009) Action II.1, no SJRRP flow modeled, Vernalis SWRCB D1641 Vernalis flow and WQ and NMFS BO (June 2009) Action IV.2.1, Delta D1641 and NMFS Delta Actions including Fall X2 FWS BO (December 2008) Action 4, Export restrictions including NMFS BO (June 2009) Action IV.11.2v Phase II, OMR FWS BO (December 2008) Actions 1-3 and NMFS BO (June 2009) Action IV.2.3v.

The modeling protocols for the recent USFWS BO (2008) and NMFS BO (2009) have been cited as being cooperatively developed by Reclamation, NMFS, U.S. Fish and Wildlife Service (USF&WS), California Department of Fish and Wildlife (CDF&W), and DWR.

Each of the BDCP no action alternatives (NAA, NAA-ELT, and NAA-LLT) uses the same New Melones Reservoir and other San Joaquin River operations. At the time of these studies' formulation, the National Marine Fisheries Services (NMFS) Biological Opinion (BO) (June 2009) had been recently released. Also, the San Joaquin River Agreement (SJRA, including the Vernalis Adaptive Management Program [VAMP]) and its incorporation into D1641 for Vernalis flow requirements were either still in force or being discussed for extension. As a component of study assumptions, the protocols of the SJRA and an implementation of the NMFS BO for San Joaquin River operations (including New Melones Reservoir operations) is included in the studies. These protocols, in particular the inclusion of VAMP which has now expired, is not appropriate as an assumption within either the No Action or Alternative Scenarios. Although appropriate within the identification of actions, programs and protocols present at the time of the NOI/NOP, they are not representative of current or reasonably foreseeable operations. Also, modeling of the future operation of the Friant Division of the CVP assumes no San Joaquin River Restoration Program releases. While assuming no difference in the current and future operation of the Friant Division avoids another difference in existing and projected future hydrology of the San Joaquin River, the assumption does not recognize the existence of the San Joaquin River Restoration Program. Results of CVP and SWP operations, in particular as affected by export constraints dependent on San Joaquin River flows and their effect on OMR, E/I and I/E diversion constraints, would be different with a different set of assumptions for San Joaquin River operations.

Finally, the habitat restoration requirements in the 2008 FWS BO and the 2009 NMFS BO are not included in the No Action Alternative baselines. Although the restoration is required to be completed either with or without completion of the BDCP, the restoration was only analyzed as part of the with project scenarios.

Model Results

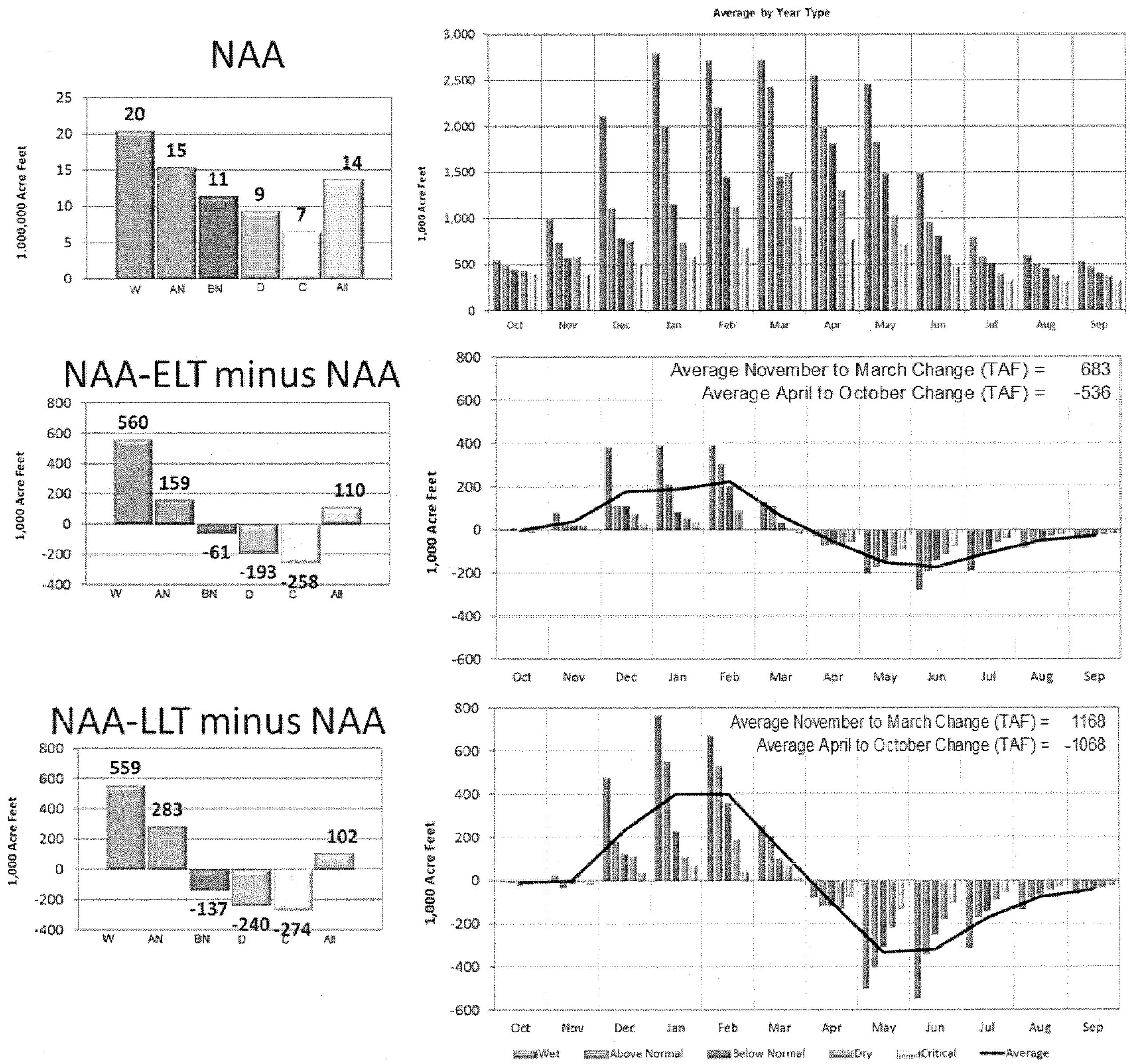
Inflow and Reservoir Storage in the Sacramento River Basin

The significance of changed hydrology between the three without project baselines is illustrated in Figure 1 below. The figure illustrates the projected combined inflow of Trinity, Shasta, Oroville, and Folsom Reservoirs under the three NAA baselines. Numerous modeling projections for climate change have been developed, and in this BDCP group of Scenarios Trinity, Shasta, and Oroville inflow are projected to increase overall, but with a significant shift from spring runoff to winter runoff and increases in wetter years with decreases in dryer years. Folsom Reservoir inflow is projected to remain about the same at the time of the NAA-ELT Scenario but decreases by the time of the NAA-LLT Scenario. The spring to winter shift in runoff is also projected for Folsom Reservoir inflow.

If climate change resulted in such drastic inflow changes, there is argument that certain underlying operating criteria such as instream flow requirements and flood control diagrams would require change in recognition of the changed hydrology. Regarding current environmental flow requirements carried into the NAA Scenarios, we question an assumed operation that continues to attempt to meet temperature targets when flow releases are unlikely to meet the target and thus a sustainable operation plan is not possible. For example, the CVP and SWP are unlikely to draw reservoirs to dead pool as often as the models depict. The NAA-ELT and NAA-LLT model Scenarios show project reservoirs going to dead pool in 10% of years; such operation would result in cutting upstream urban area deliveries below what is needed for public health and safety in 10% of years and would lead to water temperature conditions that would likely not achieve the assumed objectives. Again in short, the Scenarios that include climate change do not provide a reasonable underlying CVP/SWP operation with a changed hydrology from which to impose a Project upon to understand how BDCP Alternatives will affect the water system and water users.

In our opinion, the CalSim II depicted operations that incorporate climate change are not reasonably foreseeable and do not represent a likely future operation of the CVP/SWP. Although an argument is typically made that these study baselines will be used in a comparison analysis with Project Alternatives tiering from these baselines, we believe that the depicted operations do not represent credible CVP/SWP operations and we have no confidence in the results and they are inappropriate as the foundation of a Project Alternative. As such, although the modeling approach may provide a relative comparison between equal foundational operations, we are apprehensive to place much confidence in the computed differences shown between the NAA and Project Alternative Scenarios.

Figure 1. Projected Inflow to Trinity, Shasta, Oroville, and Folsom Reservoirs – NAA, NAA-ELT and NAA-LLT



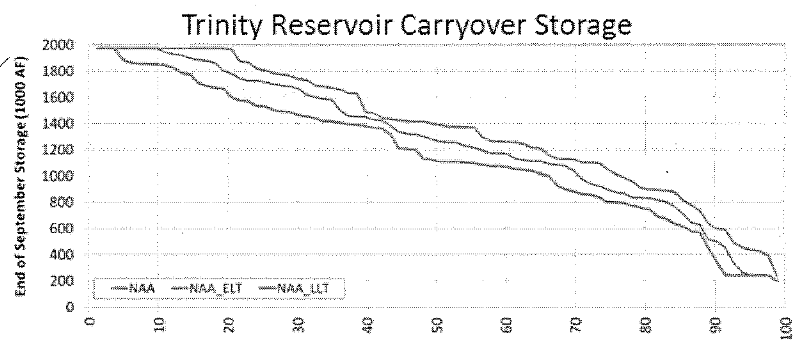
Carryover Storage in the Sacramento River Basin

For upstream CVP and SWP reservoirs the assumed shift of inflows due to climate change (Figure 1) along with a continuing need to satisfy exports demands significantly affects carryover storage. The CVP and SWP simply cannot satisfy water demands and regulatory criteria imposed on them in the NAA-ELT and NAA-LLT modeling scenarios.

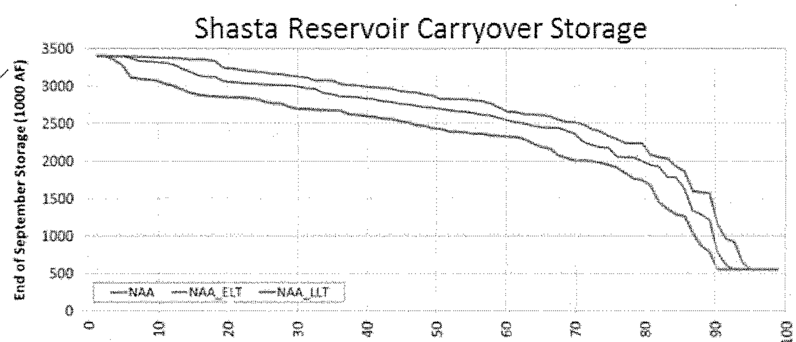
Figure 2 illustrates the typical change in carryover storage as shown for Trinity, Shasta, Oroville, and Folsom Reservoirs. The relatively high frequency (approximately 10% of time) of minimum storage occurring at CVP reservoirs illustrates our questioning of credible operations in the studies.

Figure 2. Projected Shasta Reservoir Carryover Storage, NAA, NAA-ELT and NAA-LLT

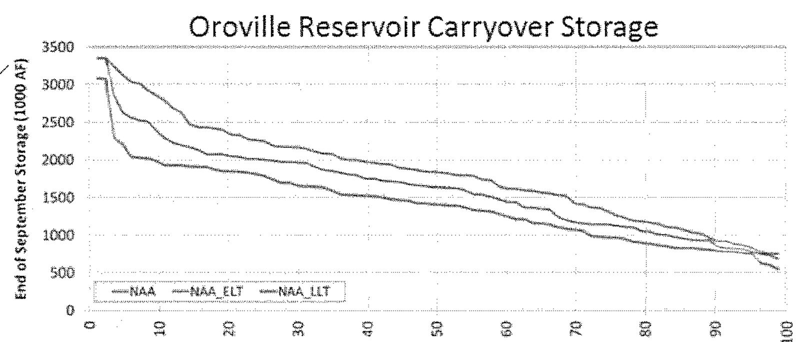
Reservoir	Year Type	NAA_ELT minus NAA	NAA_LLT minus NAA
Trinity	W	-62	-187
	AN	-79	-198
	BN	-102	-170
	D	-138	-271
	C	-126	-216
	All	-97	-209



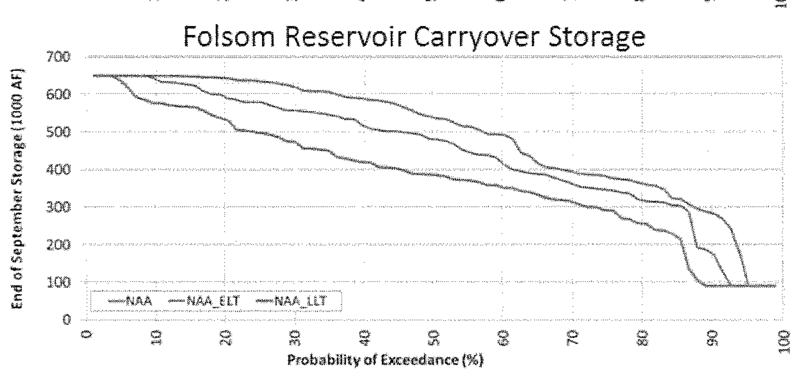
Reservoir	Year Type	NAA_ELT minus NAA	NAA_LLT minus NAA
Shasta	W	-117	-331
	AN	-199	-452
	BN	-152	-340
	D	-154	-463
	C	-192	-377
	All	-154	-386



Reservoir	Year Type	NAA_ELT minus NAA	NAA_LLT minus NAA
Oroville	W	-296	-588
	AN	-225	-460
	BN	-229	-513
	D	-180	-296
	C	-54	-159
	All	-213	-430



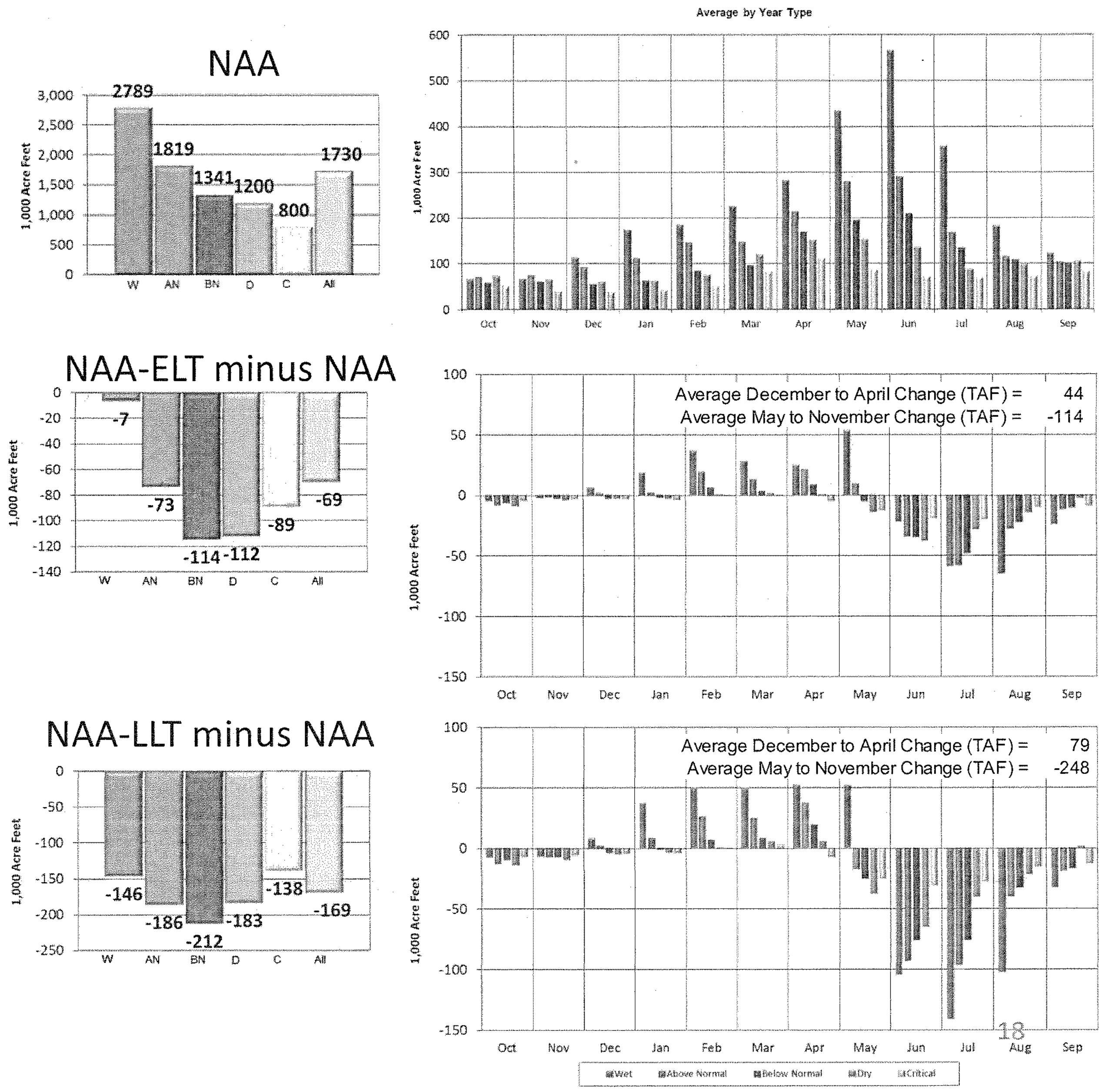
Reservoir	Year Type	NAA_ELT minus NAA	NAA_LLT minus NAA
Folsom	W	-42	-115
	AN	-54	-128
	BN	-58	-136
	D	-43	-112
	C	-43	-68
	All	-47	-113



Inflow and Carryover Storage in the San Joaquin River Basin

San Joaquin Valley reservoirs are depicted with an overall decrease in annual runoff with some shifting of runoff from spring to winter, but mostly just decreases in spring runoff due to a decline in snowmelt runoff during late spring[5]. Figure 3 illustrates the assumed effects of climate change upon inflow to Millerton Lake.

Figure 3. Projected Inflow to Millerton Lake –NAA, NAA-ELT and NAA-LLT



The hydrology differences imposed in the NAA Scenarios of the Friant Division are described above, and its appropriateness may be subject to additional debate and Alternative assumptions. However, our review found that implementation of Millerton Reservoir inflow as affected by climate change was improperly performed.

---

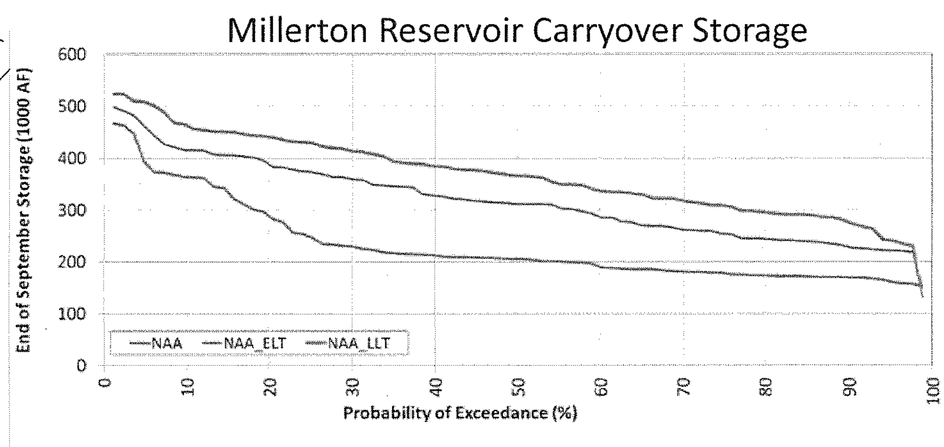
[5] BDCP Appendix 5A.2

Inflow to Millerton Reservoir in this version of CalSim is input in three separate time series for purposes of depicting the hydrology of potential upper basin reservoirs. Climate change hydrology was inconsistently incorporated at Millerton Reservoir and misapplied to the water supply and flood control operations. The result is an unrealistic operation for river releases and canal diversions. Figure 3 illustrates the projected ELT and LLT changes in Millerton Reservoir inflow incorporated in these studies. On face value of the input data, regardless of Friant Dam river release assumptions the effect of climate change at Millerton Lake will affect water deliveries.

Evidence of the inconsistent inflow problem is shown in the result for the comparison of carryover storage of Millerton Reservoir under the NAA, NAA-ELT, and NAA-LLT Scenarios (Figure 4). Carryover storage is higher in the ELT and LLT Scenarios due to climate change effects to inflow incorporated in reservoir operations but not in the computation of water supply deliveries. Thus, water deliveries are suppressed and the reservoir ends the year with greater storage.

Figure 4. Millerton Reservoir Carryover Storage, NAA, NAA-ELT and NAA-LLT Scenarios

	Year Type	NAA_ELT minus NAA	NAA_LLT minus NAA
Millerton	W	56	103
	AN	82	137
	BN	99	161
	D	87	131
	C	131	166
	All	87	136



CVP Water Service Contractor's water allocations are based on available CVP supplies, Figure 5 contains exceedance probability plots of deliveries and allocation percentages to these contractors. Table 2 contains average annual allocation to these CVP Water Service Contractors. Water supplies to these contractors decrease in the ELT and LLT relative to NAA Conditions.

Table 2. CVP Water Service Contractor Allocation Summary

	NAA	NAA-ELT	NAA-LLT
North of Delta Agricultural Service Contractors	61%	53%	46%
South of Delta Agricultural Service Contractors	48%	44%	39%
North of Delta M&I Contractors	85%	81%	77%
South of Delta M&I Contractors	79%	77%	74%

CVP Sacramento River Settlement, San Joaquin River Exchange, and Refuge deliveries are based on Shasta Criteria and are 100% in most years and 75% in "Shasta critical" years[6]. Figure 6 contains exceedance probability charts for annual water deliveries to CVP contractors whose allocations are based on Shasta Criteria. In the NAA-ELT and NAA-LLT modeling scenarios, the Sacramento River Settlement and Refuge deliveries are reduced due to water shortages that occur more often under the climate change assumptions.

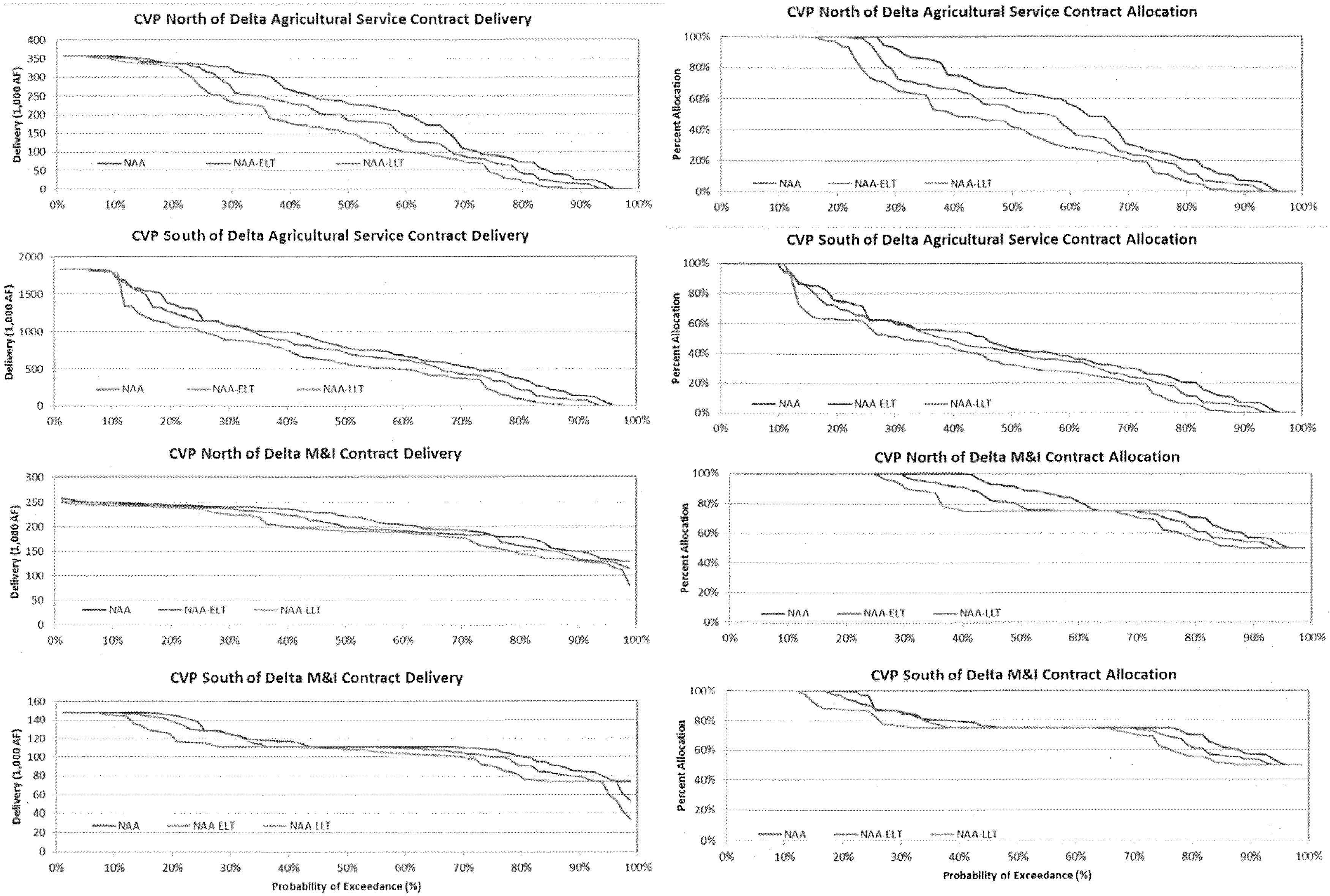
SWP Water Supply

Corresponding with the CVP operation is the projected operation of the SWP under No Action Conditions. These illustrations are shown to provide a comparison to SWP storage and exports, particularly during drought. A comparison of SWP exports to CVP SOD deliveries shows that each project exports about the same amount of water during drought.

Average annual SWP Table A water supply allocations are 62% for NAA, 61% for NAA-ELT, and 57% for NAA-LLT. Figure 7 contains an exceedance probability plot summary of SWP deliveries. SWP North of Delta deliveries to the Feather River Service Area in both the ELT and LLT are less than NAA during about 10% of the time.

[6] A "Shasta critical" year is determined when the forecasted full natural inflow into Shasta Lake is equal to or less than 3.2 million acre-feet.

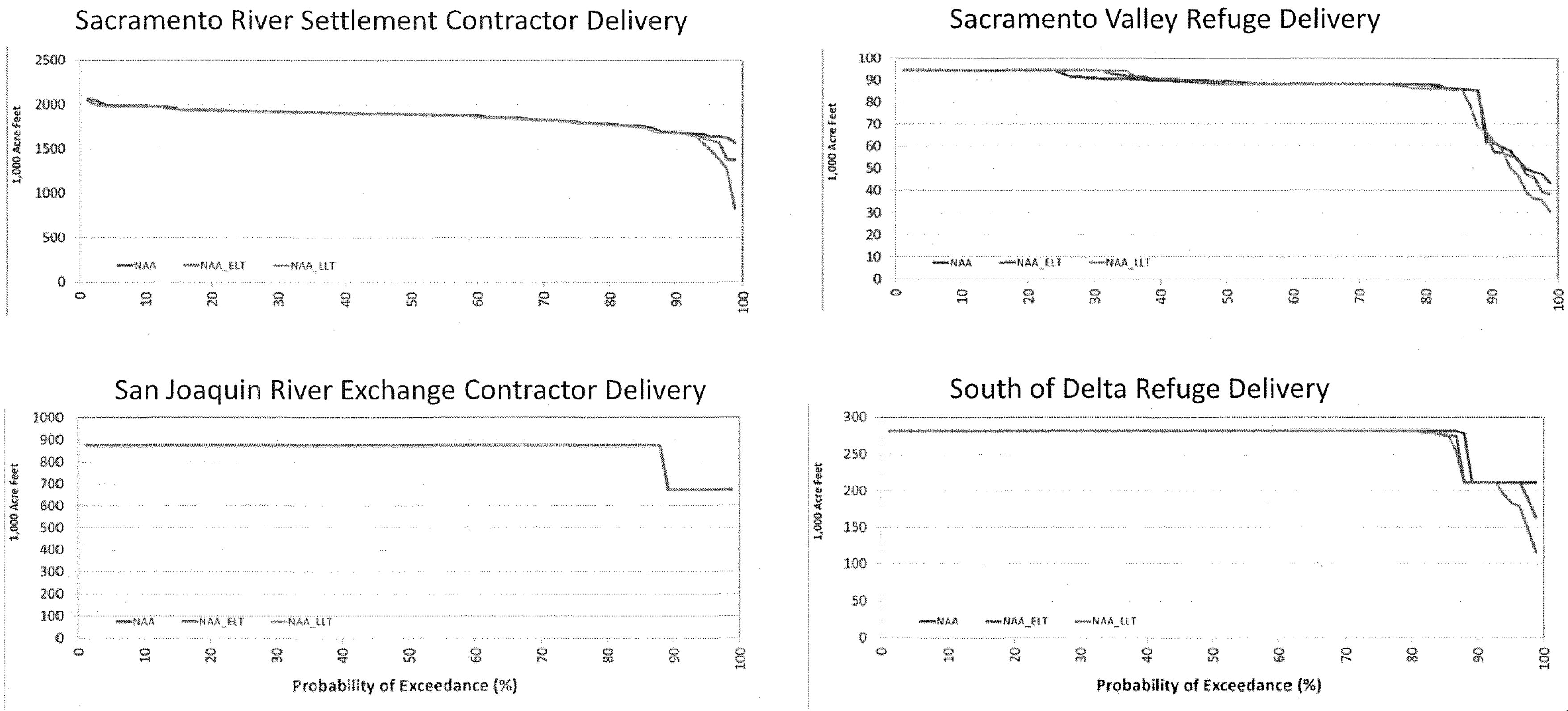
Figure 5. CVP Water Service Contractor Delivery Summary



RECIRC2654

NDWA-38

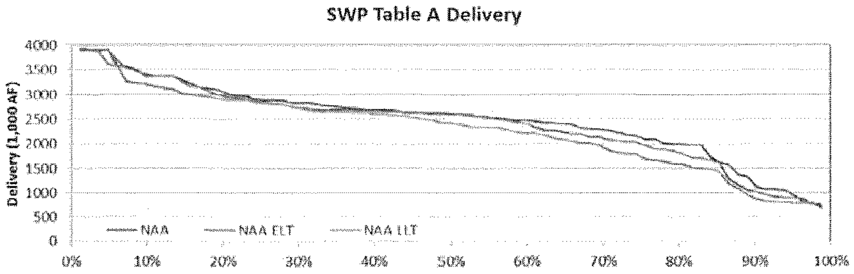
Figure 6. CVP Contractor Delivery Summary for Contractors with Shasta Criteria Allocations

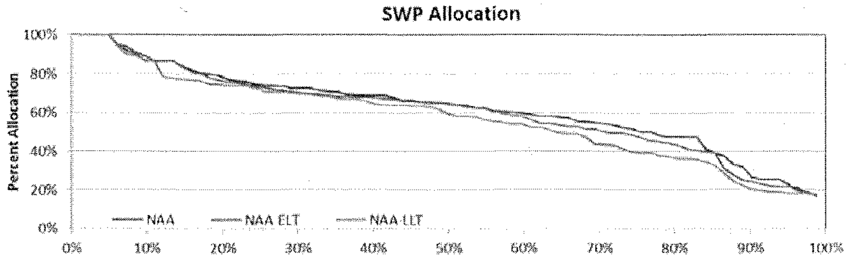


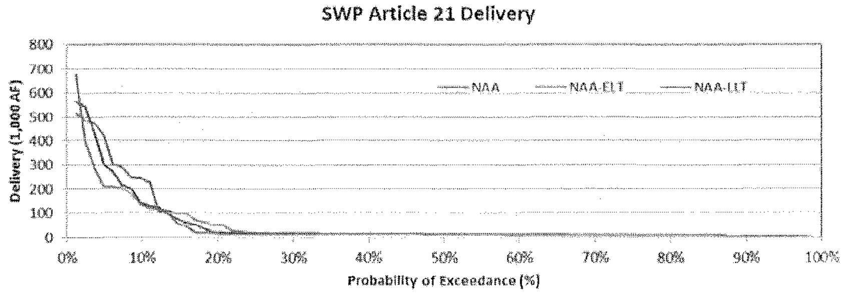
RECIRC2654

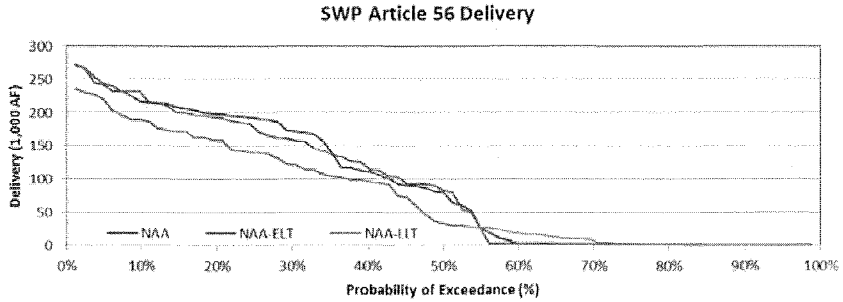
NDWA-38

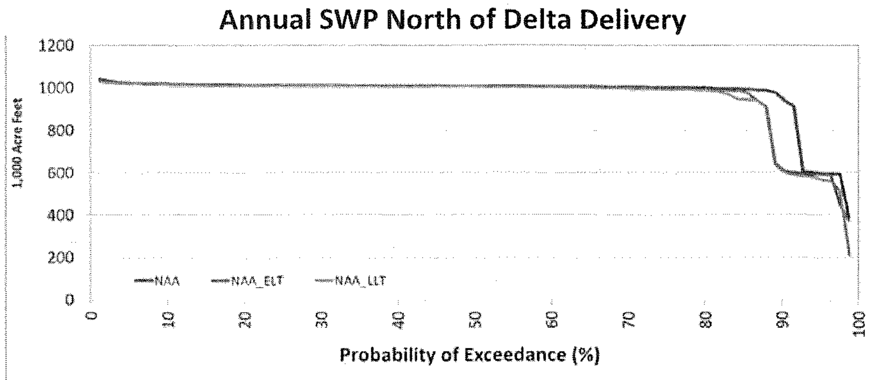
Figure 7. SWP Delta Delivery Summary











RECIRC2654

CVP/SWP Exports
Exports of the CVP and SWP have been projected to change due to a combination of climate change effects on water availability (primary effect), flow requirements for salinity control (sea level rise), additional in-basin water demands, and to a small extent greater export potential (DMC-CA intertie). Figure 8 illustrates the simulation of CVP exports and combined CVP/SWP exports under NAA, NAA-ELT, and NAA-LLT Scenarios. Under NAA average annual CVP exports are about 2.24 MAF (2.18 at Jones PP) and are about 100 TAF less in the NAA-ELT Scenario and 230 TAF less in the NAA-LLT. Annual average SWP exports are about 2.61 MAF in the NAA and are 68 TAF less in the NAA-ELT and 212 TAF less in the NAA-LLT. Annual average combined CVP/SWP exports are about 4.9 MAF in the NAA modeling (Figure 9) and about 170 TAF and 460 TAF less in the NAA-ELT and NAA-LLT respectively.

Figure 8. CVP Exports at Jones PP, NAA, NAA-ELT and NAA-LLT

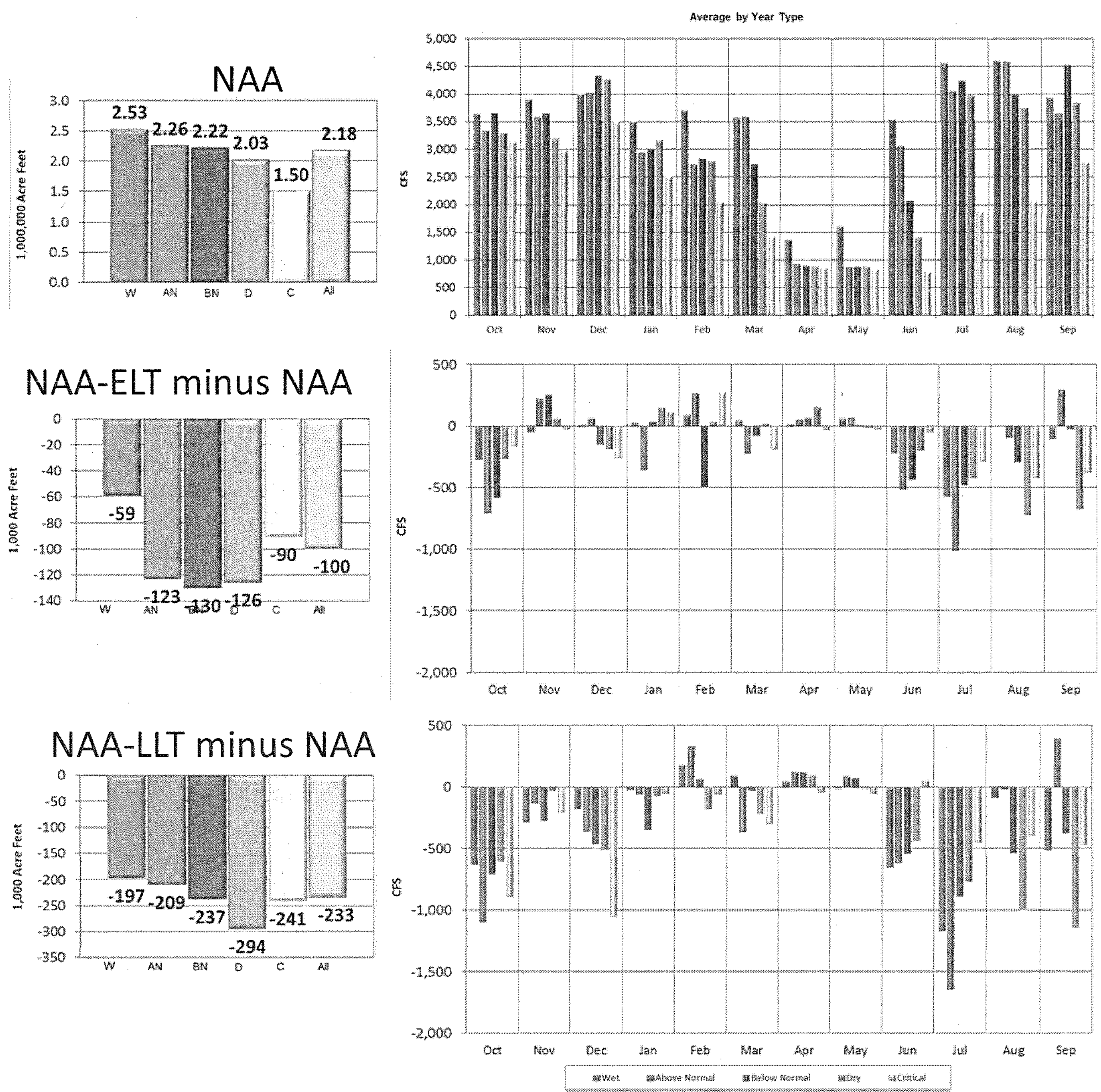
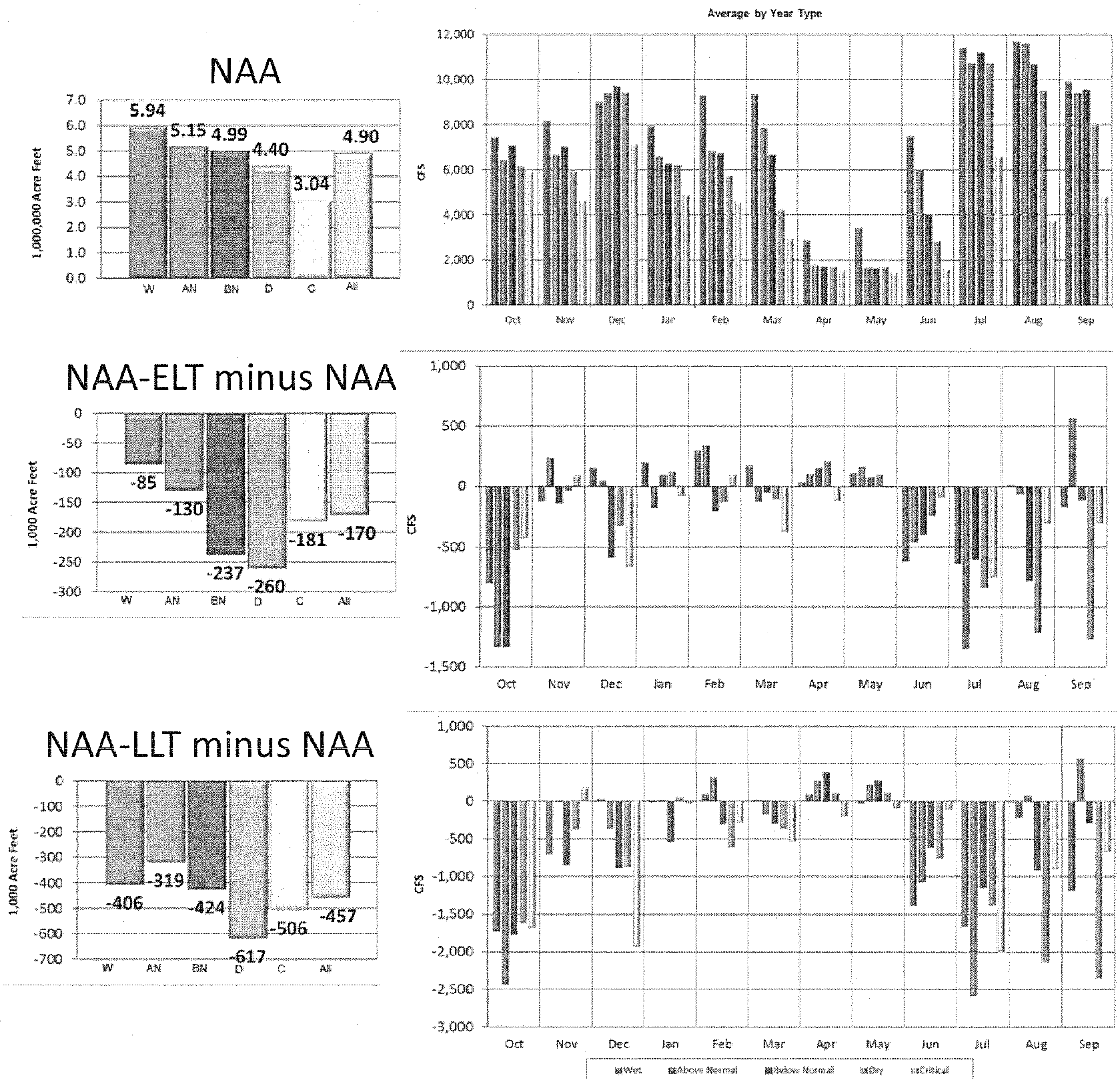


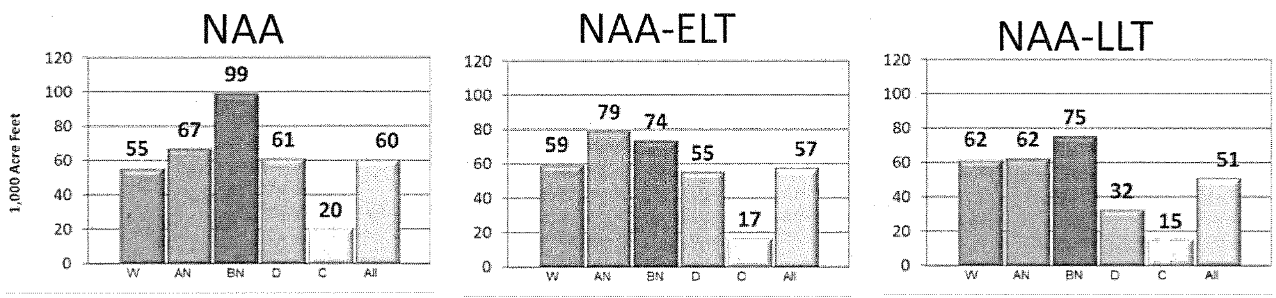
Figure 9. Total CVP/SWP Exports, NAA, NAA-ELT and NAA-LLT



Joint Point of Diversion

The NAA Alternatives do not make use of Joint Point of Diversion (JPOD), however CVP water is pumped at Banks to satisfy the Cross Valley Canal (CVC) contracts. **Figure** 10 shows annual Banks wheeling for CVC for the NAA, NAA-ELT and NAA-LLT.

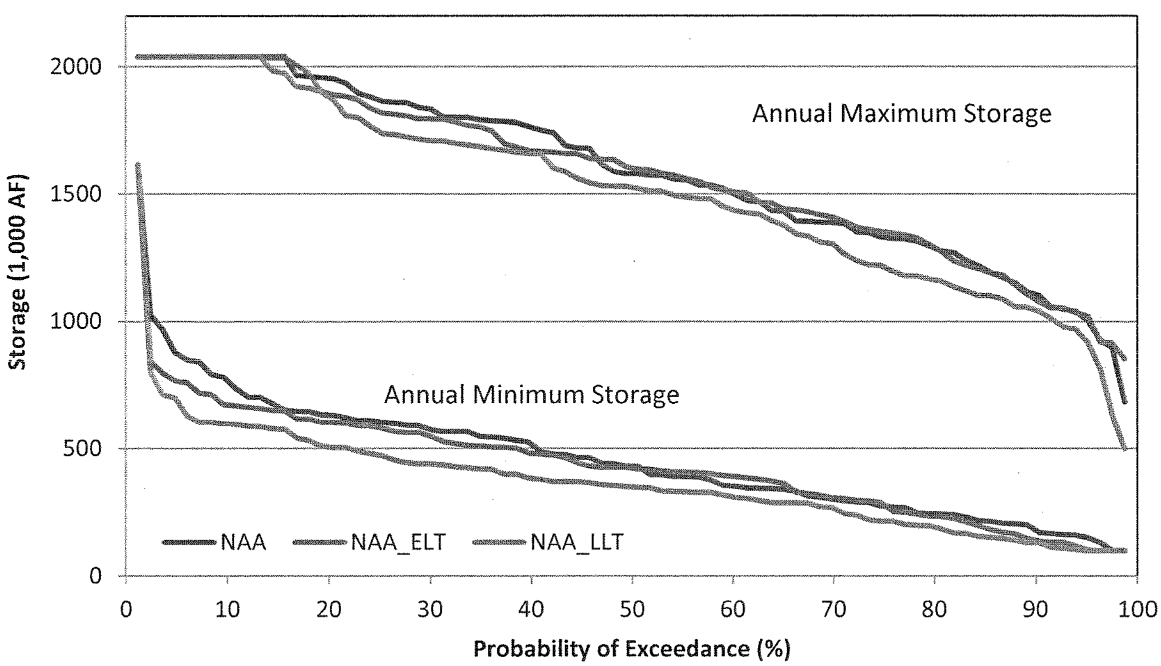
Figure 10. Cross Valley Canal Wheeling at Banks



San Luis Reservoir Operations

Modeling protocols will use San Luis Reservoir to store water when available and provide supply as exports are constrained by hydrology or regulatory constraints. Figure 11 illustrates the projected operation of San Luis Reservoir under the NAA, NAA-ELT, and NAA-LLT Scenarios. The annual maximum storage shows that the ability to fill San Luis Reservoir is somewhat similar for NAA and NAA-ELT but with less ability to fill in the NAA-LLT. The frequency of a low annual low point of San Luis Reservoir is exacerbated in the NAA-LLT Scenario. In all the Scenarios, San Luis Reservoir is heavily exercised. As currently projected, San Luis Reservoir will only fill as the result of very favorable hydrologic conditions including the availability of spill water from Friant or the Kings River system that offsets DMC water demands at the Mendota Pool.

Figure 11. San Luis Reservoir Storage – NAA, NAA-ELT and NAA-LLT



Sacramento River Temperature

CalSim II results, along with meteorological data, are used in temperature models that simulate reservoir temperature and river temperature. The BDCP modeling provided by DWR for review included the Sacramento

River temperature model and results for the No Action and Alternatives. Each BDCP Alternative used temperature target criteria for the upper Sacramento River as is used for the Existing Conditions modeling scenario. Equilibrium temperatures, a calculated model input that approximately depicts the effective air temperature for interaction with water temperature in the model, between Shasta and Gerber are increased by an annual average of 1.6°F for the ELT Scenarios and by 3.3°F for LLT Scenarios. Figure 12 contains monthly exceedance probability charts of temperature at Bend Bridge in the Sacramento River for April through October for the Existing Conditions and NAA-ELT Scenarios. There is about a 1 degree increase in average monthly temperature for the April through October period. Figure 13 contains similar information as Figure 12, but compares modeling results for the NAA-LLT and Existing Conditions Scenarios, there is often a 2°F increase in the NAA-LLT relative to Existing Conditions.

The increase in equilibrium temperatures combined with decreases in storage would lead to water temperature conditions that would likely not achieve the assumed objectives. Figure 12 and Figure 13 illustrate an increase in the probability that a water temperature target of 56°F would be exceeded at Bend Bridge under both the NAA-ELT and NAA-LLT Scenarios. The probability of exceedance increases approximately 5% to 20% depending on the month for the NAA-ELT Scenario and approximately 10% to 40% for the NAA-LLT Scenario.

Figure 12. Temperature Exceedance Sacramento River at Bend Bridge Existing, No Action Alternative, ELT

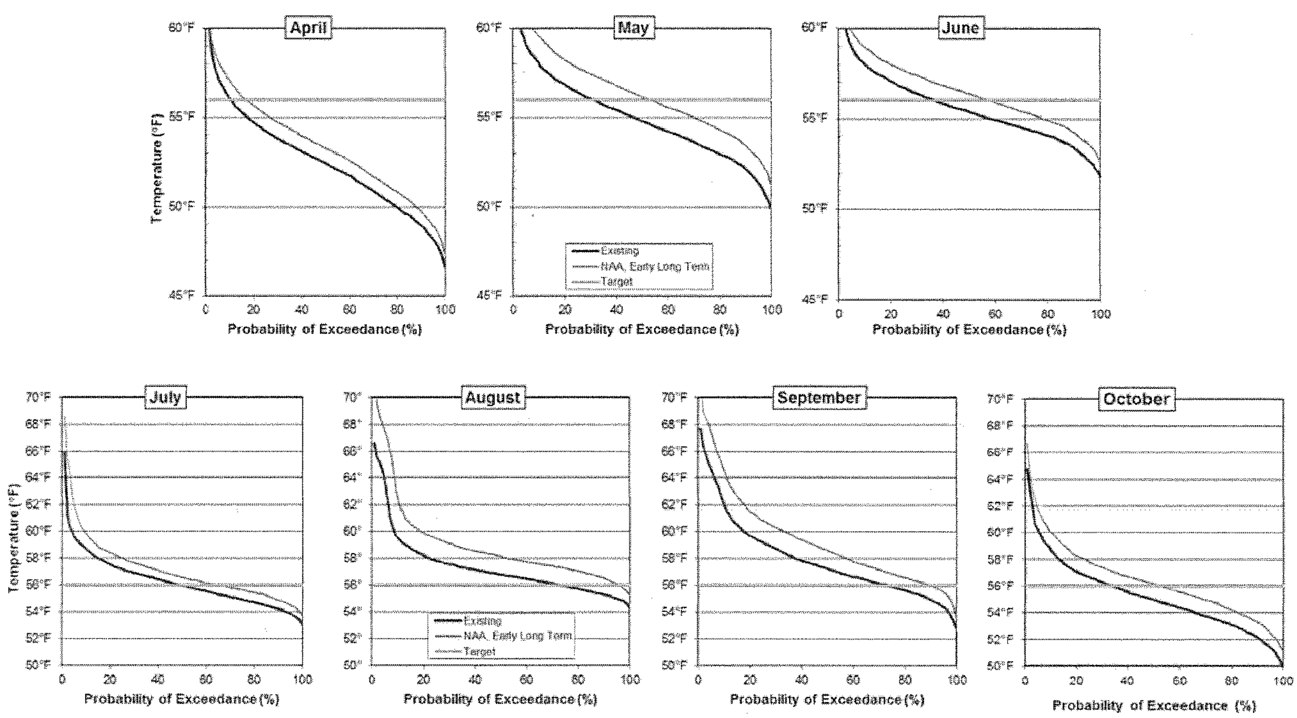
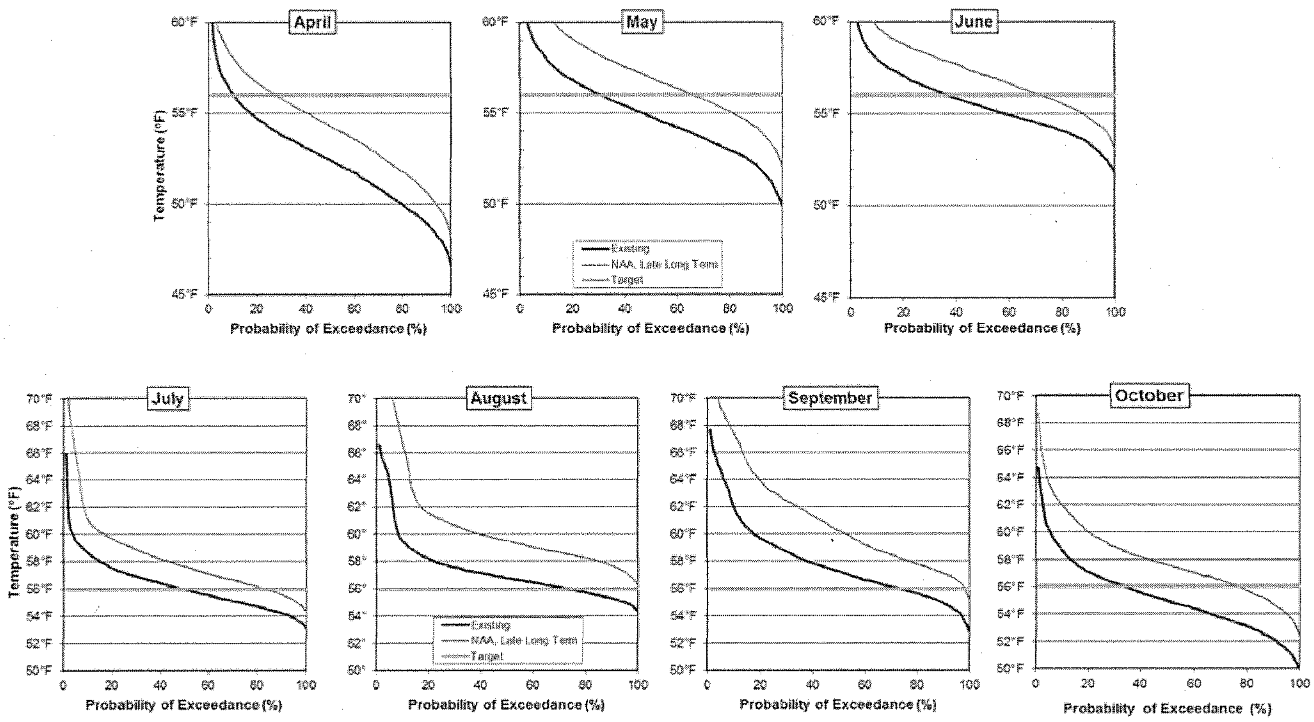


Figure 13. Temperature Exceedance Sacramento River at Bend Bridge Existing, No Action Alternative, LLT



Conclusions regarding Climate Change Assumptions and Implementation

With the predicted changes in precipitation and temperature implemented in the BDCP modeling, there is simply not enough water available to meet all regulatory objectives and water user demands. Yet the BDCP modeling continues to operate the system without any adaptation measures and thus fails to meet its objectives. In this aspect, the BDCP modeling simply does not simulate reality. For instance, if the assumed climate conditions occur in reality the following adaptation measures have been discussed: (1) as precipitation patterns change, operational rules regarding when to release water from reservoirs for flood protection should be updated; (2) during severe droughts, emergency drought declarations could call for mandatory conservation and/or relaxation of regulatory criteria; and (3) if droughts become more frequent, the CVP and SWP would likely revisit the rules by which they allocate water during shortages and operate more conservatively in wetter years. The BDCP modeling is useful in that it reveals hard decisions that must be made. But in the absence of making those decisions, the modeling results themselves are not informative, particularly during drought conditions. When conditions are projected to be so dire without the project, the effects of the project could be obscured simply because conditions cannot get any worse (i.e., storage cannot be reduced below its minimum level).

2.2 BDCP Operation

The next step of our analysis centered on reviewing BDCP modeling of the with project scenarios as described in the December 2013 Draft BDCP and described as Alternative 4 in the Draft EISR.

Description of the BDCP Project

At the time of review, this Alternative was coined Alt 4 and represented a dual conveyance facility. The two DWR analyses reviewed were identified as:

- Alt 4 (dual conveyance) – ELT

  The same system demands and facilities as described in the NAA-ELT with the following primary changes: three proposed North Delta Diversion (NDD) intakes of 3,000 cfs each; NDD bypass flow requirements; additional positive OMR flow requirements and elimination of the San Joaquin River I/E ratio and the export restrictions during VAMP; modification to the Freemont Weir to allow additional seasonal inundation and fish passage; modified Delta outflow requirements in the spring and/or fall (defined in the Decision Tree discussed below); movement of the Emmaton salinity standard; redefinition of the EI ratio; and removal of current permit limitations for the south Delta export facilities. Set within the ELT environment.
- Alt 4 (dual conveyance) – LLT

  The same as the previous Scenario except established in the LLT environment.

The BDCP contemplates a dual conveyance system that would move water through the Delta's interior or around the Delta through an isolated conveyance facility. The BDCP CalSim II files contained a set of studies evaluating the projected operation of a specific version of such a facility. The Alternative was imposed on two baselines: the NAA-ELT scenario and the NAA-LLT scenario.

The changes (benefits or impacts) of the operation due to Alt 4 are highly dependent upon the assumed operation of not only the BDCP facilities and the changed regulatory requirements associated with those facilities, but also by the assumed integrated operation of the CVP and SWP facilities. The modeling of the NAA Scenarios introduced a significant change in operating protocols suggested primarily for reaction to climate change. We consider the extent of the reaction not necessarily representing a likely outcome, and thus have little confidence that the NAA baselines are a "best" (or even valid) representation of a baseline from which to compare an action Alternative. However, a comparison review of the Alternative to the NAA baselines illuminates operational issues in the BDCP modeling and provides insight as to where benefits or impacts may occur as additional studies are provided.

Since the effects of climate changes are more severe in the LLT than in the ELT, this review focuses on the ELT modeling because the results are less skewed by the climate change assumptions and problems.

BDCP's Alternative 4 has four possible sets of operational criteria, termed the Decision Tree, that differ based on the "X2" standards[7] that they contemplate:

- Low Outflow Scenario (LOS), otherwise known as operational scenario H1, assumes existing spring X2 standard and the removal of the existing fall X2 standard;
- High Outflow Scenario (HOS), otherwise known as H4, contemplates the existing fall X2 standard and providing additional outflow during the spring;
- Evaluated Starting Operations (ESO), otherwise known as H3, assumes continuation of the existing X2 spring and fall standards;
- Enhanced spring outflow only (not evaluated in the December 2013 Draft BDCP), scenario H2, assumes additional spring outflow and no fall X2 standards.

While it is not entirely clear how the Decision Tree would work in practice, the general concept is that the prior to operation of the new facility, implementing authorities would select the appropriate Scenario (from amongst the four choices) based on their evaluation of targeted research and studies to be conducted during planning and construction of the facility.

---

[7] X2 is a salinity standard that requires outflows sufficient to attain a certain level of salinity at designated locations in the Delta at certain times of year.

For our analysis, we reviewed the HOS (or H4) scenario because the BDCP[8] indicates that the initial permit will include HOS operations that may be later modified at the conclusion of the targeted research studies. The HOS includes the existing fall X2 requirements but adds additional outflow requirements in the spring. We reviewed the model code and discussed the operations with DWR and Reclamation, who acknowledged that although the SWP was bearing the majority of the responsibility for meeting the additional spring outflow in the modeling, the responsibility would need to be shared with the CVP[9]. In subsequent discussions, DWR and Reclamation have suggested that the additional water may be purchased from other water users. However, the actual source of water for the additional outflow has not been defined. Since the BDCP modeling assumes that SWP bears the majority of the responsibility for meeting the additional outflow, yet this is not how the project will be operated in reality, our review of the BDCP modeling results for HOS is limited to the evaluation of how the SWP reservoir releases on the Feather River translate into changes in Delta outflow and exports.

Our remaining analysis examines the ESO (or H3) scenario (labeled Alt 4-ELT or Alt 4-LLT in this section) because it employs the same X2 standards as are implemented in the No Action Alternatives NAA-ELT and NAA-LLT. This allows us to focus our analysis on the effects of the BDCP operations independent of the possible change in the X2 standard.

High Outflow Scenario (HOS or H4) Results

In Alt 4-ELT H4 Feather River flows during wetter years are increased more than 3,000 cfs in April and May and then decreased in most year types during July and August, while September flow is only decreased in wetter years. Figure 14 shows average monthly change in Feather River flow by water year type. Accompanying the changes in Feather River flow are changes in Oroville Reservoir storage levels, Figure 15 contains average monthly changes in Oroville storage. Alt4-ELT H4 end of June storage in Oroville during wetter years is about 480 TAF lower than the NAA-ELT while critical year storage is about 400 TAF higher. Counter to the reduction in Oroville storage, CVP average upstream carryover storage increases about 80 TAF and critical year increases by 380 TAF. Figure 16 contains average monthly changes in Delta outflow, increases in Feather River spring time flows are generally not used to increase Delta outflow, but are allowed to support increases in Delta exports.

Figure 17 displays changes in average monthly Delta exports, there are increases when diverting higher upstream spring releases in wetter years, while there are decreases during summer months in most years. Figure 18 contains an average annual summary of project deliveries, total CVP deliveries increase by about 70 TAF while SWP deliveries decrease by about 100 TAF. Dryer year SWP deliveries decrease by 250 to 400 TAF, while wet year deliveries increase by 200 TAF. Total CVP deliveries increase in wetter years by exporting increased releases from Oroville.

The overall effect of the HOS appears to be increases in Oroville releases that support both CVP and SWP exports in wetter years, with modest increases in Delta outflow. There is also a decrease in SWP reliability through large delivery reductions in dryer years accompanied by Oroville storage increases. In addition to increases in dry and critical year storage in Oroville, total CVP dry and critical year carryover increases by 100 TAF and 380 TAF respectively with negligible reductions in wetter years types.

---

[8] Draft BDCP, Chapter 3, Section 3.4.1.4.4
[9] August 7, 2013 meeting with DWR, Reclamation, and CH2M HILL

CVP and SWP obligation for providing flow to satisfy Delta outflow requirements is described in the Coordinated Operations Agreement (COA). Because the CVP and SWP share responsibility for meeting required Delta outflow based on specific sharing agreement, it doesn't seem reasonable that CVP water supplies would increase while SWP water supplies decrease under this Alternative. The manner in which this alternative is modeled is inconsistent with existing agreements and operating criteria. If the increases in outflow were met based on COA, there would likely be reductions in Shasta and Folsom storage that may cause adverse environmental impacts.

Figure 14. Changes in Feather River Flow, Alt 4 H4 ELT minus NAA-ELT

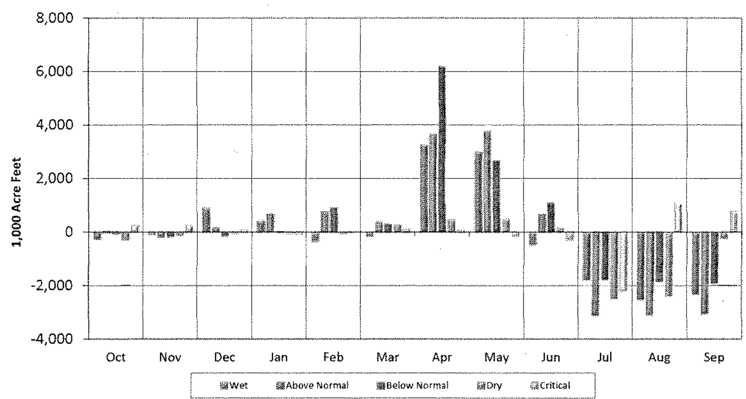


Figure 15. Changes in Oroville Storage, Alt 4 H4 ELT minus NAA-ELT

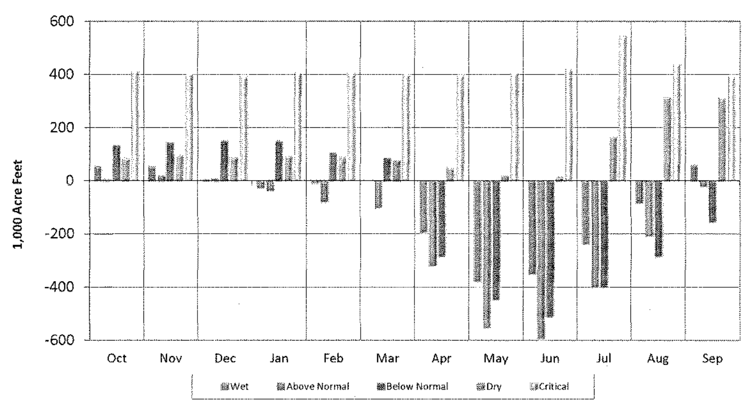


Figure 16. Changes in Delta Outflow, Alt 4 H4 ELT minus NAA-ELT

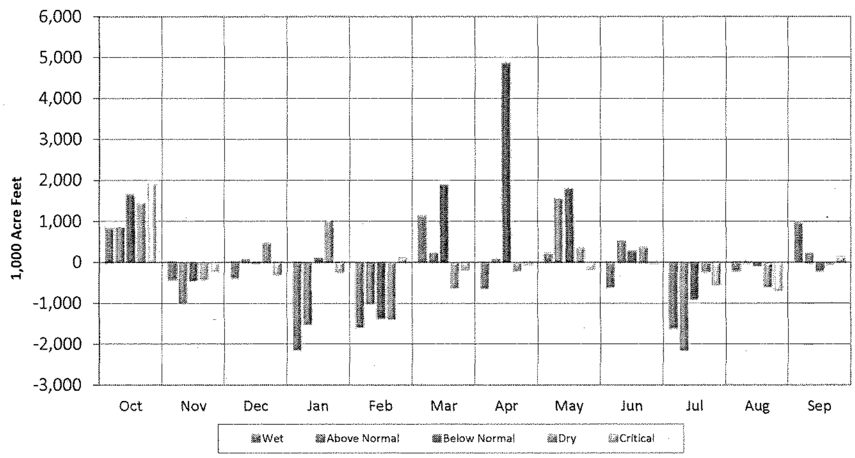


Figure 17. Changes in Delta Export, Alt 4 H4 ELT minus NAA-ELT

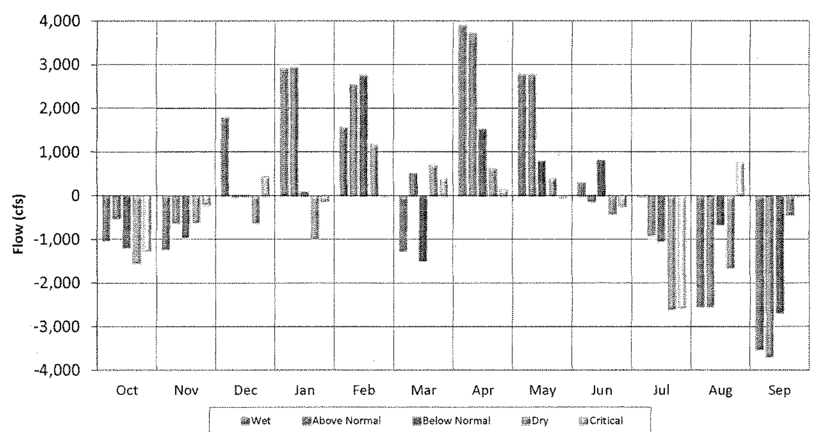
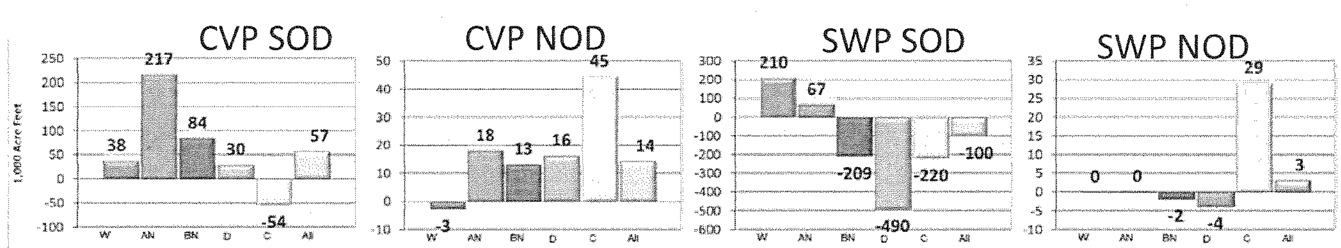


Figure 18. Changes in CVP and SWP Deliveries, Alt 4 H4 ELT minus NAA-ELT

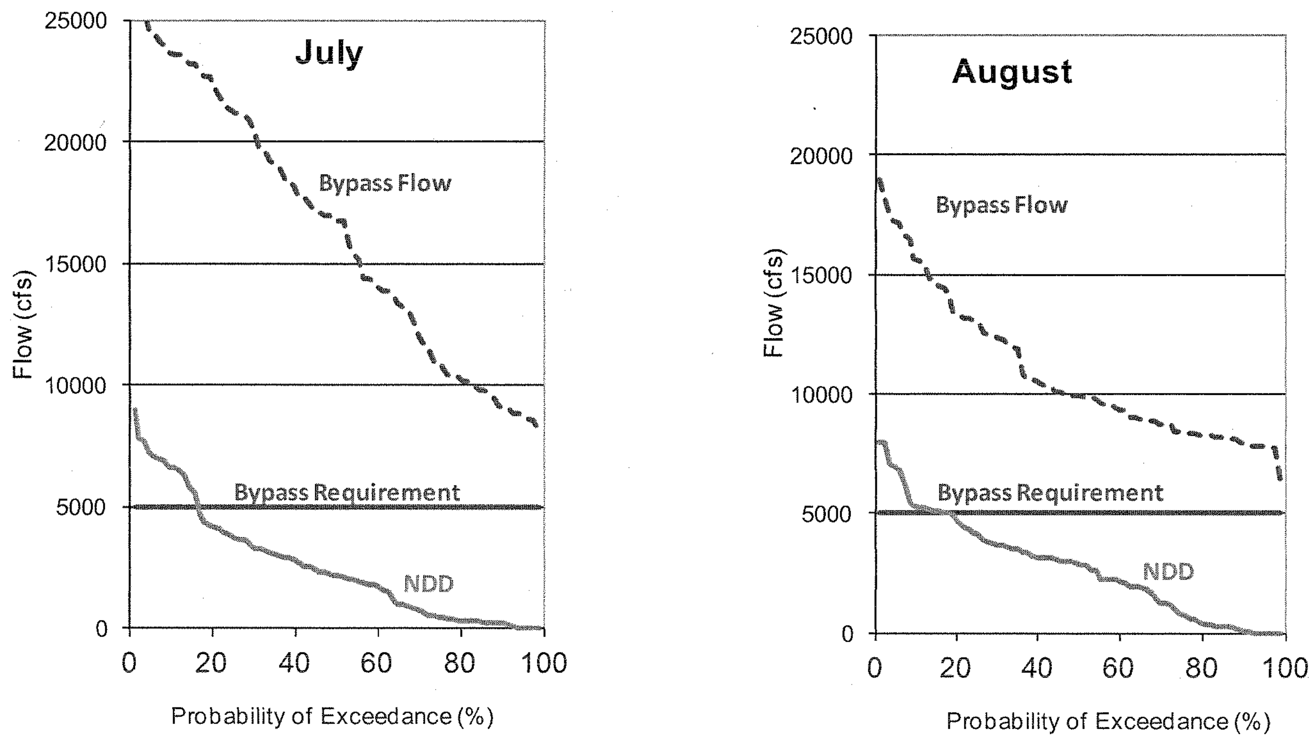


Evaluated Starting Operations (ESO or H3) Results

North Delta Diversion Intakes

Sacramento River flow below the North Delta Diversion (NDD) must be maintained above the specified bypass flow requirement, therefore the NDD rates are limited to the Sacramento River flow above the bypass requirement. Due to an error in CalSim II that specifies an unintended additional bypass requirement, modeling performed for the BDCP EIRS often bypasses more Sacramento River flow than is specified in the BDCP project description. This error has been fixed in the most recent public releases of CalSim II, but BDCP modeling has not been updated to reflect these fixes. Figure 19 contains exceedance probability plots showing the Sacramento River required bypass, Sacramento River bypass flow, NDD, and excess Sacramento River flow to the Delta as modeling for BDCP. As can be seen in Figure 19, the bypass flow is always above the bypass requirement in July and August. The BDCP version of CalSim sets a requirement for Sacramento River inflow to the Delta needed to satisfy all Delta flow, quality, and export requirements, this requirement should be removed when modeling the NDD.

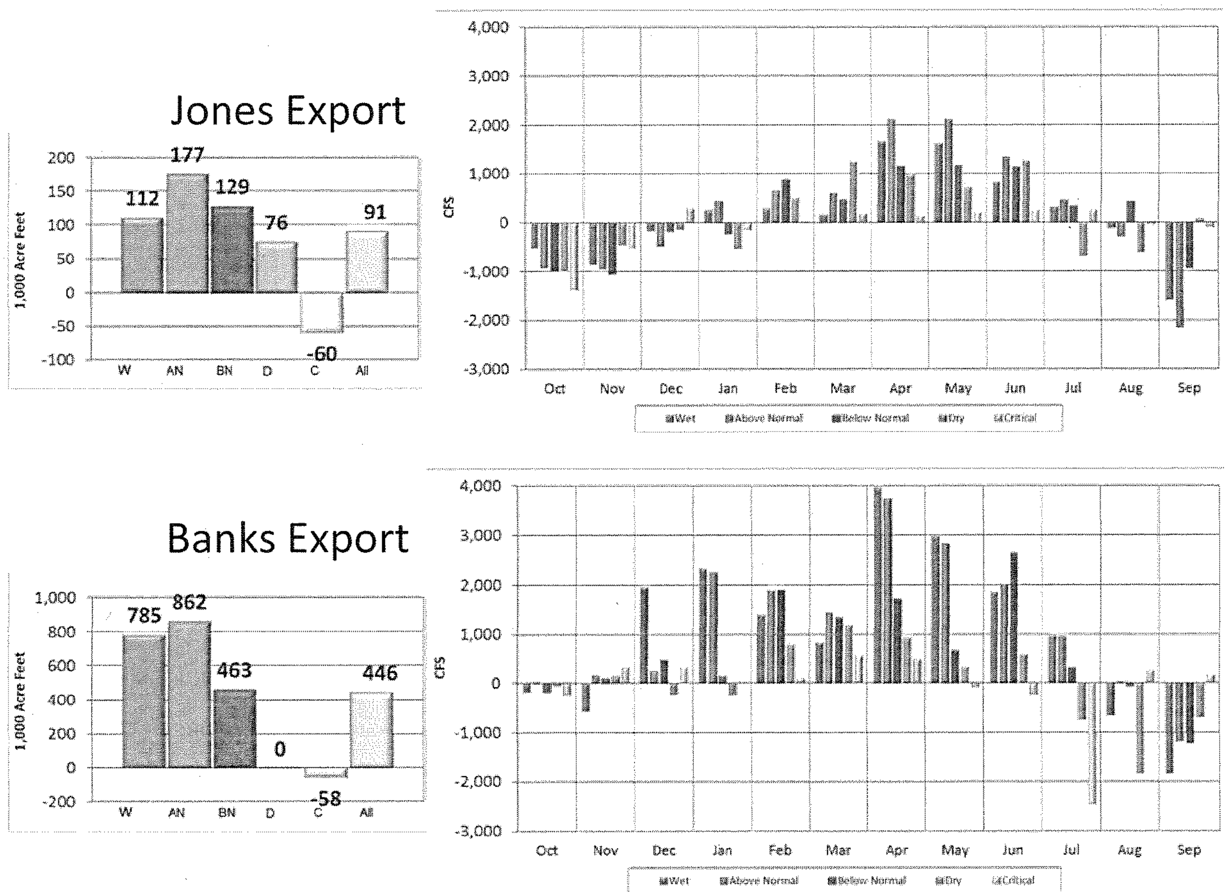
Figure 19. NDD, Bypass Requirement, Bypass Flow, and Excess Sacramento R. flow for Alt 4-ELT



CVP/SWP Exports

Overall the Alt 4 will increase exports compared to the NAA-ELT, with the majority of the increased exports realized by the SWP. Figure 20 illustrates a comparison between the NAA-ELT and Alt 4-ELT of CVP and SWP exports. On average, total combined exports under Alt 4–ELT are projected to increase by 537 TAF from 4.73 MAF to 5.26 MAF compared to the NAA-ELT.

Figure 20. Change in CVP (Jones) and SWP (Banks) Exports (Alt 4-ELT minus NAA-ELT)



With the addition of the North Delta Diversion facility, the water exported dramatically shifts from South Delta diversions to North Delta diversions. Figure 21 illustrates the change in routing of South of Delta exports under Alt 4 compared to the NAA-ELT. On average, export through the South Delta facility are projected to decrease by 2.1 MAF and the North Delta diversions will export 2.6 MAF which includes the 2.1 MAF shifted from the South Delta facility plus the additional 537 TAF of increased exports.

Figure 21. Change in Conveyance Source of Exports (Alt 4-ELT minus NAA-ELT)

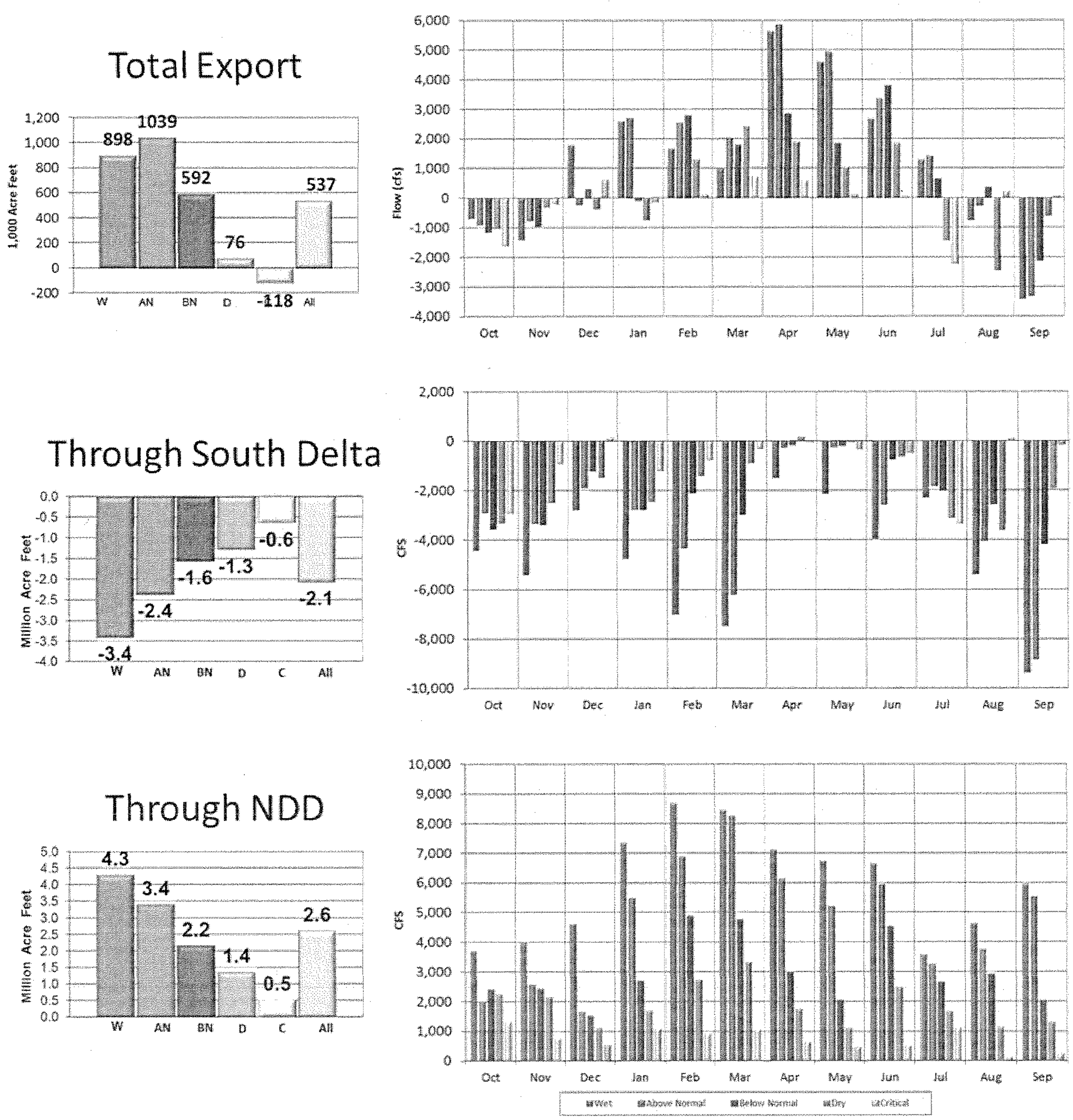
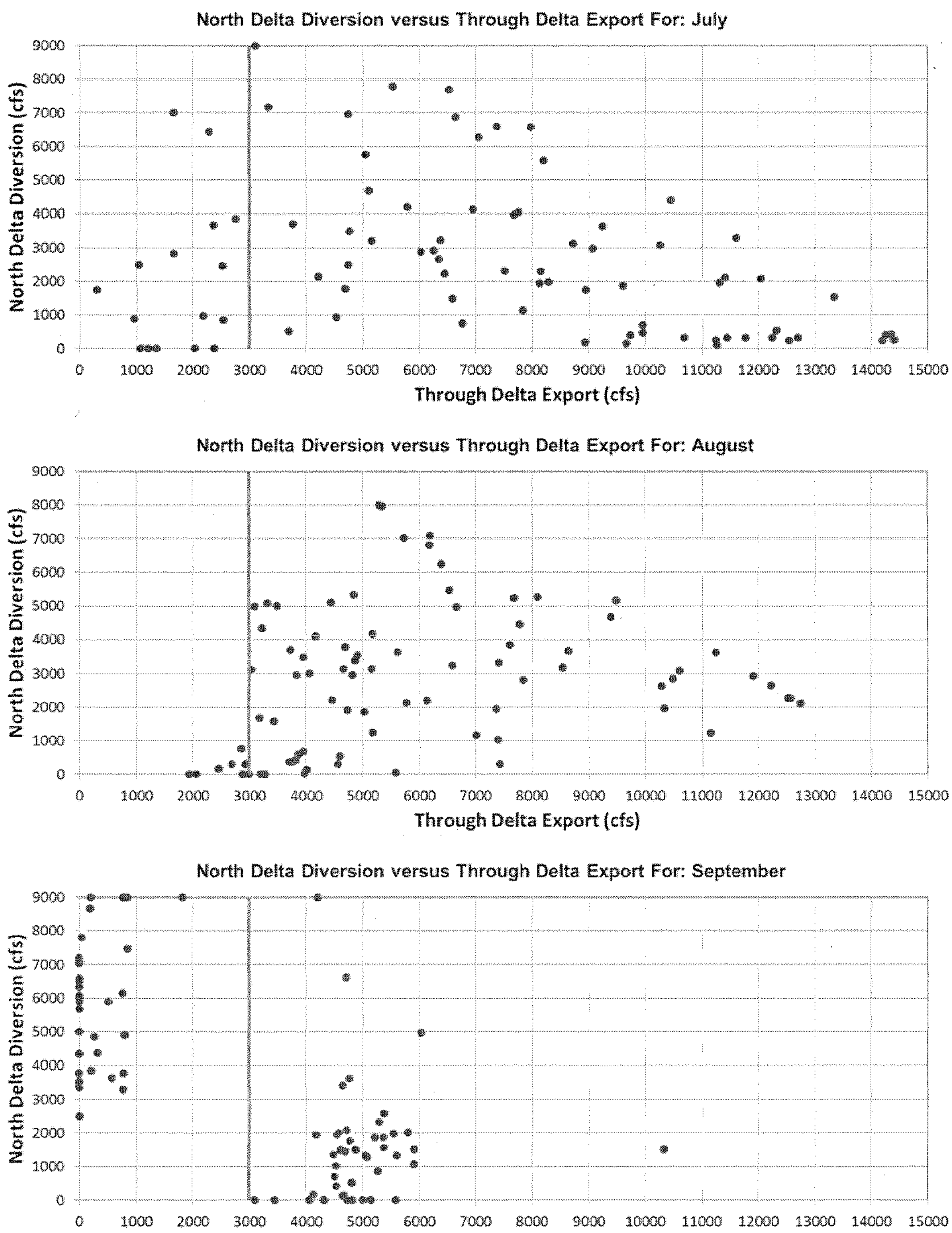


Figure 22 contains figures for July, August, and September for Alt 4-ELT that plot NDD against SDD. In the months of July to September SDD are occasionally very high, exceeding 14,000 cfs in July, with minimal NDD. This occurs due to outdated model code that imposes an instream flow requirement in Sacramento River flow below Hood in excess of the bypass criteria prescribed in the BDCP. There are numerous occurrences when bypass flows prescribed in the BDCP are exceeded and SDD are higher than expected. On the other hand, there are also many times when NDD are above minimum pumping levels and SDD are below the BDCP prescribed 3,000 cfs threshold indicated by the green line in Figure 22. Alt 4-ELT North Delta Diversion Versus South Delta Diversion for July, August, and September. For unknown reasons, the model code requiring SDD to be greater than 3,000 cfs before NDDs occur from July through September is deactivated in the BDCP modeling of this Alternative.

Figure 22. Alt 4-ELT North Delta Diversion Versus South Delta Diversion for July, August, and September

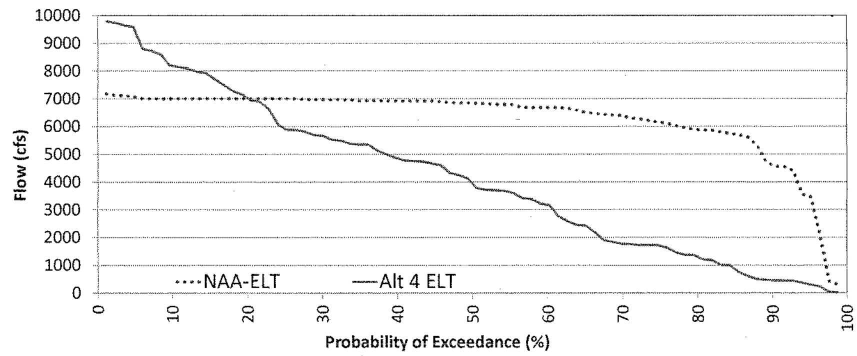


South Delta Diversion at Banks is not limited to existing permit capacity of 6,680 cfs and pumping may reach full capacity of 10,300 cfs in July, August, and September. Figure 23 contains exceedance probability charts of South

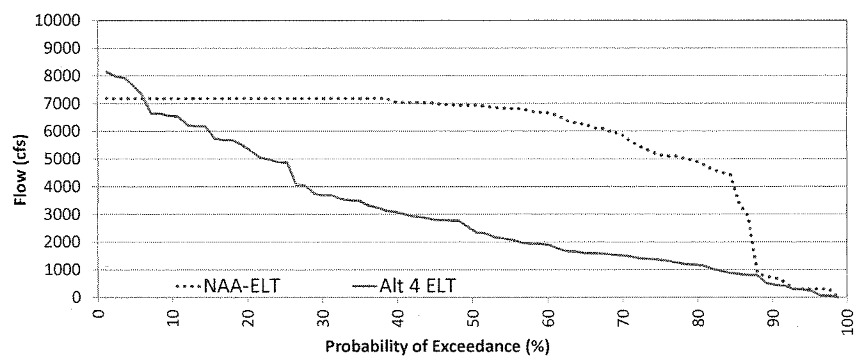
Delta Diversion at Banks for July, August, and September. The chart for July shows SDD at Banks exceeding existing permit capacity 20% of years, in August this occurs in about 7% of years. There are South Delta diversions at Banks 25% of the time in September while diversions from the Sacramento River may range from 2,500 cfs to 7,500 cfs.

Figure 23. South Delta Diversion at Banks

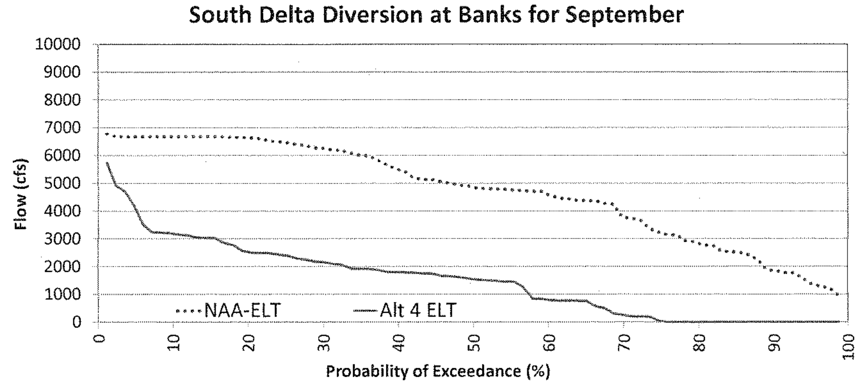
South Delta Diversion at Banks for July



South Delta Diversion at Banks for August



South Delta Diversion at Banks for September

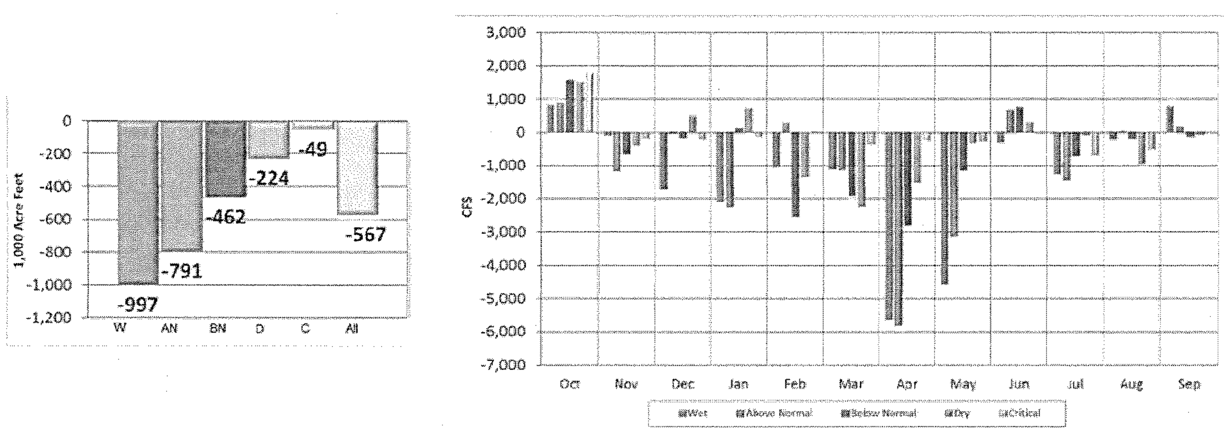


Generally exports increase during winter and spring months due to the ability to avoid fishery concerns by diverting at the North Delta rather than South Delta.

Delta Outflow

Figure 24 illustrates a comparison of Delta outflow between the NAA-ELT and Alt 4-ELT. Decreases in Delta outflow are the result of the CVP and SWP ability to increase Delta exports in Alt 4-ELT. The apparent increase in Delta outflow in October is partially due to additional export restrictions though Old and Middle River flow requirements. However, the increase in October Delta outflow is also due to an unrealistic operation of the Delta Cross Channel. The additional export restrictions cause the flow standards imposed at Rio Vista to be the controlling point in CVP and SWP operations; the water quality standards are all being met and do not require flows above the amount needed to satisfy the Rio Vista standard. Meeting the Rio Vista flow standards without closing the Delta Cross Channel gate results in releasing more water from upstream reservoirs than would otherwise be necessary. This occurs because a certain amount of the water released to meet the Rio Vista flow standards would flow into the Central Delta at location of the Delta Cross Channel gate. This water would not make it to Rio Vista and therefore would not be counted towards meeting the Rio Vista flow standards. However, due to the BDCP model's assumed restrictions on exports at this time, this water could not be pumped from the South Delta facilities and thus ends up as "extra" Delta outflow. By closing the Delta Cross Channel gate, the operators would assure that all of the water released to meet the Rio Vista flow standards would be counted towards those standards. The BDCP model's assumptions that the Delta Cross Channel gate would not be closed are not practical or a sensible operation as the operators confirmed they would close the gate during these conditions to avoid the unnecessary loss of water supplies (as was done in October and November 2013). The assumption in the BDCP model to maintain the gate in the open position causes it to overstate the amount of Delta outflow.

Figure 24. Delta Outflow Change (Alt 4-ELT minus NAA-ELT)



CVP/SWP Reservoir Carryover Storage

CVP/SWP reservoir operating criteria in the Alt4-ELT scenario differs from the NAA-ELT scenario. This difference is primarily driven by changes in both CVP and SWP San Luis Reservoir target storage. CalSim II balances upstream Sacramento Basin CVP and SWP reservoirs with storage in San Luis Reservoir by setting target storage levels in San Luis Reservoir. CalSim II will release water from upstream reservoirs to meet target levels in San Luis Reservoir and the target storage will be met as long as there is capacity to convey water and water is available in upstream reservoirs. In Alt 4 the San Luis Reservoir target storage is set very high in the spring and early summer months, and then reduced in August and set to San Luis Reservoir dead pool from September through December. This change in San Luis target storage relative to the NAA causes upstream reservoirs to be drawn down from June through August and then recuperate storage relative to the NAA by cutting releases in September; Alt 4 upstream storage then remains close to the NAA during fall months. These operational criteria cause changes in upstream cold water pool management and affect several resource areas. Figure 25, Figure 26, Figure 27, and Figure 28 contain exceedance charts for carryover storage and average monthly changes in storage by Sacramento Valley Water Year Type for North of Delta CVP and SWP reservoirs.

San Luis Reservoir Operations

In addition to changes in upstream storage conditions, changes in San Luis Reservoir target storage cause San Luis Reservoir storage to reach dead pool in many years with subsequent SOD delivery shortages. Although some delivery shortages are due to California Aqueduct capacity constraints, the largest annual delivery shortages are a result of inappropriately low target storage levels. Average annual Table A shortages due to artificially low San Luis reservoir storage levels increased from 3 TAF in the NAA-ELT scenario to 35 TAF in the Alt4-ELT scenario. (Shortages due only to a lack of South of Delta conveyance capacity were not included in these averages.) Such shortages occurred in 2% of simulated years in the NAA-ELT scenario and 23% of years in the Alt4-ELT scenario. In addition to the inability to satisfy Table A allocations, low storage levels cause loss of SWP contractors' Article 56 water stored in San Luis Reservoir. Average annual Article 56 shortages were 43 TAF in the Alt4-ELT scenario because of low San Luis storage and 5 TAF in the NAA-ELT scenario. Low San Luis storage causes Article 56 shortages in 27% of simulated years in the Alt4-ELT scenario as compared to 5% of simulated years in the NAA-ELT. Another consequence of low storage levels in San Luis Reservoir is a shift in water supply benefits from Article 21 to Table A. As seen in Figure 29 and Figure 30 San Luis Reservoir storage fills more regularly in the Alt 4-ELT scenario, but is exercised to a lower point more often.

Figure 25. Trinity Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type

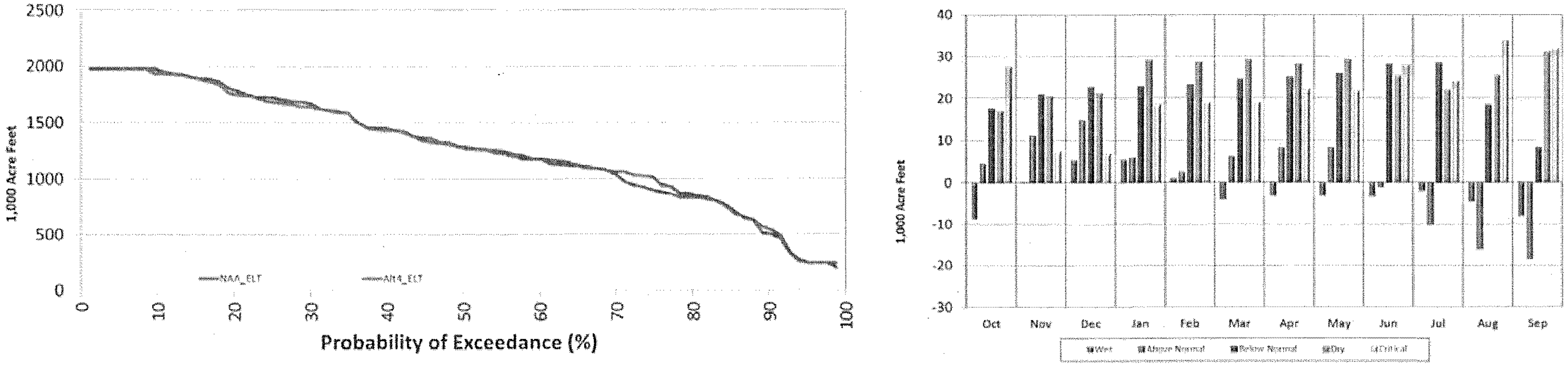
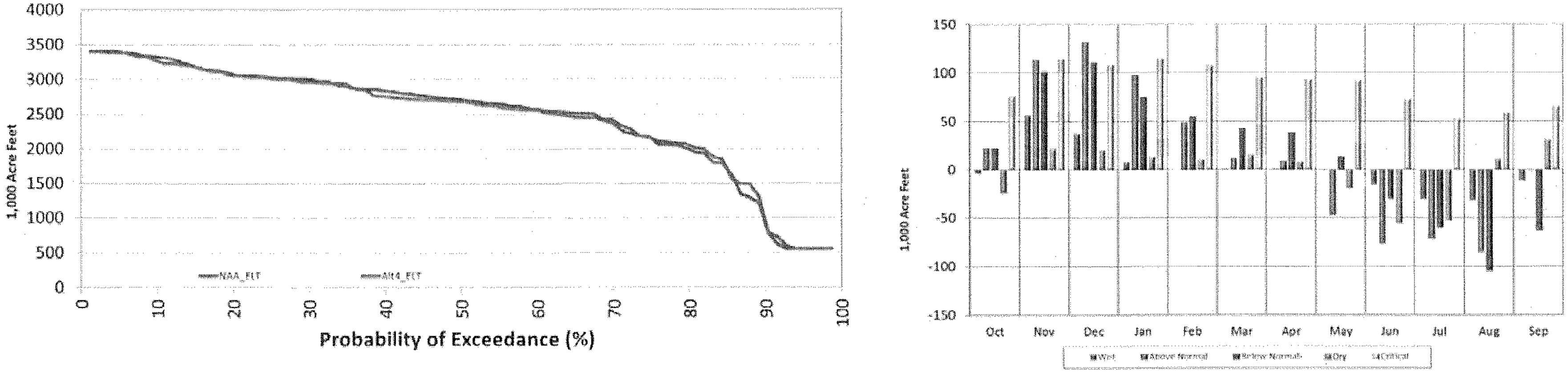


Figure 26. Shasta Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type



RECIRC2654

NDWA-38

Figure 27. Oroville Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type

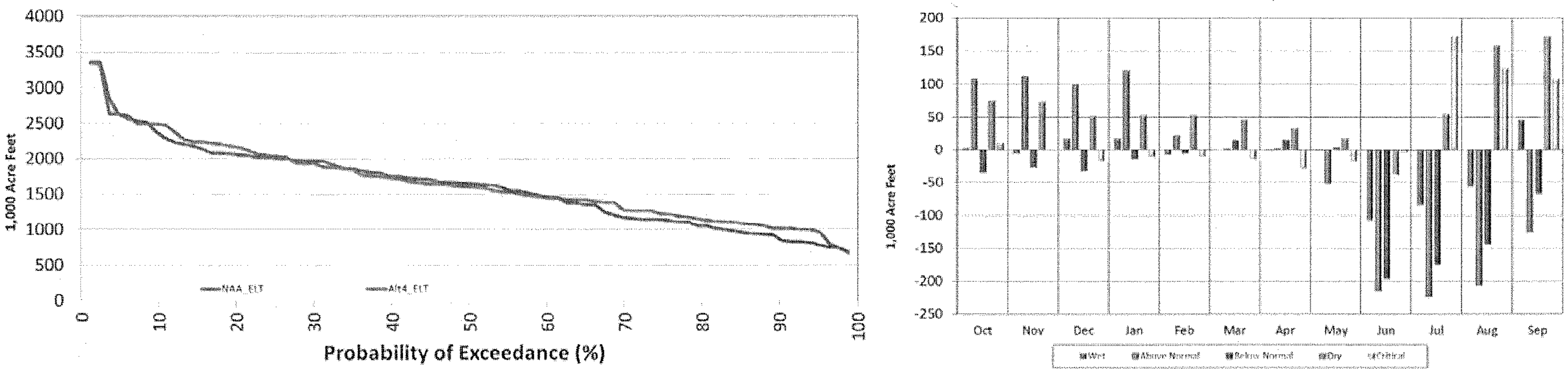
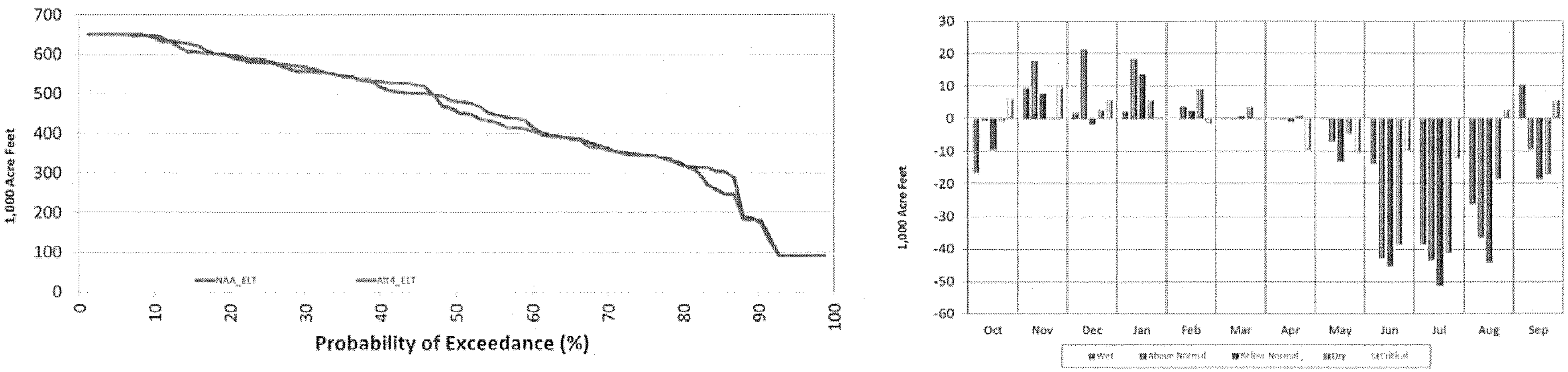


Figure 28. Folsom Reservoir Carryover Storage and Average Monthly Changes (Alt 4-ELT minus NAA-ELT) in Storage by Water Year Type



RECIRC2654

Figure 29. Federal Share of San Luis Reservoir (Alt 4-ELT and NAA-ELT)

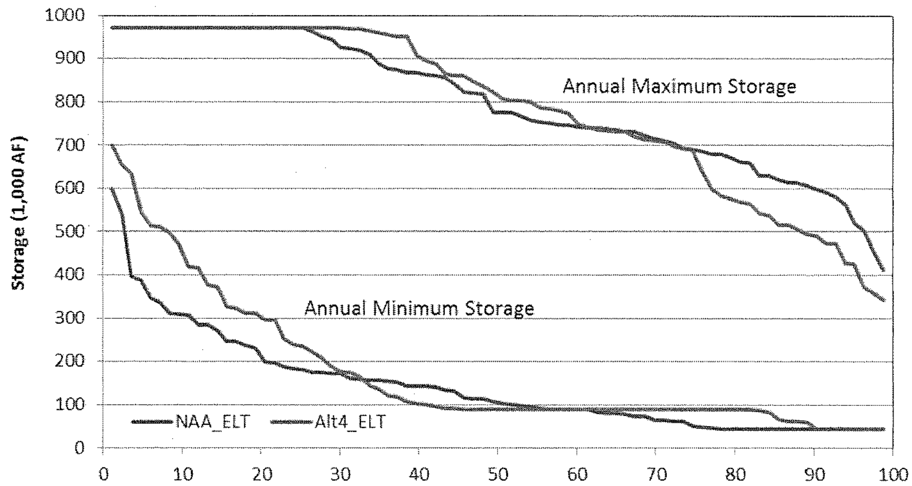
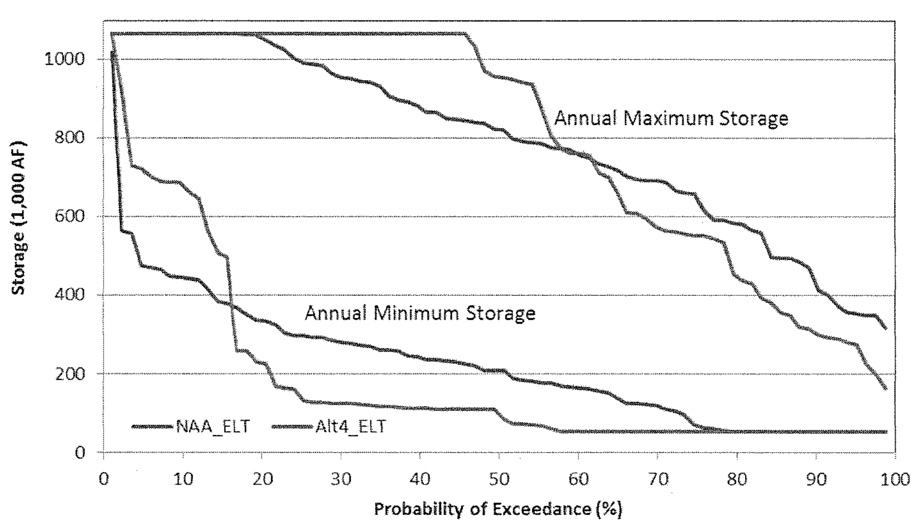


Figure 30. State Share of San Luis Reservoir (Alt 4-ELT and NAA-ELT)



CVP Water Supply

The changes in water supply to CVP customers, based on customer type and water year type is shown in Table 3. Alt 4-ELT shows an average increase of approximately 109,000 AF of delivery accruing to CVP customers with CVP SOD agricultural contractors receiving most of the benefit. Changes in Sacramento River Settlement contract deliveries are not an anticipated benefit of the BDCP, increases in these deliveries in Alt 4-ELT relative to the NAA-ELT are due to the shortages in the NAA-ELT from climate change that are reduced in Alt 4-ELT. Although the BDCP modeling demonstrates minor benefits to NOD CVP service contractors, this increase is not an anticipated benefit of the BDCP.

Consistent with modeling for the NAA-ELT Scenario, San Joaquin River Exchange Contractors receive full deliveries in accordance with contract provisions. Figure 31 compares CVP Service Contract delivery of Alt 4-ELT to the NAA-ELT Scenario. Increases in delivery generally occur in below and above normal years.

Table 3. CVP Delivery Summary (Alt 4-ELT and NAA-ELT)

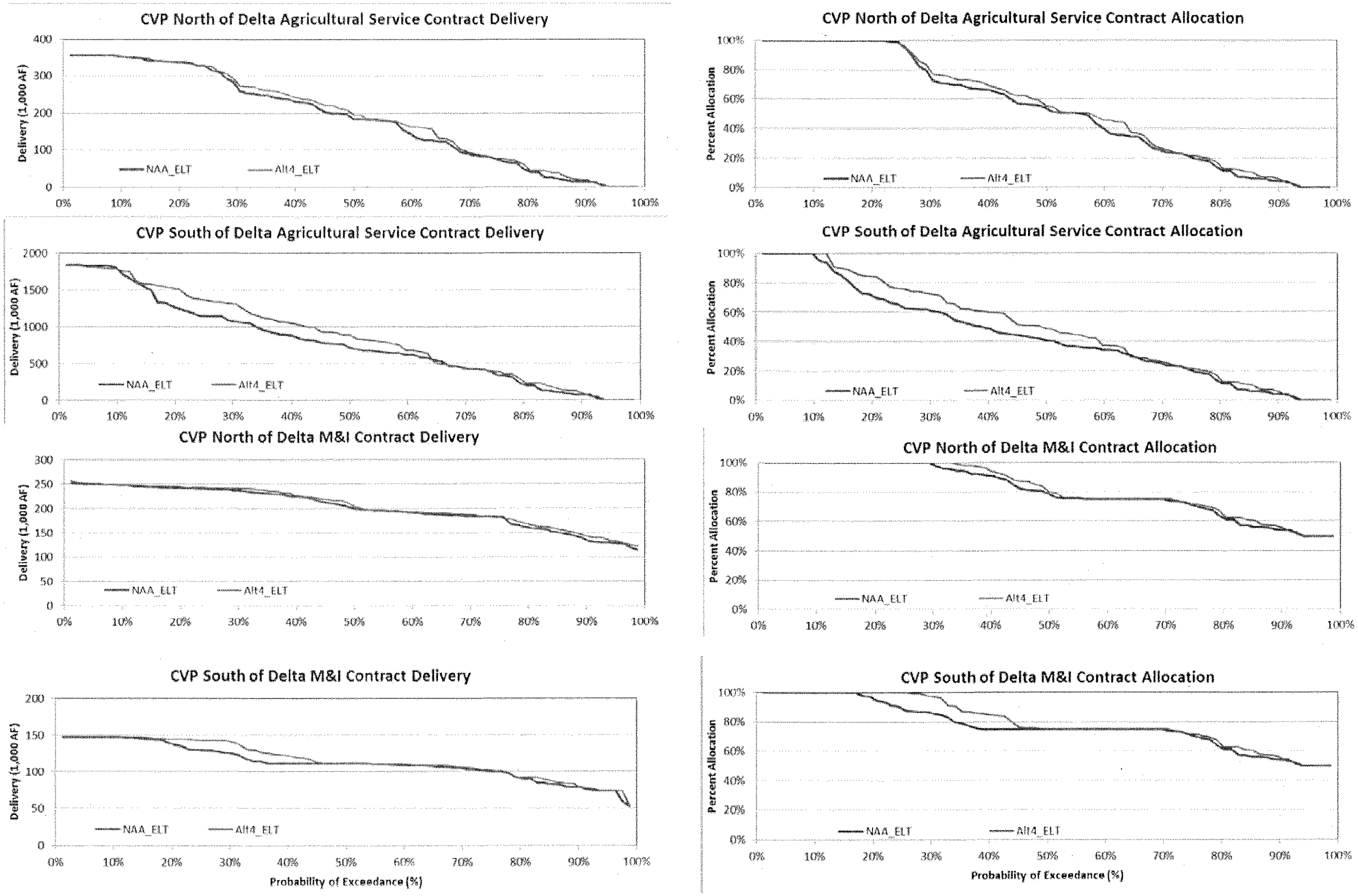
NAA-ELT (1,000 AF)

	AG NOD	AG SOD	Exchange	M&I NOD	M&I SOD	Refuge NOD	Refuge SOD	Sac. Setlmnt	CVP NOD Total	CVP SOD Total
All Years	**187**	**796**	**852**	**201**	**112**	**86**	**271**	**1846**	**2321**	**2215**
W	309	1364	875	236	134	90	281	1856	2491	2837
AN	246	908	802	214	110	83	257	1716	2258	2246
BN	146	596	875	198	108	92	281	1899	2335	2044
D	95	440	864	175	100	90	277	1890	2250	1864
C	29	152	741	140	79	64	223	1674	1908	1376

Difference: Alt4-ELT minus NAA-ELT (1,000 AF)

	AG NOD	AG SOD	Exchange	M&I NOD	M&I SOD	Refuge NOD	Refuge SOD	Sac. Setlmnt	CVP NOD Total	CVP SOD Total
All Years	8	90	0	4	4	1	0	3	15	94
W	1	68	0	1	3	2	1	-2	1	72
AN	14	199	0	3	12	1	0	-1	17	211
BN	17	153	0	5	4	0	0	0	22	158
D	10	48	0	5	2	1	-1	-1	15	49
C	3	6	0	5	2	-1	2	26	33	12

Figure 31. CVP Service Contract Deliveries (Alt 4-ELT and NAA-ELT)



RECIRC2654

NDWA-38

SWP Water Supply

Similar in nature, but larger in magnitude are changes in SWP deliveries. Figure 32 and Table 4 illustrate the benefits of Alt 4-ELT in comparison to the NAA-ELT Scenario. These studies show an increase in average annual SWP SOD deliveries of approximately 408,000 AF, but a reduction in critical year deliveries of approximately 177,000 AF. There is an overall reduction in Article 56 deliveries. Typically in modeling and in actual SWP operations, increases in Table A correspond with increases in Article 56. The reason that Article 56 deliveries decrease overall is that insufficient quantities of water are carried over in San Luis and Article 56 contractors are subsequently shorted. SWP delivery increase is slightly less than increases in Banks export because there is increased wheeling for the Cross Valley Canal contractors with BDCP.

Table 4. SWP Delivery Summary (Alt 4-ELT and NAA-ELT)

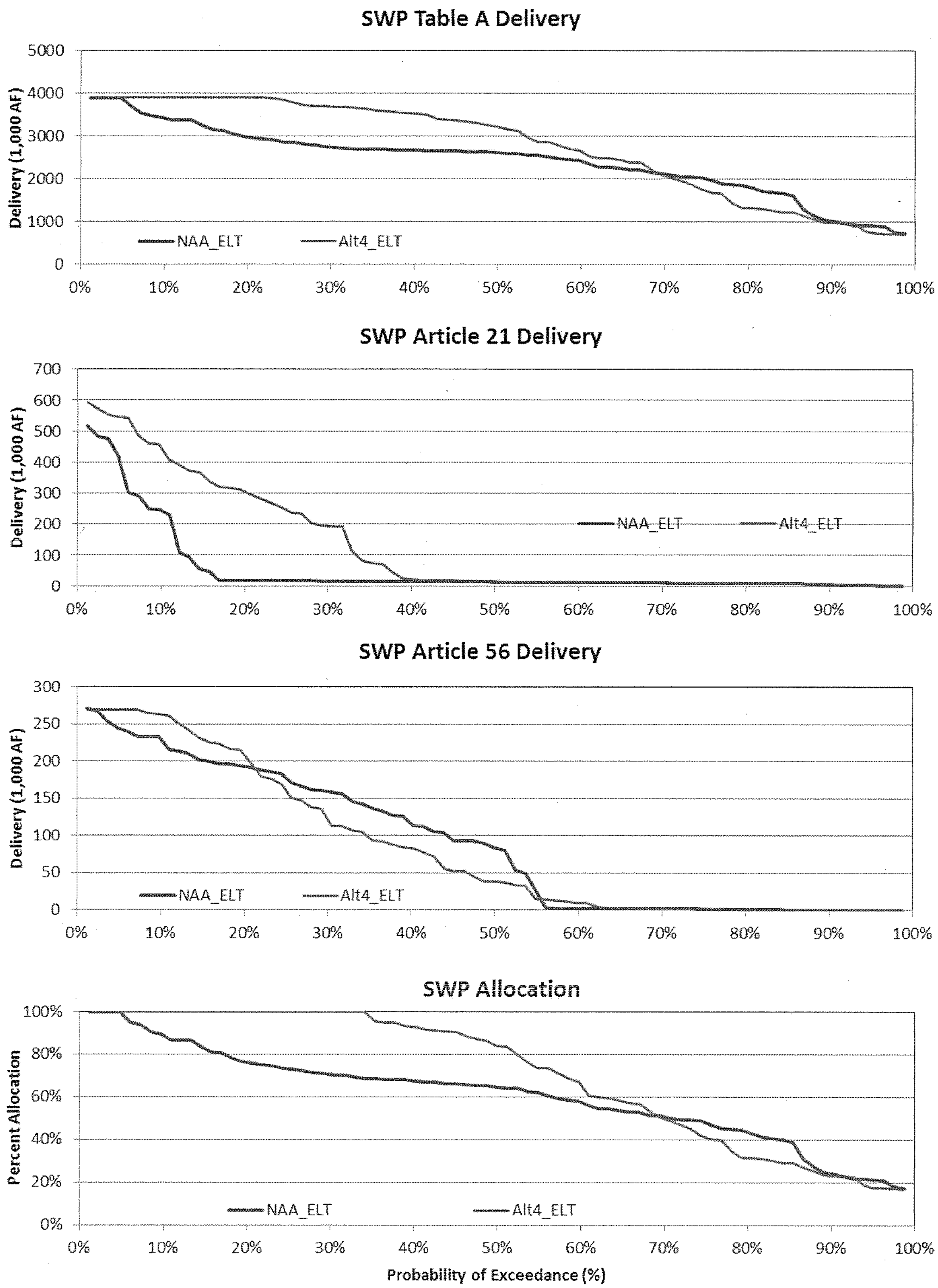
NAA-ELT (1,000 AF)

	Table A	Art. 21	Art. 56	Total
All Years	**2425**	**52**	**90**	**2567**
W	3112	79	112	3303
AN	2467	34	57	2559
BN	2515	48	109	2673
D	2033	43	88	2165
C	1172	28	47	1246

Difference: Alt4-ELT minus NAA ELT (1,000 AF)

	Table A	Art. 21	Art. 56	Total
All Years	339	75	-6	408
W	587	159	5	751
AN	728	99	-24	803
BN	525	44	2	571
D	-120	19	-10	-111
C	-146	-19	-12	-177

Figure 32. SWP Contract Deliveries (Alt 4-ELT and NAA-ELT)



Freemont Weir Modifications and Yolo Bypass Inundation

A component of the BDCP Alternative 4 is a modification to the Freemont Weir to allow water to flow into the Yolo Bypass when the Sacramento River is at lower flow than is currently needed. Currently, the Sacramento River does not flow over the Freemont Weir until flow reaches about 56,000 cfs. With the proposed modification Sacramento River flow may enter the Yolo Bypass at much lower flow levels. Figure 33 and Figure 34 contains charts that compare Freemont Weir flow into the Yolo Bypass to Sacramento River flow at the weir, Figure 33 show this relationship for the NAA-ELT and Figure 34 shows this same relationship for Alt 4-ELT.

Although CalSim II is a monthly time-step model, it contains an algorithm that estimates daily flow. Therefore, average monthly flows displayed in Figure 33 shows Sacramento River entering the Yolo Bypass at flow levels less than 56,000 cfs, when this occurs water is flowing over the Freemont Weir for a portion of the month. There is a 100 cfs minimum flow diversion from the Sacramento River diversion to the Yolo Bypass from September through June in Alt 4-ELT.

Figure 35 and Figure 36 contains average monthly flow from the Sacramento River over the Freemont Weir to the Yolo Bypass for the NAA-ELT (Figure 35), average monthly difference between Alt 4-ELT and NAA-ELT (Figure 36), and the annual average difference between Alt 4-ELT and NAA-ELT (Figure 37). In the NAA-ELT scenario flow over the Freemont Weir generally occurs in wet years, this flow is extended to all year types and all months except July and August in Alt 4-ELT. The average annual increase in flow is about 430 TAF.

Figure 33. Fremont Weir vs. Sacramento River NAA-ELT

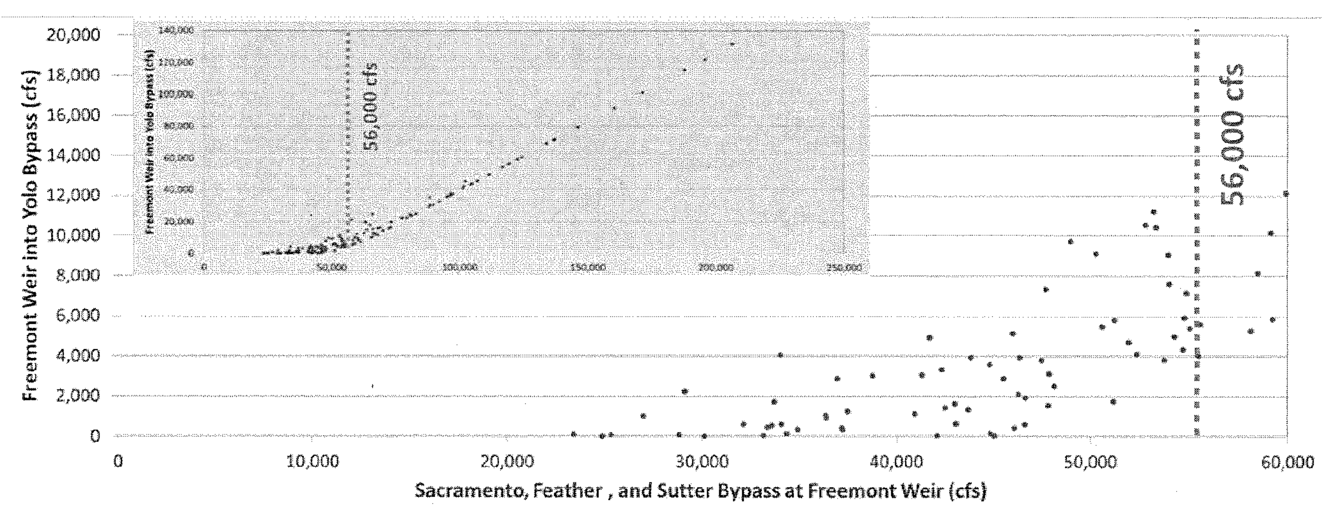


Figure 34. Fremont Weir vs. Sacramento River Alt 4-ELT

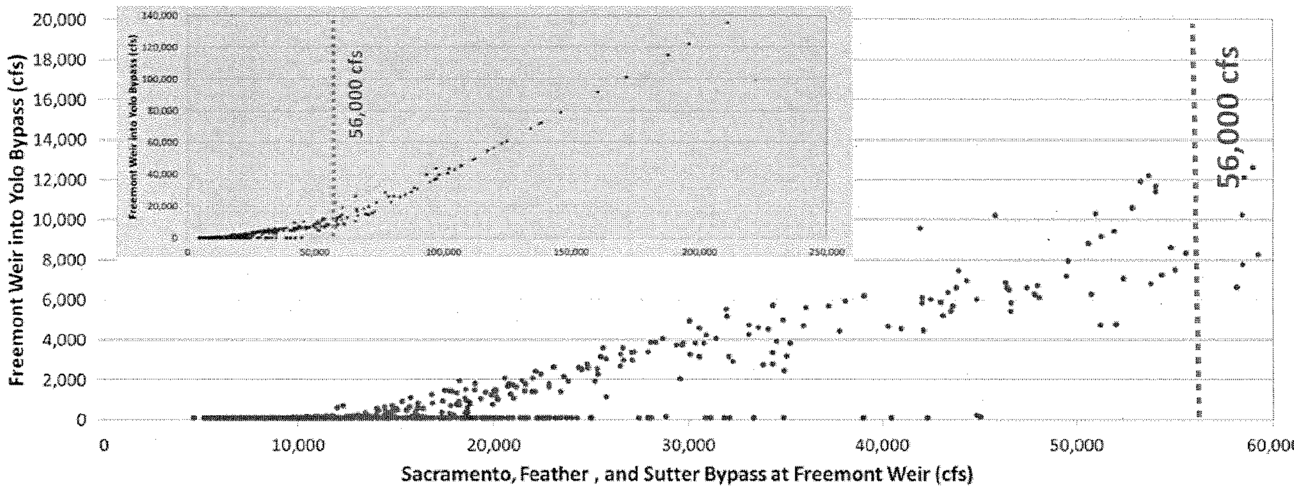


Figure 35. Average Fremont Weir Flow to Bypass by Water Year Type NAA-ELT

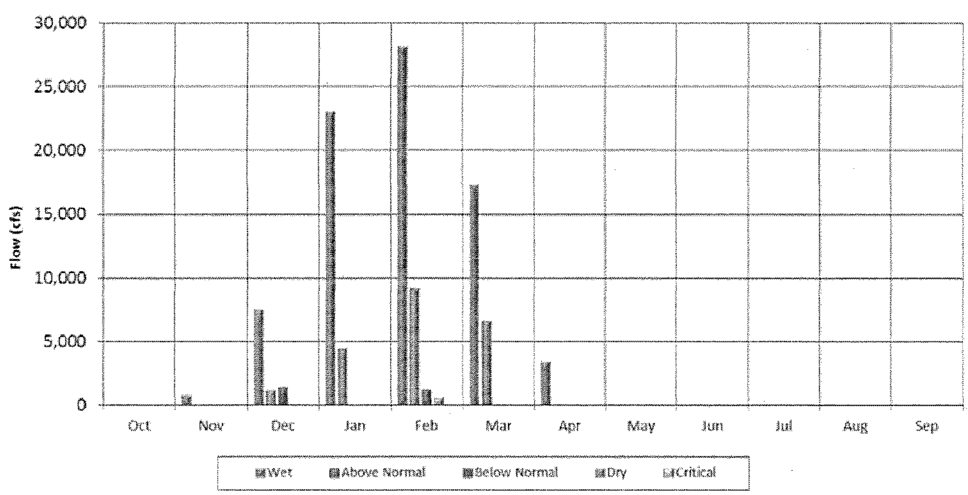


Figure 36. Average Fremont Weir Flow to Bypass by Water Year Alt 4 ELT minus NAA-ELT

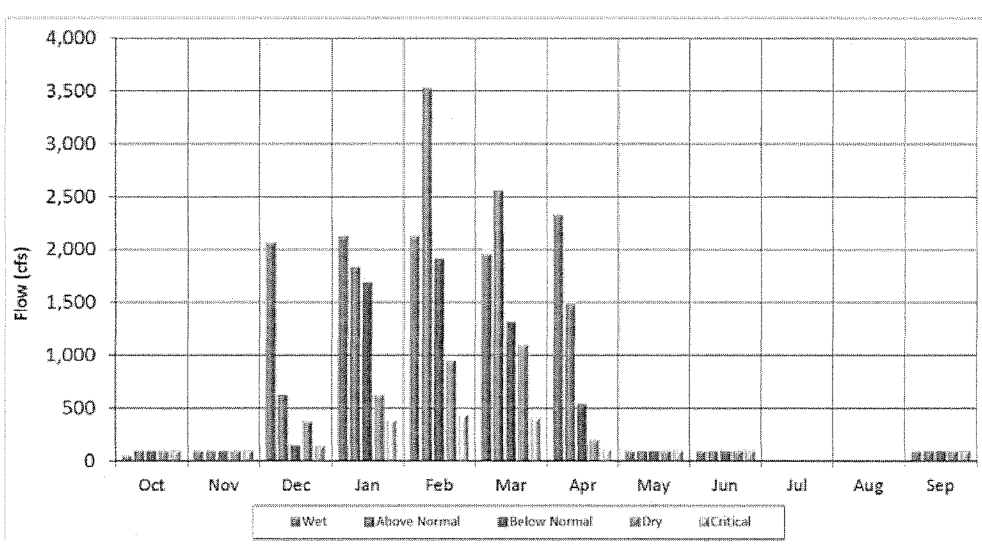
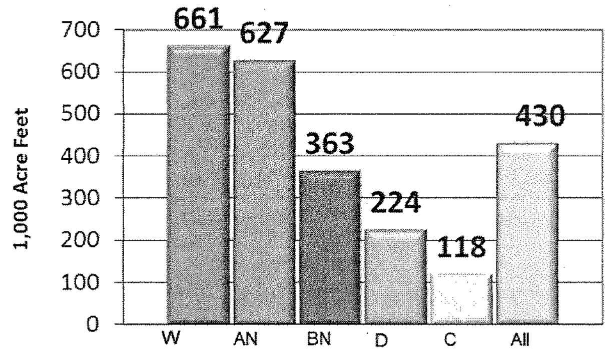


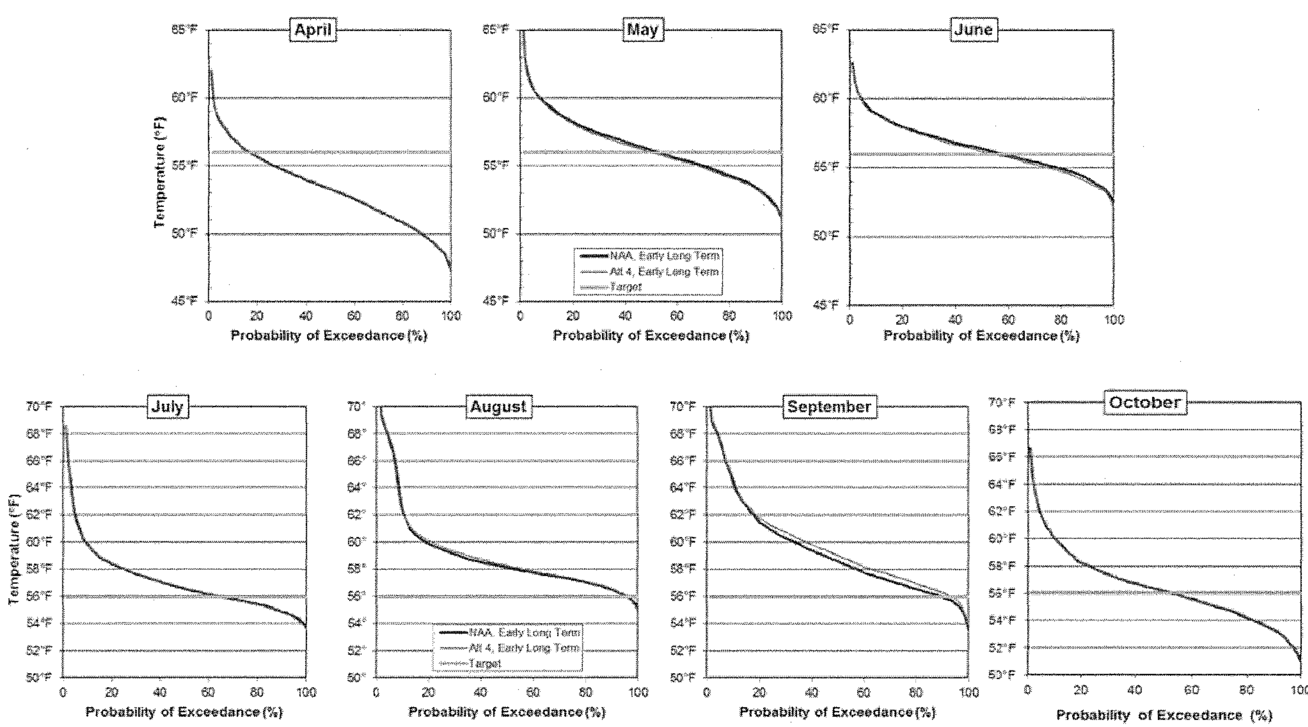
Figure 37. Annual Change in Fremont Weir Flow to Bypass Alt 4-ELT minus NAA-ELT



<u>Sacramento River Temperature</u>

Figure 38 contains exceedance probability plots of Sacramento River temperature at Bend Bridge for the NAA-ELT and Alt 4-ELT. For the months of April through July modeling shows few changes in upper Sacramento River water temperature. The Alt 4-ELT scenario shows temperature increases in August relative to the NAA-ELT. In about 75% of years modeling shows about 0.5°F increase in Alt 4-ELT relative to the NAA-ELT. The temperature models will meet inputted target temperatures until Shasta Lake cold water is depleted, this typically occurs in September. This is the likely reason temperature increases in modeling tend to occur in September.

Figure 38. Sacramento River Temperature at Bend Bridge NAA-ELT and Alt 4-ELT



Conclusions regarding CalSim II modeling of BDCP Alternative 4

BDCP's "High Outflow Scenario" is not sufficiently defined for analysis.

The High Outflow Scenario (HOS) requires additional water (Delta outflow) during certain periods in the spring. The BDCP places most of the responsibility for meeting this new requirement on the SWP. However, under the Coordinated Operations Agreement ("the COA"), when one project – either the CVP or the SWP – assumes sole responsibility for meeting a regulatory standard that imposes a water cost, the CVP and the SWP water allocations are adjusted to share the burden and avoid a windfall to the water users who have not "paid" their share. Yet, the BDCP modeling does not adjust operations to pay back the COA debt accrued to the SWP due to the additional Delta outflow requirements.

Furthermore, after consultation with DWR and Reclamation operators and managers, we conclude that there is no apparent source of CVP or SWP water to satisfy the increased outflow requirements and pay back the COA debt without depleting upstream storage. Recent public discussions of the High Outflow Scenario indicate that additional water to satisfy the increased spring outflow requirement will need to be obtained from water transfers from upstream water users to avoid depleting cold water pools in upstream reservoirs. However, this approach is unrealistic: during most of the spring time period when the flows are proposed to be increased, agricultural water users are not irrigating. This means that there is not sufficient water available to meet the increased flow requirements without taking stored water from the reservoirs, which would potentially impact salmonids on the Sacramento River system.

Simulated operation of BDCP's dual conveyance, coordinating proposed North Delta diversion facilities with existing south Delta diversion facilities, is inconsistent with the project description.

The Draft Plan and associated Draft EIR/EIS specify criteria for how much flow can be diverted by the new north Delta diversion (NDD) facilities and specify when to preferentially use the NDD facilities or the existing south Delta diversion (SDD) facilities. However, the BDCP modeling contains an erroneous constraint that is preventing the NDD facilities from taking as much water as is described in the project description. Although this error has been fixed by DWR and Reclamation in more recent versions of the model, it remains a problem in the BDCP models. Additionally, the BDCP modeling does not reflect summertime operations of the South Delta intakes that are described in the Draft EIR/EIS as a feature of the BDCP project intended to prevent water quality degradation in the south Delta. The net effect of these two issues is that the BDCP modeling significantly underestimates the amount of water diverted from the new North Delta facilities and overestimates the amount of water diverted from the South Delta.

BDCP modeling contains numerous coding and data issues that skew the analysis and conflict with actual real-time operational objectives and constraints

Operational logic is coded into the CalSim II model to simulate how DWR and Reclamation would operate the system under circumstances for which there are no regulatory or otherwise definitive rules. This attempt to specify (i.e., code) the logic sequence and relative weighting such that a computer can simulate "expert judgment" of the human operators is a critical element to the CalSim II model. In the BDCP model, some of the operational criteria for existing facilities such as the Delta Cross Channel and San Luis Reservoir are inconsistent with real-world conditions.

3 INDEPENDENT MODELING

This effort originally stemmed from reviews of BDCP modeling where we found that BDCP modeling does not provide adequate information to determine how BDCP may affect the system. There are three basic reasons why we cannot determine how the BDCP will affect water operations: 1) NAAs do not depict reasonable operations due to climate change assumptions, 2) operating criteria used in the BDCP Alternative 4 result in unrealistic operations, and 3) updates to CalSim II since the BDCP modeling was performed almost 4 years ago will likely alter model results.

The first phase of this independent modeling effort was development of updated Existing and Future Condition Baselines that are acceptable to all parties involved in this process, which included a coordinated effort with Reclamation and DWR. The second phase of this effort was analysis of BDCP Alternatives using updated CalSim II baselines.

Independent modeling was performed by imposing various components of the BDCP Alternative 4 on the Future Conditions Baseline. Not only is this the typical method of performing CEQA and NEPA analysis, but it demonstrates how proposed projects may alter the current operations within a generally understood contemporary setting.

3.1 Changes to CalSim II Assumptions

Revisions approved by DWR and Reclamation for the 2013 baseline

DWR and Reclamation provided CalSim II models used for the 2013 SWP Delivery Reliability Report (DRR) for use in this independent modeling effort. Changes to these models were made for this effort and provided to DWR and Reclamation, many of these changes have since been incorporated into DWR and Reclamation's model and others are under review.

The CalSim II model used for the 2013 SWP DRR is located on DWR's web site at: http://baydeltaoffice.water.ca.gov/modeling/hydrology/CalSim/Downloads/CalSimDownloads/CalSim-IIStudies/SWPReliability2013/index.cfm. Documentation for this model is described in the report titled: "*Draft Technical Addendum to the State Water Project Delivery Reliability Report 2013*", also located on DWR's web site at: http://baydeltaoffice.water.ca.gov/swpreliability/. Key modeling assumptions used for this effort are consistent with the 2013 SWP DRR and are listed in Table 4 of the Technical Addendum.

CalSim II is continuously being worked on and improved to better represent CVP and SWP operations and fix known problems. The Technical Addendum to the 2013 SWP DRR contains a description of updates and fixes that have occurred since modeling was performed for the BDCP Draft EIRS. Among these changes and fixes are key items that directly affect operation of facilities proposed in BDCP Alternative 4, these items are described on page 4 of 2013 SWP DRR Technical Addendum. Key among these fixes is the correction of the Sacramento River flow requirement for Delta inflow that causes NDD bypass to exceed requirements.

A key component of this independent modeling effort is the development of an acceptable CalSim II Future No-Action (FNA) model scenario. The purpose for developing the FNA Scenario is to produce an operational scenario that is realistic enough to understand how changes proposed in the BDCP will affect operations. The process of developing the FNA involved research and development of CalSim II model updates and several meetings with Reclamation and DWR modeling and operations staff. In addition to changes in the FNA Scenario, CalSim II was updated to better reflect operation of the NDD, CVP and SWP reservoir balancing, DCC gate operations, and CVP/SWP water supply allocations.

Additional Revisions to CalSim II Assumptions

The following changes were made to the 2013 SWP DRR version of CalSim II for this effort:

- San Joaquin River Basin
  - Turned off San Joaquin River Restoration Program (SJRRP) The SJRRP will cause a change to San Joaquin River inflow to the Delta not associated with the BDCP. To avoid adding complications to the identification of BDCP export benefits the SJRRP was not incorporated into the analysis.
  - Tuolumne: updated time-series, lookup tables, and wresl code
  - Turned off SJRA (VAMP) releases
- Updated Folsom flood diagram
- Rice decomposition demand diversions from Feather River
- Dynamic EBMUD diversion at Freeport
- SEP1933 correction to daily disaggregated minimum flow requirements at Wilkins Slough and Red Bluff
- CVP M&I demands are updated to reflect assumptions used by Reclamation
- Yuba Accord Transfer
- Los Vaqueros Reservoir capacity

San Joaquin River Basin

BDCP modeling depicted San Joaquin River Basin operations generally consistent with the actions, programs and protocols in place at the time of NOI/NOP issuance. Some of those conditions are now not representative of current development or operations. With the exception of the assumption for the SJRRP, the independent modeling has revised San Joaquin River Basin operations to reflect more contemporary LOD assumptions. In future level analyses the independent modeling similarly assumes no SJRRP, but only for analysis simplicity concerning BDCP export benefits. Additional analyses may be useful in understanding effects of collectively implementing the BDCP and SJRRP.

The San Joaquin River Basin (SJR) is depicted for current conditions, primarily affected by the operations of the Stanislaus, Tuolumne, Merced, and upper San Joaquin River tributaries. The upper San Joaquin River is currently modeled in a "pre-" SJRRP condition, consistent with the 2005 CalSim version. The FNA Scenario also models the upper San Joaquin River without the SJRRP. The SJR depicts near-term operations including SWRCB D-1641 flow and water quality requirements at Vernalis met when hydrologically possible with New Melones operations. The Vernalis flow objective is set by SWRCB D-1641 February-June base flow requirements. There are no pulse flow requirements during April and May, and there is no acquired flow such as VAMP or Merced water. D1641 Vernalis water quality requirements are set at 950/650 EC to provide an operational buffer for the requirement. New Melones is operated to provide RPA Appendix 2E flows as fishery releases and maintains the DO objective in the Stanislaus River through a flow surrogate. Stanislaus River water right holders (OID/SSJID) are provided deliveries up to land use requirements as occasionally limited due to operation agreement (formula). CVP Stanislaus River contractors are provided allocations up to 155 TAF per year in accordance with proposed 3-level plan based on the New Melones Index (NMI). For modeling purposes during the worst drought sequence periods, CVP Stanislaus River contractors and OID/SSJID diversions are additionally cut to maintain New Melones Reservoir storage no lower than 80 TAF. Merced River is operated for Federal Energy Regulatory Commission (FERC) and Davis-Grunsky requirements, and provides October flows as a condition of Merced ID's water rights. The Tuolumne River is operated to its current FERC requirements and current water use needs and has been updated to recent conditions.

Folsom Lake Flood Control Diagram

During wetter years, inflow to Folsom Lake is sufficient to keep the reservoir full while satisfying all demands downstream. When this condition occurs in actual operations, operators increase releases during summer months to maintain higher instream flows and prevent large releases in the fall to evacuate Folsom to satisfy flood control storage requirements. To prevent the model from keeping the reservoir full going into the fall months and then making large releases to comply with flood control storage requirements, the maximum allowable storage during summer months is ramped from full storage in June to flood control levels in the fall. Although this is a common modeling tool, Folsom storage level for the end of September was set too low in the SWP DRR model causing unnecessary releases and resulting in Folsom storage being lower than desired. An adjustment was made to achieve a more realistic summer drawdown for Folsom.

Feather River Rice Decomposition Demand

Demand for rice straw decomposition (decomp) water from Thermalito Afterbay was added to the model and updated to reflect historical diversion from Thermalito in the October through January period. There are approximately 110,000 acres of rice in the Feather River Service Area irrigated primarily with water diverted from Thermalito Afterbay. Although decomp water demand for the Sacramento River has been included in CalSim II since about 2006, this demand has been absent for the Feather River. Inclusion of decomp demand in the version of CalSim II used for this effort results in an increase in Feather River diversion in fall months of about 160,000 AF.

Dynamic EBMUD Diversion at Freeport

Previously the EBMUD operation was pre-determined and input to CalSim II as a time-series. The below criteria was implemented in CalSim II model code to achieve a dynamic representation of EBMUD diversion from the Sacramento River at Freeport.

The EBMUD water service contract is unique. EBMUD's total system storage must be forecast to be below 500 TAF on October 1 for CVP water to be available under the EBMUD contract. In years when this occurs, we assume EBMUD will take the minimum of 65 TAF of CVP water or their CVP allocation (133 TAF * CVP M&I allocations) in the first and second years of any multi-year period when CVP water is available under their contract. In the third year, EBMUD would be limited to 35 TAF of CVP water (assuming diversion of 65 TAF in years one and two) because their contract limits cumulative CVP water over three consecutive years to 165 TAF. The 65, 65, 35 TAF annual diversion pattern then repeats if water is available for four or more consecutive years under the EBMUD contract.

Wilkins Slough Minimum Flow Requirement

Wilkins Slough minimum flow requirements, C129_MIF, includes an adjustment for daily operations based on work with the Sacramento River Daily Operations Model (SRDOM). The flow adjustment for daily flows for September 1933 in the state variable input file appeared unreasonable in the previous model. The flow adjustment in this month was approximately 1,860 cfs and was requiring release of approximately 100 TAF out of Shasta. Review of the entire time-series of daily adjustments showed the adjustment in this month was an order of magnitude greater than in any other September in the simulation period. The year 1933 is a critically dry year, and the third of four consecutive Shasta Critical years. Historical precipitation records from the consumptive use models for the Sacramento Valley, which serves as the basis of much of the CalSim hydrology, were reviewed to ensure there was no unusual precipitation in this month that may create variations in daily flows. It was determined that this daily adjustment is in error. The daily adjustment for this time-step was set to 10 cfs, the value for August 1933.

CVP M&I Demands
Reclamation M&I contractor demands upstream from the Delta have not been adequately represented in CalSim II until Reclamation updated the model in 2012. A more accurate representation of CVP M&I demands, developed in 2012, was incorporated into the model for this effort.

Yuba Accord Water Transfer
In CalSim, Yuba Accord Water Transfers are limited to releases from New Bullards Bar Reservoir. The release is picked up at Banks Pumping Plant or stored in Oroville and Shasta for later release. The additional release from New Bullards Bar is represented in CalSim through an inflow arc. The subsequent refill of New Bullards Bar is represented in CalSim through a diversion arc. In CalSim II, refill is assumed to always occur in the winter following the transfer. However, in the SWP DRR model, there were a few years in which no transfers took place but refill still occurred in the following winter. This was fixed in the updated baseline by capping refill to the previous summer's total transfer.

Los Vaqueros Reservoir
Expansion of Los Vaqueros Reservoir was completed in 2012. Storage capacity was increased from 103 TAF to 160 TAF. In DWR's BDCP studies, Los Vaqueros capacity was set to 103 TAF. The independent modeling increases Los Vaqueros capacity to 160 TAF.

3.2 Changes to BDCP Operations

San Luis Reservoir Rule-Curve Logic Change
In the independent modeling, San Luis rule-curve logic was refined for both SWP and CVP operations. San Luis rule-curve is used to maintain an appropriate balance between San Luis Reservoir storage and North of Delta reservoirs. The key considerations in formulating rule-curve are as follows:

- Ensure that sufficient water is available in San Luis Reservoir to meet contract allocations when exports alone are insufficient due to various operational constraints.
- Minimize San Luis Reservoir carryover storage to low point criteria (both CVP and SWP) and Article 56 carryover (only SWP). The basic premise is to maintain Reservoir San Luis storage no higher than necessary to satisfy south of Delta obligations to avoid excessive drawdown of upstream storage.

In DWR's BDCP studies, there were significant shortages in Table A and Article 56 deliveries because of an improper balance between upstream and San Luis Reservoir storage. The updated SWP rule-curve logic reduces these shortages but does not eliminate them. Also, the updated CVP rule-curve logic allows for higher CVP allocations without increasing risk of shorting SOD contractors.

Upstream Storage Release to Fill San Luis Reservoir Above Needed Supply
In the BDCP NAA and the independent modeling FNA, the model has a priority to release excess stored water that will likely be released for flood control purposes from Shasta and Folsom storage for export at Jones Pumping Plant to storage in San Luis Reservoir in the late summer and early fall months. The purpose was to get a head start on filling San Luis Reservoir for the coming water year if there is a high likelihood of Shasta or Folsom spilling. This was an assumed CVP/SWP adaptation to the export reductions in the winter and spring months due to the salmon and smelt biological opinions. However, with the NDD facility in Alt 4, winter and spring export restrictions impact CVP exports much less and there is no longer a reason to impose this risk on upstream storage. As such, the weights, or prioritizations, of storage in Shasta and Folsom were raised so that excess water would

not be released specifically to increase CVP San Luis storage Reservoir above rule-curve. This was changed in Alt 4 and not the FNA to better reflect how the system may operate under these different conditions.

Delivery allocation adjustment for CVP SOD Ag service and M&I contractors

CVP SOD Ag service and M&I allocations are limited by both systemwide water supply (storage plus inflow forecasts) and Delta export constraints; whereas similar CVP NOD allocations are dependent solely on water supply. This frequently results in SOD water service contractors receiving a lower contract year allocation than NOD water service contractors, especially under the Biological Opinion export restrictions. However, with the NDD facility operations as proposed under Alt 4 H3, the CVP can largely bypass these Delta export restrictions, and the export capacity constraint on CVP SOD allocations was determine to be overly conservative. Therefore, the export capacity component of CVP SOD allocations was removed in the BDCP Alternative and both SOD and NOD CVP allocations are equal and based only on water supply.

Folsom/Shasta Balance

CVP operations were refined in the BDCP Alternative to provide maximum water supply benefits to CVP contractors while protecting Trinity, Shasta, and Folsom carryover storage in the drier years. As a whole, this was accomplished with refinements to allocation logic and San Luis rule-curve. However, in initial study runs, an imbalance between Folsom and Shasta was created; while there was a total positive impact to upstream storage in dry years, there was a negative impact to Folsom storage. This was resolved by inserting Folsom protections in the Shasta-Folsom balancing logic. With these protections, the positive carryover impacts were distributed to Trinity, Shasta, and Folsom.

North Delta Diversion Bypass Criteria

The daily disaggregation method for implementing NDD bypass criteria as implemented in DWR's BDCP model was left mostly intact for the updated BDCP studies. However, there were modifications to properly fit the bypass criteria implementation within the latest CalSim operations formulation. Modifications are as follows:

1. No NDD operations occur in cycles 6 through 9 so that Delta operations and constraints can be fully assessed without NDD interference.
2. Cycles 10 and 11 (Daily 1 and Daily 2 respectively) were added to determine NDD operations given various operational constraints including the NDD bypass criteria.
3. From July to October, bypass criteria are based on monthly average operations (no daily disaggregation). Given the controlled reservoir releases at this time and the constant bypass criteria (5,000 cfs from July to September and 7,000 cfs in October), this was determined to be a reasonable assumption. This also simplified coordination of DCC gate operations with NDD in October which will be discussed later.
4. When warranted by conditions in cycle Daily 1 (cycle 10), the bypass criteria in May and June were allowed to be modeled on a monthly average basis in cycle Daily 2 (cycle 11). This allowed a reduction in the number of cycles necessary to determine the fully allowed diversion under the bypass criteria when the Delta was in balance and additional upstream releases were made to support diversions from the North Delta.

Delta Cross Channel Gate Reoperation in October

The BDCP Alt 4 results in significantly more October surplus Delta outflow as compared to the baseline. The cause of this Delta surplus at a time when the Delta is frequently in balance is a combination of proposed through-Delta export constraints (OMR flow criteria and no through-Delta exports during the San Joaquin River October pulse period), Rio Vista flow requirements, and DCC gate operations. In DWR's BDCP studies, it was assumed that the

DCC gates would be open for the entire month of October thereby requiring much higher Sacramento River flows at Hood in order to meet the Rio Vista flow requirement than if the DCC gates were closed. Whereas in the independent BDCP modeling it was assumed that the DCC gates were closed for a number of days during the month such that the 7,000 cfs NDD bypass criteria would be sufficient to meet the weekly average Rio Vista flow requirements. The intent was to minimize surplus Delta outflow while meeting Delta salinity standards and maintaining enough bypass flow to use the NDD facility for SOD exports. This is an approximation of what is likely to occur in real-time operations under similar circumstances. Further gate closures may be possible as salinity standards allow if operators decide to preserve upstream storage at the expense of NDD diversions. This type of operation would require additional model refinements.

Wilkins Slough minimum flow requirement

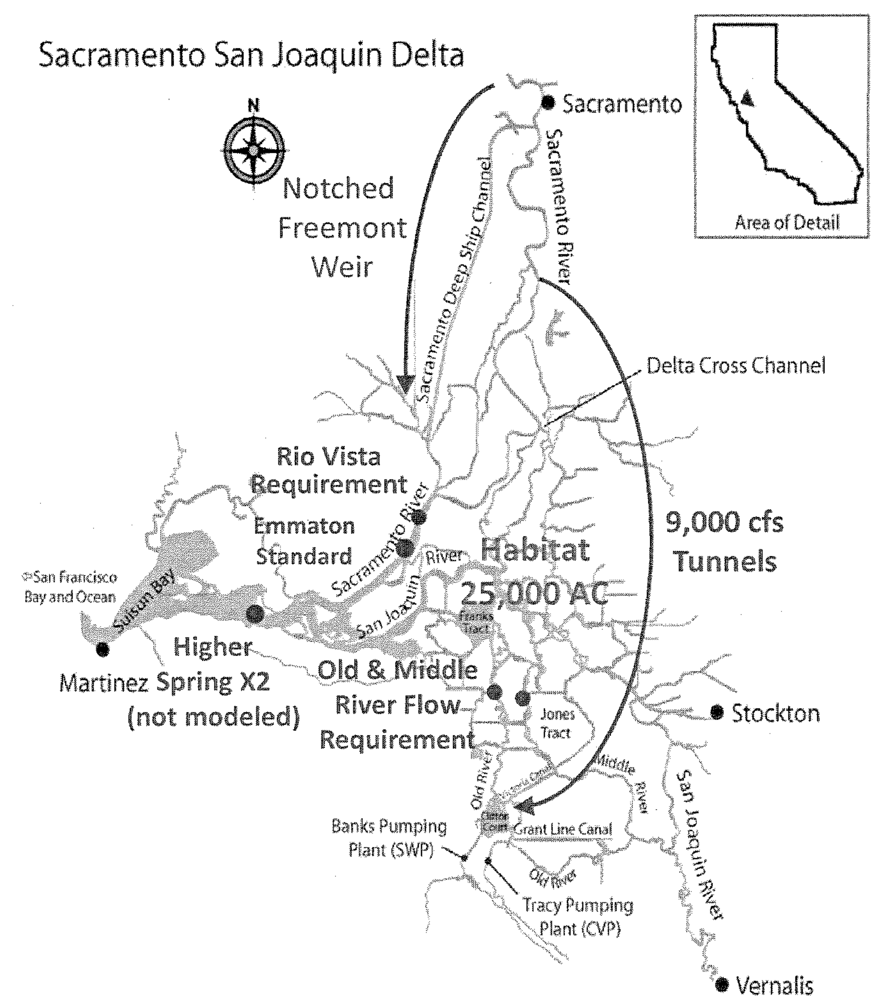
Currently in CalSim II, relaxation of the Wilkins Slough minimum flow requirement is tied to CVP NOD Ag Service Contractor allocations. This does not reflect actual operations criteria where relaxation of the flow requirement is dependent solely on storage conditions at Shasta. From the comparative analysis perspective of our CalSim planning studies, this introduces a potential problem: changes in CVP NOD Ag Service allocations can result in unrealistic changes in required flow at Wilkins Slough, and such changes in Wilkins Slough required flow can result in unrealistic impacts to Shasta storage. To bypass this problem, we assumed that the required flow at Wilkins Slough in the alternative was equal to the baseline.

3.3 Alternative 4 Modeling results

Analysis for this effort was focused on BDCP Alt 4 with existing spring and fall X2 requirements, which corresponds to "Alternative 4 H3" in the Decisions Tree. This modeling is performed without climate change, and includes refined operating criteria for the NDD, CVP and SWP reservoirs, DCC gate closures, and water supply allocations. This modeling includes all Project features that are included in Alt 4 in the BDCP modeling. The Project features are displayed in Figure 39 and summarized as:

- NDD capacity of 9,000 cfs
- Bypass flow requirements for operation of the NDD
- Additional positive OMR flow requirements
- No San Joaquin River I/E ratio
- Changed location for Emmaton water quality standard in SWRCB D-1641
- Additional Sacramento River flow requirement at Rio Vista
- 25,000 acres of additional tidal habitat
- Notched Fremont Weir

Figure 39. Alt 4 Features

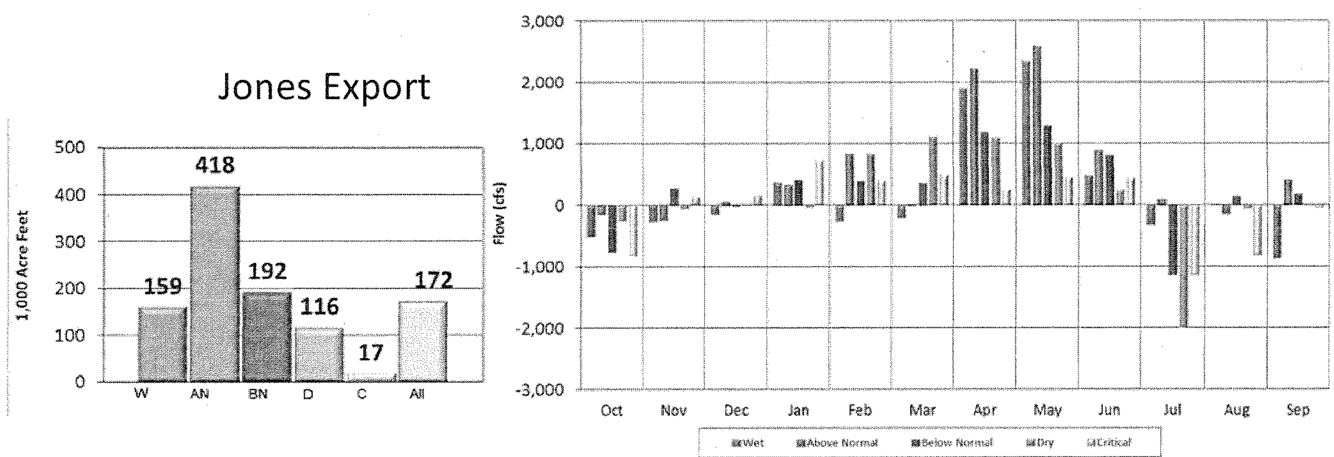


For the purpose of describing results of the independent modeling, the revised Future No Action model scenario is labeled "FNA" and the revised BDCP Alt 4 scenario is labeled "Alt 4".

CVP/SWP Delta Exports

Average annual exports at Jones pumping plant are about 170 TAF higher in the Alt 4 Scenario compared to the FNA scenario, as seen in Figure 40. Increases generally occur from January through June when Old & Middle River (OMR) criteria limit use of Jones PP in the FNA Scenario. Decreases occur in July in drier year types because the increased ability to convey water in spring months reduces the need to convey water stored in upstream reservoirs in July. Reductions in Jones export in October are partially a function of increases in OMR flow requirements.

Figure 40. Change in Delta Exports at Jones Alt 4 minus FNA



Similar to export at Jones, Banks exports are generally higher from January through June because use of NDD allows pumping that is not possible in the FNA Scenario, as seen in Figure 41. Banks exports are increased during summer months of wetter year types. This is due to earlier wheeling for CVP Cross Valley Canal contractors (without NDD Banks capacity isn't typically available until Fall in wet years) and wheeling of CVP water through Joint Point of Diversion (JPOD). CVP export at Banks is displayed in **Figure 42**. In wetter years, upstream CVP reservoirs hold more water than can be exported at Jones pumping plant, this water is typically spilled in the FNA scenario. CVP water stored in upstream reservoirs can be released in July, August, and September to support south of Delta beneficial use of water through use of JPOD in Alt 4.

Figure 41. Change in Delta Exports at Banks Alt 4 minus FNA

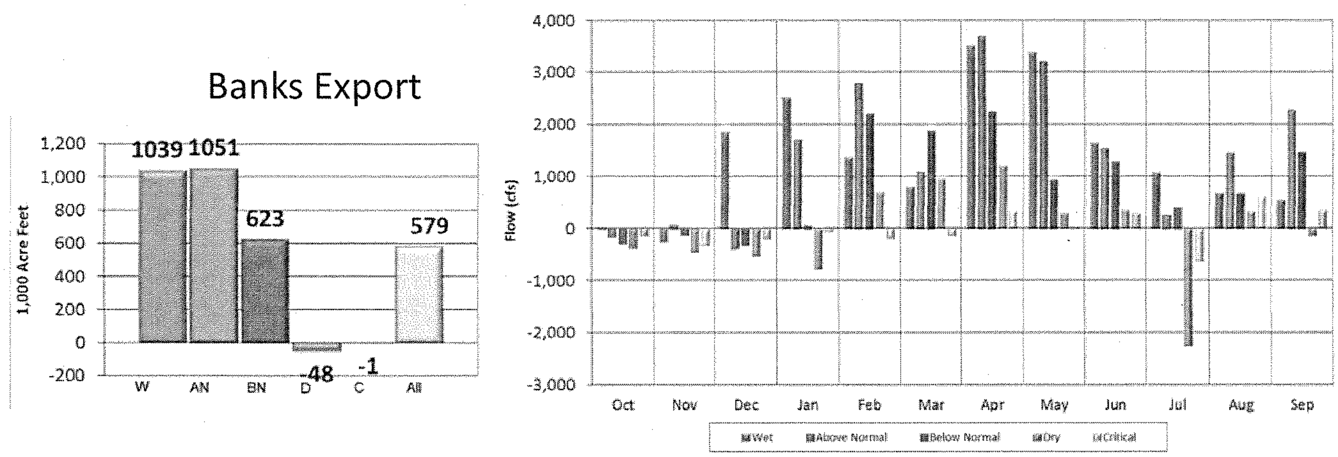
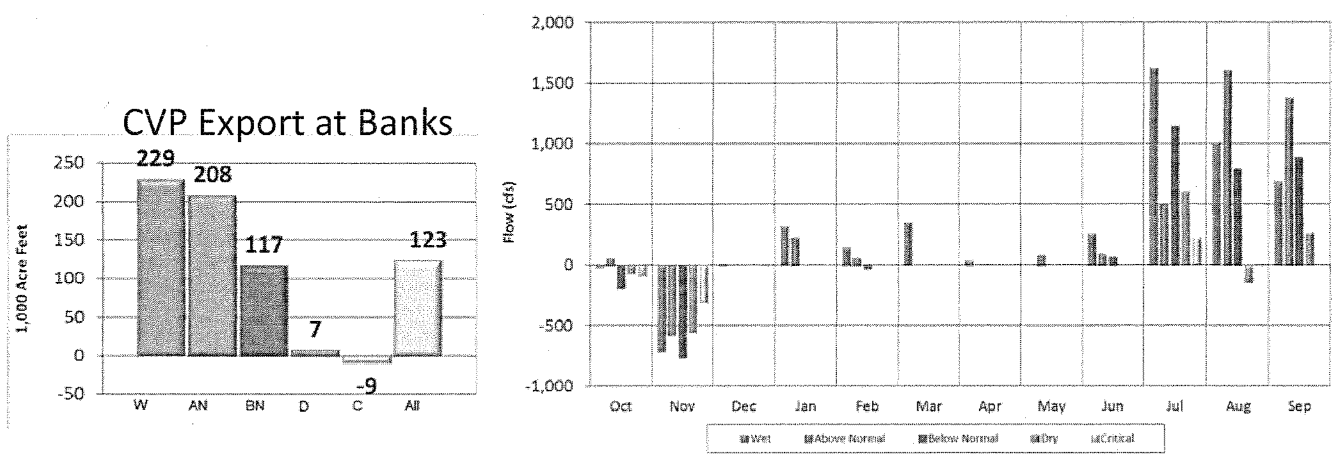


Figure 42. Change in CVP Delta Exports at Banks Alt 4 minus FNA



Changes in total, South Delta, and North Delta exports are displayed in Figure 43. Average annual increase in total Delta exports is about 750 TAF, the increases primarily occur in wetter year types with lesser increases in dryer years. South Delta export decreases about 2.53 MAF in Alt 4 relative to the FNA. Export through the NDD is 3.28 MAF in Alt 4, about 58% of total exports are diverted from the North Delta.

Figure 43. Change in Conveyance Source of Exports (Alt 4 minus FNA)

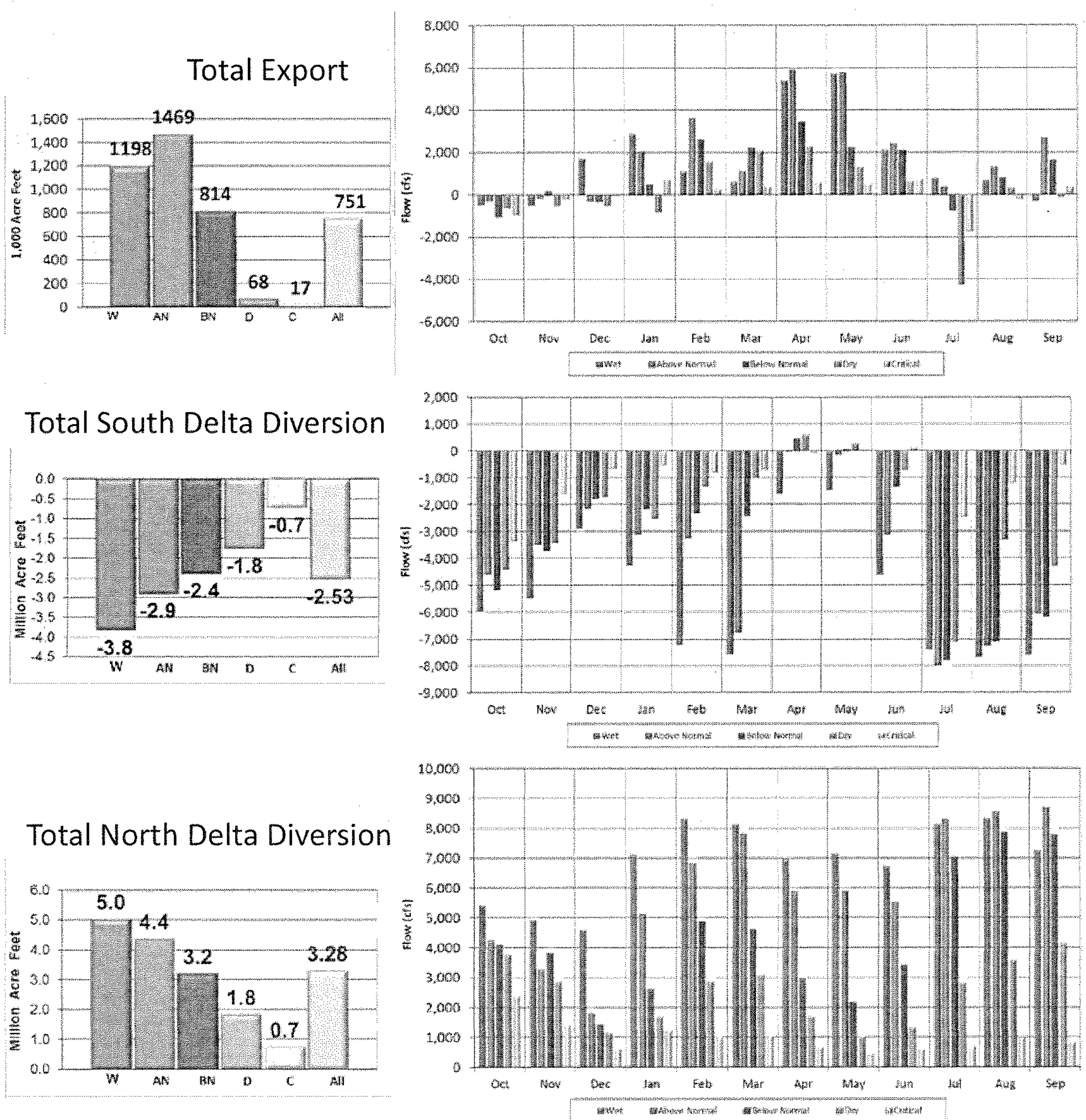
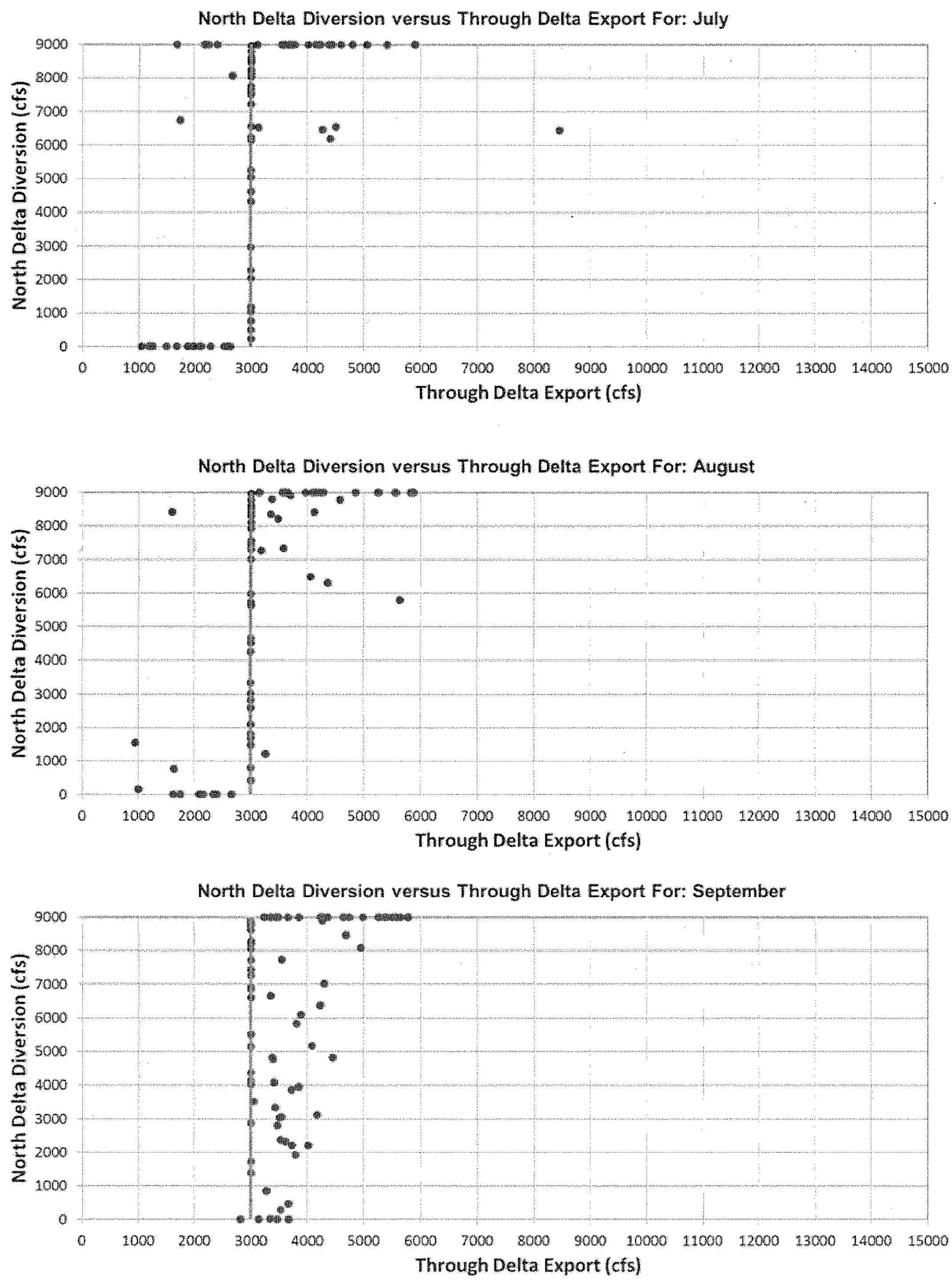


Figure 44 contains modeling results from Alt 4 for July, August, and September that plot NDD against SDD (Through Delta Export). There are many occasions when SDD are 3,000 cfs, which is due to criteria specifying that SDD during this time period need to be at least 3,000 cfs prior to diverting at the NDD facility. Although there are about six occurrences in July and three in August where the model did not satisfy this criterion, this issue has not yet been addressed for this modeling effort.

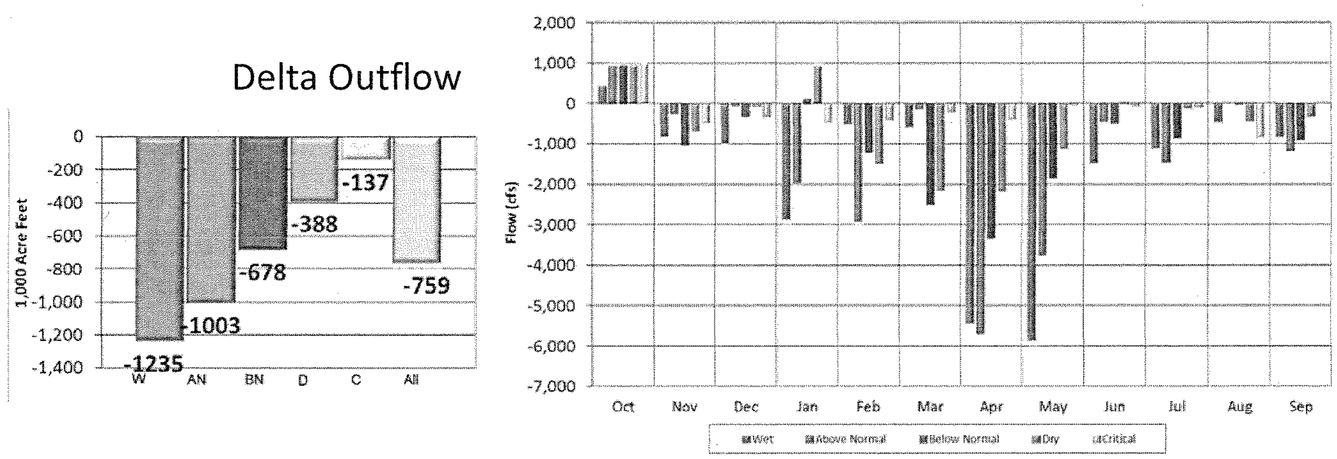
Figure 44. Alt 4 North Delta Diversion Versus South Delta Diversion for July, August, and September



Delta Outflow

Figure 45 contains annual and monthly average changes in Delta outflow by water year type, average annual Delta outflow decreases about 760 TAF in the Alt 4 Scenario relative to the FNA Scenario. The decrease is primarily due to increases in Delta exports, which are about 750 TAF on average. Larger decreases generally occur in January through May when exports are constrained in the FNA Scenario and in the Alt 4 Scenario the NDD can be used to export water. Delta outflow increases in October due to the combination of additional OMR flow requirements that restrict exports and Sacramento River flow requirements at Rio Vista. The additional surplus Delta outflow in Alt 4 was minimized through coordination of the Delta Cross Channel Gate operations with the Rio Vista flow requirements and North Delta Diversion bypass requirements.

Figure 45. Changes in Delta Outflow (Alt 4 minus FNA)



Carryover Storage

Figure 46, Figure 47, Figure 48, and Figure 49 contain exceedance charts for carryover storage and average monthly changes in storage by Sacramento Valley Water Year Type for CVP and SWP upstream reservoirs. CVP/SWP reservoirs tend to be higher in the Alt 4 Scenario relative to the FNA on an average basis. Generally, CVP/SWP reservoirs are higher in storage in dryer year types and can be lower in wetter year types.

Ability to convey stored water from upstream CVP/SWP reservoirs to south of Delta water users is increased in Alt 4 relative to the FNA. Therefore, when upstream reservoirs are at higher storage levels more water is released to satisfy south of Delta water demands. This is the primary reason Shasta, Oroville, and Folsom tend to be lower during summer months of wetter years.

Currently, and in the FNA Scenario, the CVP and SWP ability to export natural flow, or unstored water, is constrained due to SWRCB D-1641 and requirements in the salmon and smelt biological opinions. With the greater ability to export unstored water during winter and spring months in the Alt 4 Scenario, compared to FNA, there is generally a reduced reliance on stored water to satisfy south of Delta demands. The increased ability to export unstored water allows the CVP and SWP to maintain higher storage levels in upstream reservoirs during dryer year types while still maintaining south of Delta deliveries. Carryover storage in the Alt 4 Scenario tends to be higher than the FNA Scenario at lower storage levels, and Alt 4 storage is lower in wetter years when storage levels are higher. In the wettest of years there is enough water in the system that both scenarios have similar carryover storage conditions.

Figure 46. Trinity Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type

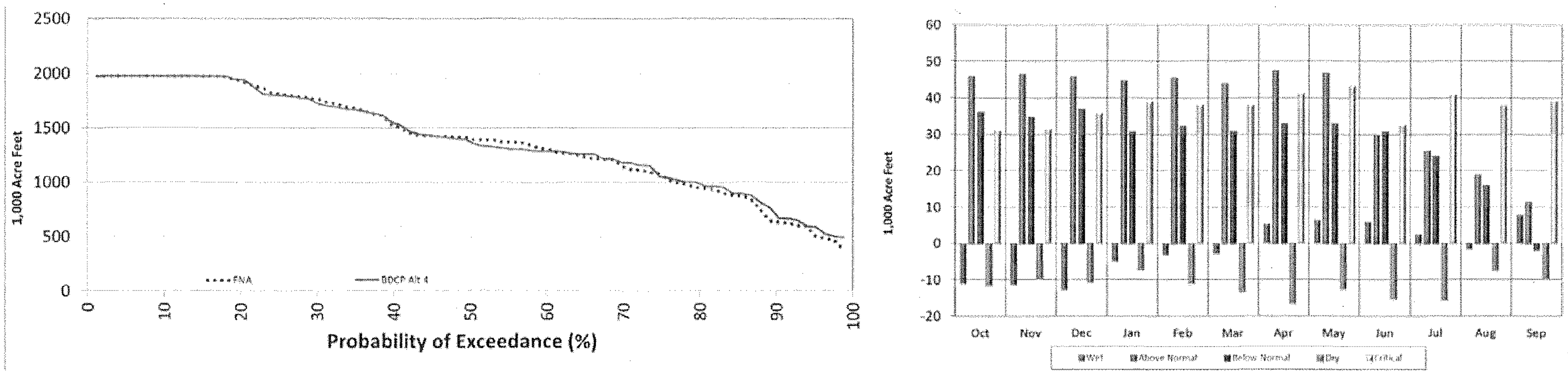


Figure 47. Shasta Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type

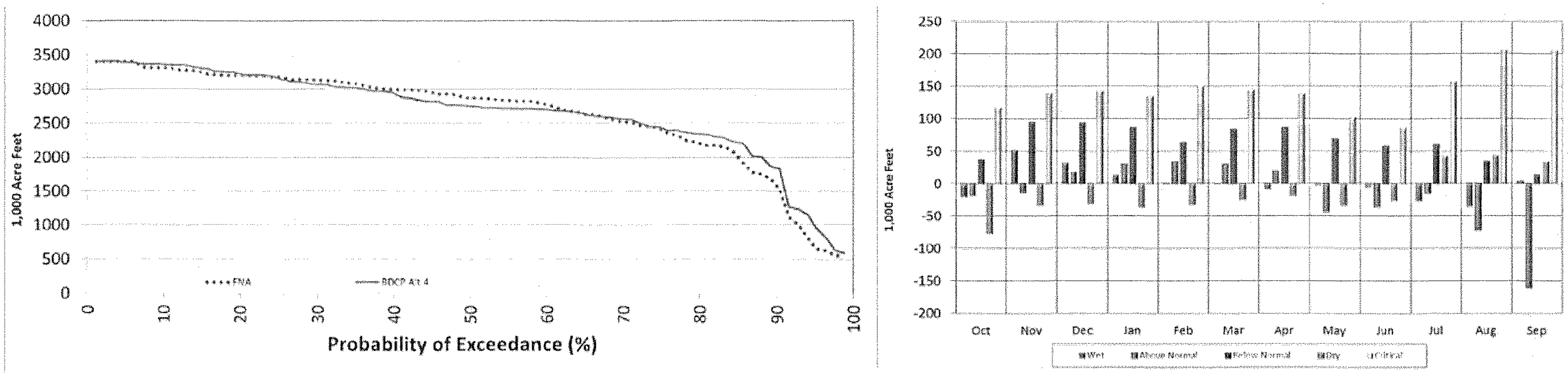


Figure 48. Oroville Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type

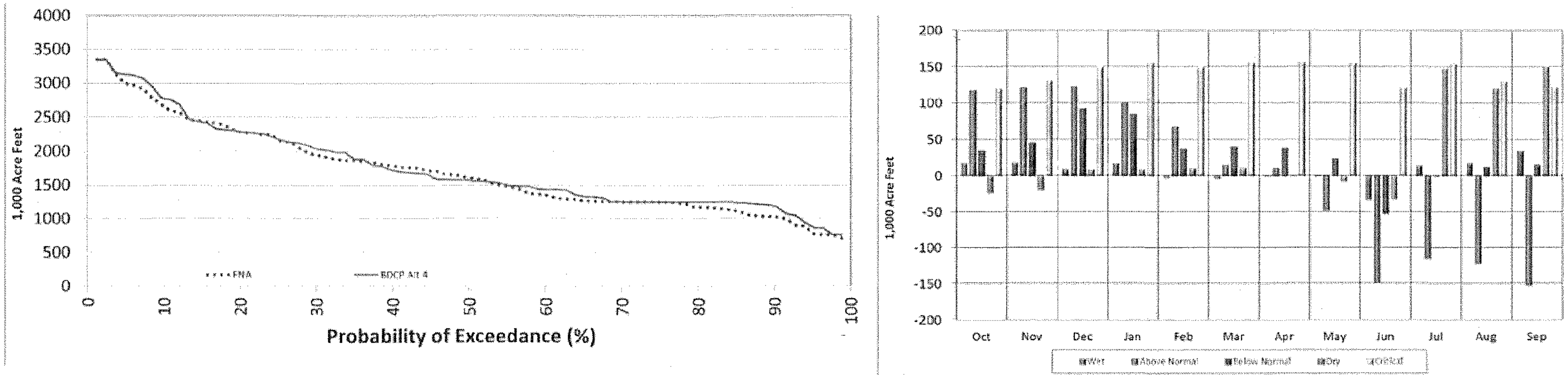
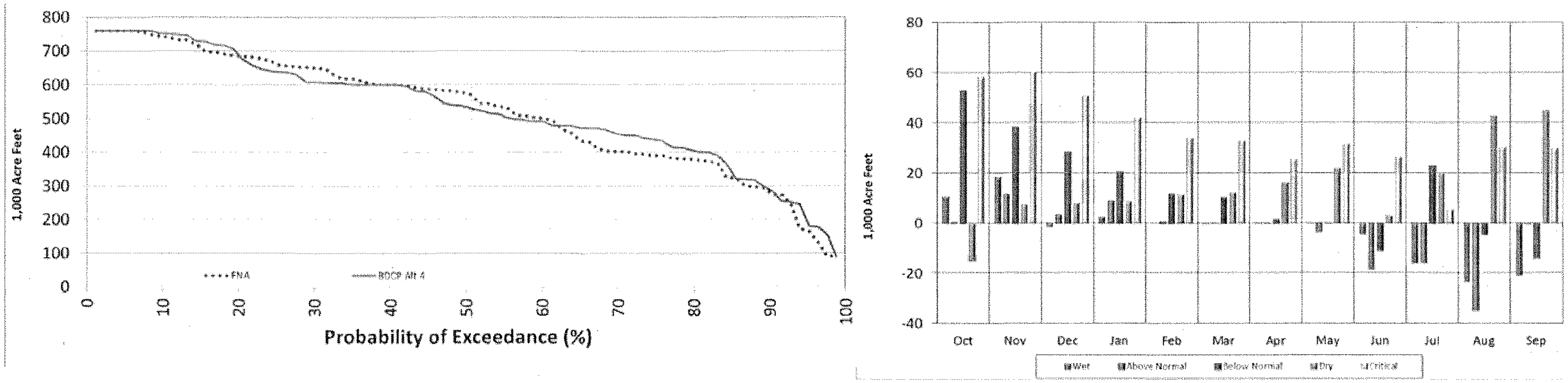


Figure 49. Folsom Reservoir Carryover Storage and Average Monthly Changes in Storage by Water Year Type



RECIRC2654

NDWA-38

San Luis Reservoir Operations

As seen in Figure 50 and Figure 51 below, both CVP and SWP portions of San Luis Reservoir storage fills more regularly in the Alt 4 Scenario. As described earlier in this document, low point in both CVP and SWP San Luis Reservoir is managed to satisfy water supply obligations the model makes during the spring of each year. This is a complex balance involving available upstream storage, available conveyance capacity, delivery allocations, and south of Delta demand patterns. Considering this myriad of variables, there are times when low point in San Luis Reservoir is higher in the Alt 4 Scenario than the FNA Scenario and times when the opposite is true.

Figure 50. SWP San Luis

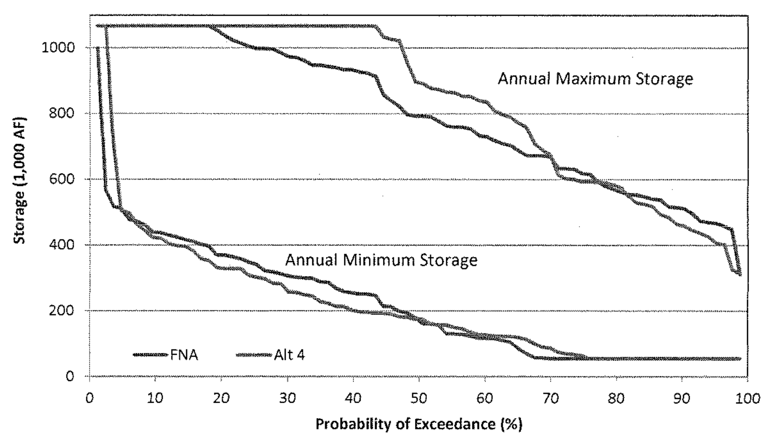
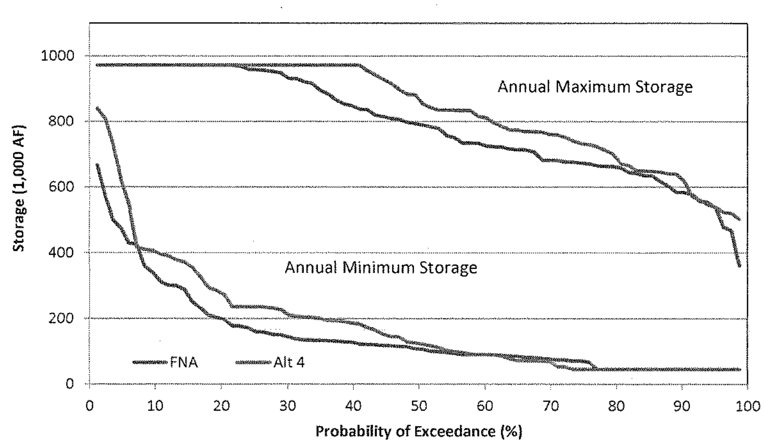


Figure 51. CVP San Luis



CVP Water Supply

As can be seen in Table 5, the independent modeling analysis shows an average increase of approximately 262 TAF of delivery accruing to CVP customers in the Alt 4 Scenario relative to the FNA Scenario, mostly occurring to CVP SOD agricultural customers. Delivery increases are greater in wetter year types with lower increases in dryer years. Figure 52 contains exceedance probability plots for CVP water service contractor deliveries and allocations. Changes in Sacramento River Settlement and San Joaquin River Exchange Contractor deliveries do not occur in the modeling analysis and are not an anticipated benefit of the BDCP. Although modeling demonstrates minor changes to NOD CVP service contractors, this increase is not an anticipated benefit of the BDCP.

Table 5. CVP Delivery Summary

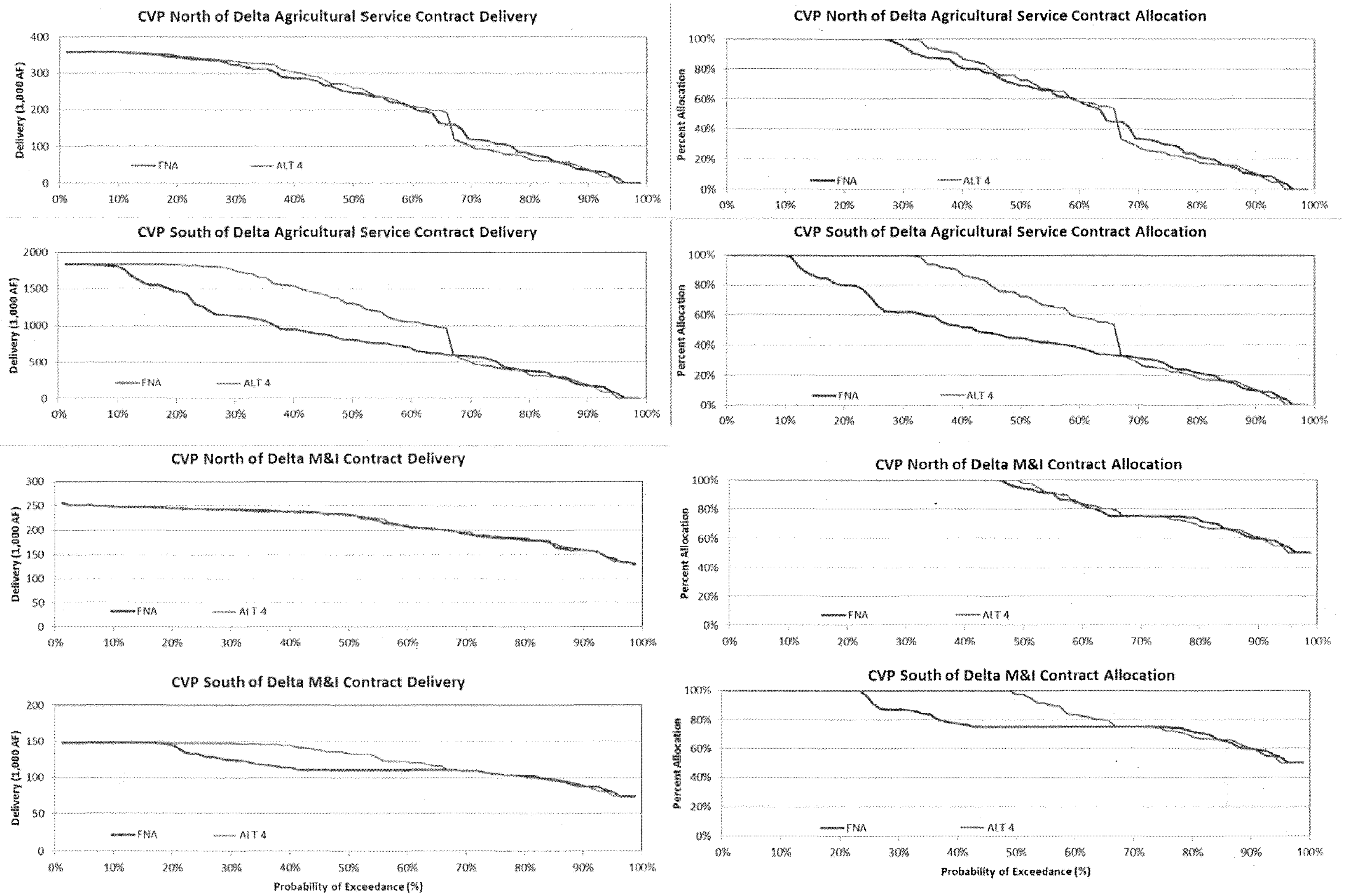
Average Annual CVP deliveries by Water Year Type FNA (1,000 AF)

	AG NOD	AG SOD	Exchange	M&I NOD	M&I SOD	Refuge NOD	Refuge SOD	Sac. Setlmnt	CVP NOD Total	CVP SOD Total
All Years	**220**	**882**	**852**	**214**	**116**	**87**	**273**	**1860**	**2380**	**2306**
W	327	1408	875	241	135	90	280	1856	2515	2881
AN	284	999	802	221	113	83	258	1716	2304	2341
BN	206	725	875	217	111	90	281	1900	2413	2176
D	138	569	864	195	106	88	277	1896	2317	2000
C	43	202	741	157	87	71	234	1754	2025	1447

Difference: Alt 4 minus FNA (1,000 AF)

	AG NOD	AG SOD	Exchange	M&I NOD	M&I SOD	Refuge NOD	Refuge SOD	Sac. Setlmnt	CVP NOD Total	CVP SOD Total
All Years	2	251	0	0	9	0	0	0	2	260
W	0	305	0	0	10	0	1	0	0	316
AN	10	492	0	1	14	1	0	-2	10	504
BN	12	354	0	5	16	0	-2	1	19	366
D	-10	67	0	-4	4	1	0	-1	-15	72
C	2	27	0	2	2	1	0	-1	4	29

Figure 52. CVP Water Supply Delivery and Allocation



RECIRC2654

NDWA-38

SWP Water Supply

The independent analysis shows an increase in average annual SWP SOD deliveries of approximately 450 TAF, but a reduction in critical year deliveries of approximately 116 TAF. Annual average Article 21 deliveries increase by about 100 TAF and Article 56 increases by about 18 TAF. Figure 53 contains exceedance probability plots for SWP SOD deliveries for the FNA and Alt 4 Scenarios, each of these plots show increases in higher delivery years. Although Table A deliveries increase in 65% of years, there are decreases in 35% of the dryer years (see Table 6).

Table 6. SWP Delivery Summary

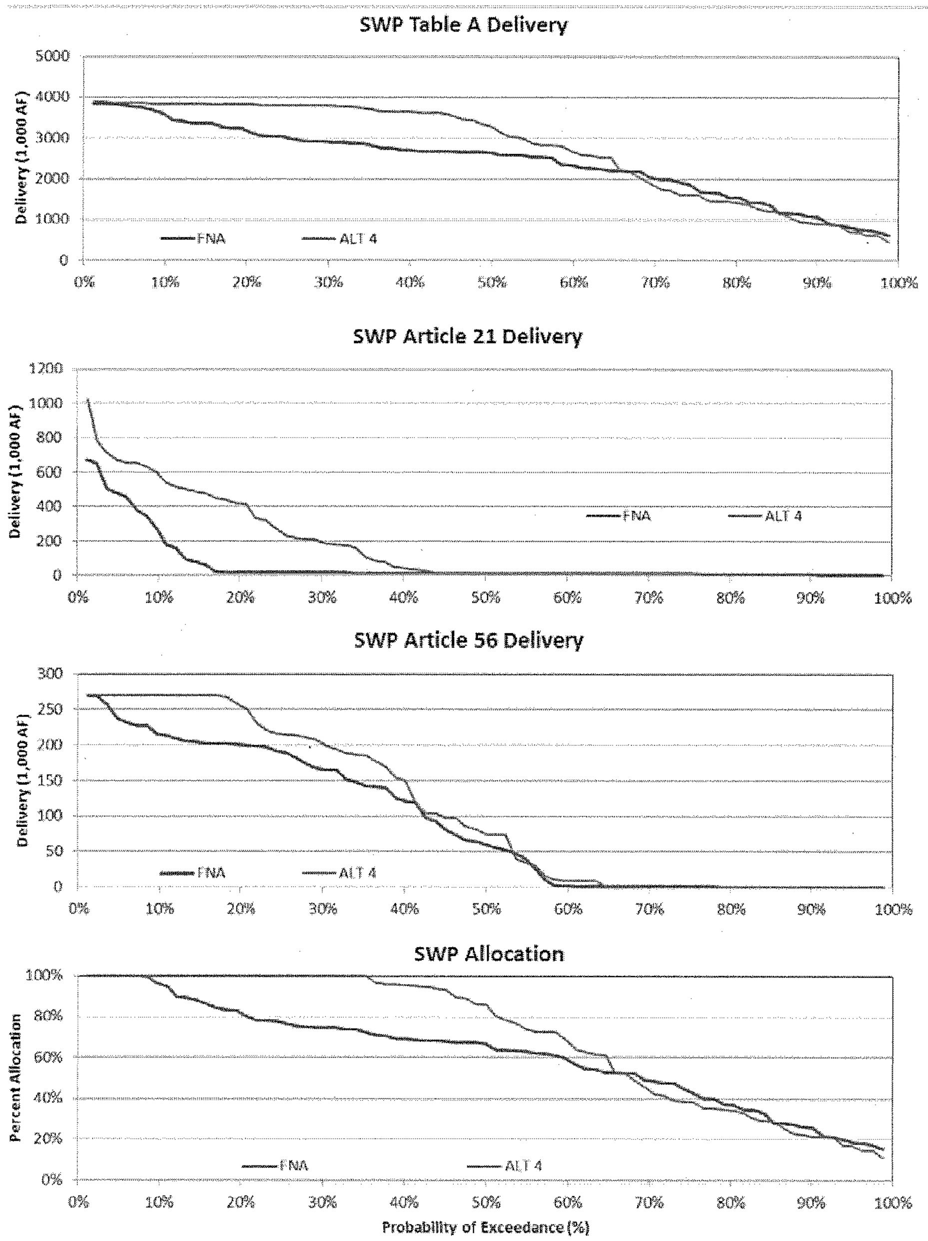
FNA

	Table A	Art. 21	Art. 56	Total
All Years	**2426**	**64**	**90**	**2580**
W	3221	98	121	3440
AN	2628	86	81	2794
BN	2527	82	95	2703
D	1809	14	70	1893
C	1105	17	48	1170

Difference Alt4 minus FNA

	Table A	Art. 21	Art. 56	Total
All Years	328	102	18	448
W	525	220	14	759
AN	636	98	-1	733
BN	565	50	31	647
D	-63	41	27	6
C	-124	-8	16	-116

Figure 53. SWP Delivery for Alt 4 and FNA



4 COMPARING INDEPENDENT MODELING AND BDCP MODELING

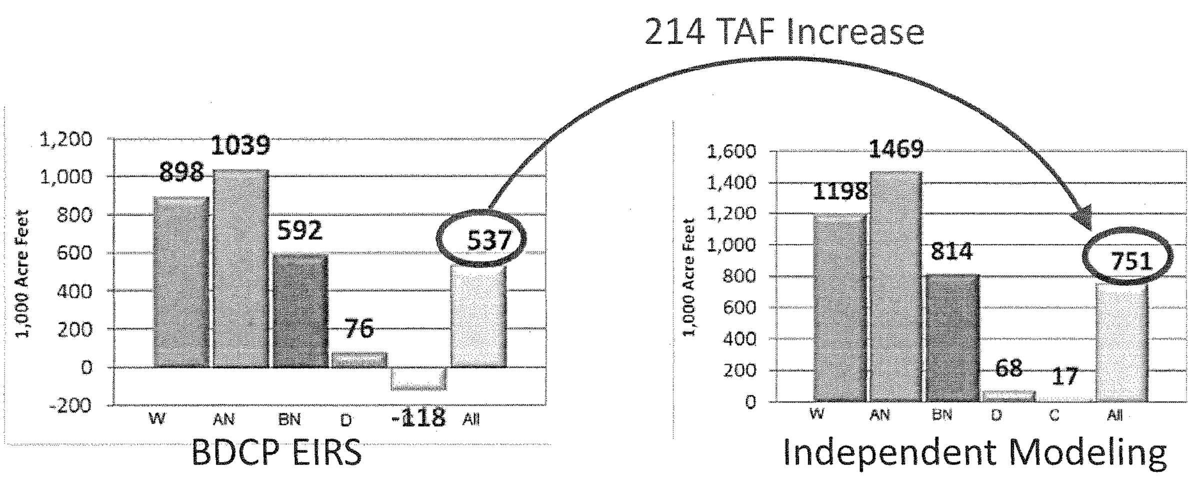
The independent modeling effort originally stemmed from reviews of DWR's BDCP modeling where we found that BDCP modeling does not provide adequate information to determine how BDCP may affect the system. Based on the premise that the independent modeling portrays a more accurate characterization of how the CVP/SWP system may operate under Alt 4, this comparison is meant to demonstrate the differences between results of a more accurate analysis and BDCP modeling. Differences in results between these modeling efforts are believed to provide insight regarding how effects that BDCP will have on the actual CVP/SWP system differ from modeling used to support the Draft EIRS.

Although thorough comparisons of modeling were performed, only key differences are illustrated for the purpose of this comparison.

Delta Exports

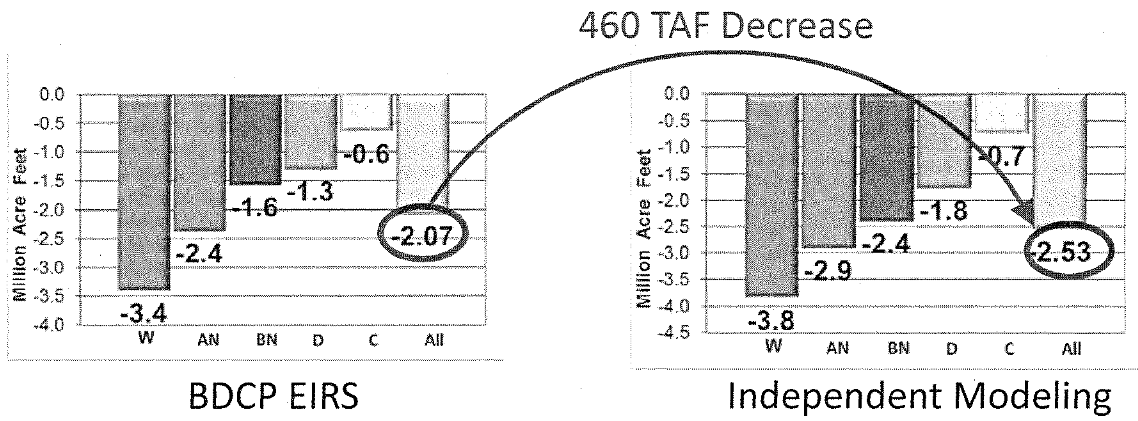
Figure 54 displays changes in the Delta exports for the BDCP modeling (Alt 4-ELT minus NAA-ELT) and for the independent modeling (Alt 4 minus FNA). Independent modeling analysis shows about 200 TAF greater increases in exports than the BDCP modeling. A large component of this difference is due to fixes of known modeling issues, as described in the 2013 SWP DRR. This difference is also attributable to more realistic reservoir operations, more efficient DCC gate operations, changes in water supply allocation logic, and more efficient operation of the NDD.

Figure 54. Result Difference: Delta Exports



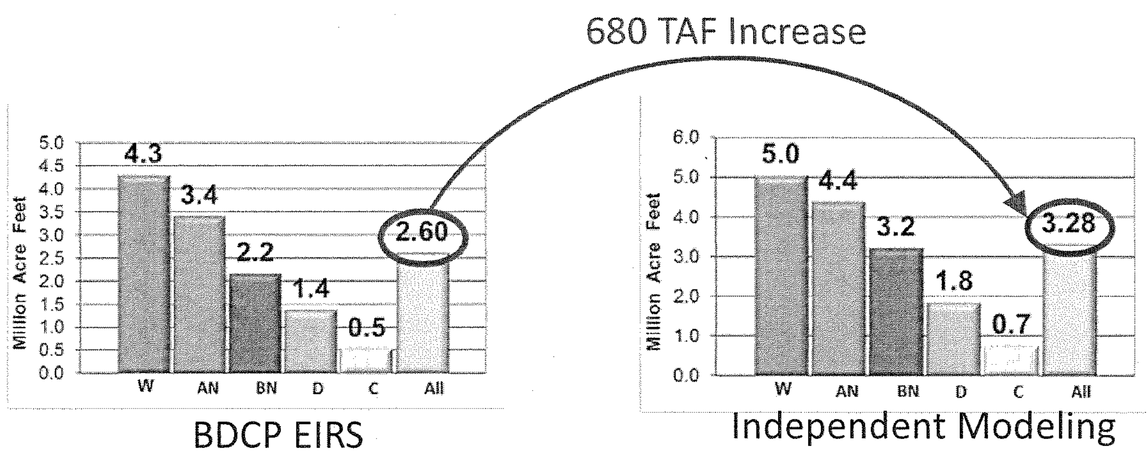
Average annual SDD are decreased by about 460 TAF in the independent analysis compared to the BDCP modeling. A large component of this difference is due to fixes of known modeling issues, as described in the 2013 SWP DRR. These fixes prevent "artificial" bypass criteria from limiting use of the NDD beyond what is intended in the BDCP project description. This difference is also attributable to more efficient DCC gate operations and more efficient operation of the NDD. Figure 55 demonstrates the difference between the BDCP and independent analysis, where SDD decrease by 2.07 MAF in the BDCP analysis and by 2.53 MAF in the independent analysis.

Figure 55. Result Difference: South Delta Diversion



Use of the NDD is 680 TAF greater in the independent analysis relative to the BDCP analysis. A large component of this difference is due to fixes of known modeling issues, as described in the 2013 SWP DRR. These fixes prevent "artificial" bypass criteria from limiting use of the NDD beyond what is described in the BDCP project description. Figure 56 compares average annual NDD in the BDCP to the independent analysis.

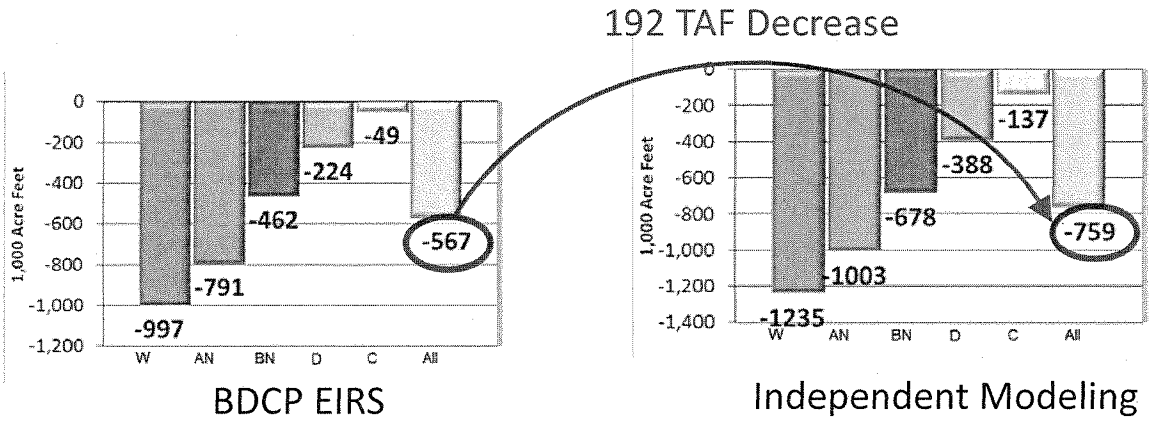
Figure 56. Result Difference: North Delta Diversion



Delta Outflow

Total Delta exports in the independent analysis are about 200 TAF greater than the BDCP modeling analysis with a corresponding decrease in Delta outflow in the independent analysis of about 200 TAF. Figure 57 compares average annual changes in Delta outflow between the independent analysis and BDCP modeling, BDCP modeling shows a decrease of about 567 TAF and the independent analysis shows a decrease of about 759 TAF.

Figure 57. Result Difference: Net Delta Outflow



Reservoir Storage

Reservoir operating rules for Alt4 in the BDCP EIRS modeling are changed relative to the NAA. In the BDCP EIRS modeling of Alt 4 rules are set to releases more water from upstream reservoirs to San Luis Reservoir from late winter through July, reduce releases in August, and then minimize releases to drive San Luis Reservoir to dead pool from September through December. This operation is inconsistent with actual operations and causes reductions in upstream storage from May through August. Figure 58 and Figure 59 contain exceedance probability plots of carryover storage and average monthly changes in storage by water year type for Shasta and Folsom for the BDCP and independent modeling. Although carryover storage for Alt 4 and the NAA is similar in the BDCP EIRS modeling, there is drawdown from June through August that may cause impacts to cold water pool management. In the independent modeling upstream reservoirs are drawn down more in years when storage is available while dryer year storage is maintained at higher levels, this is illustrated in the carryover plots for Shasta and Folsom in Figure 58 and Figure 59.

Figure 58. Result Difference: Shasta Storage

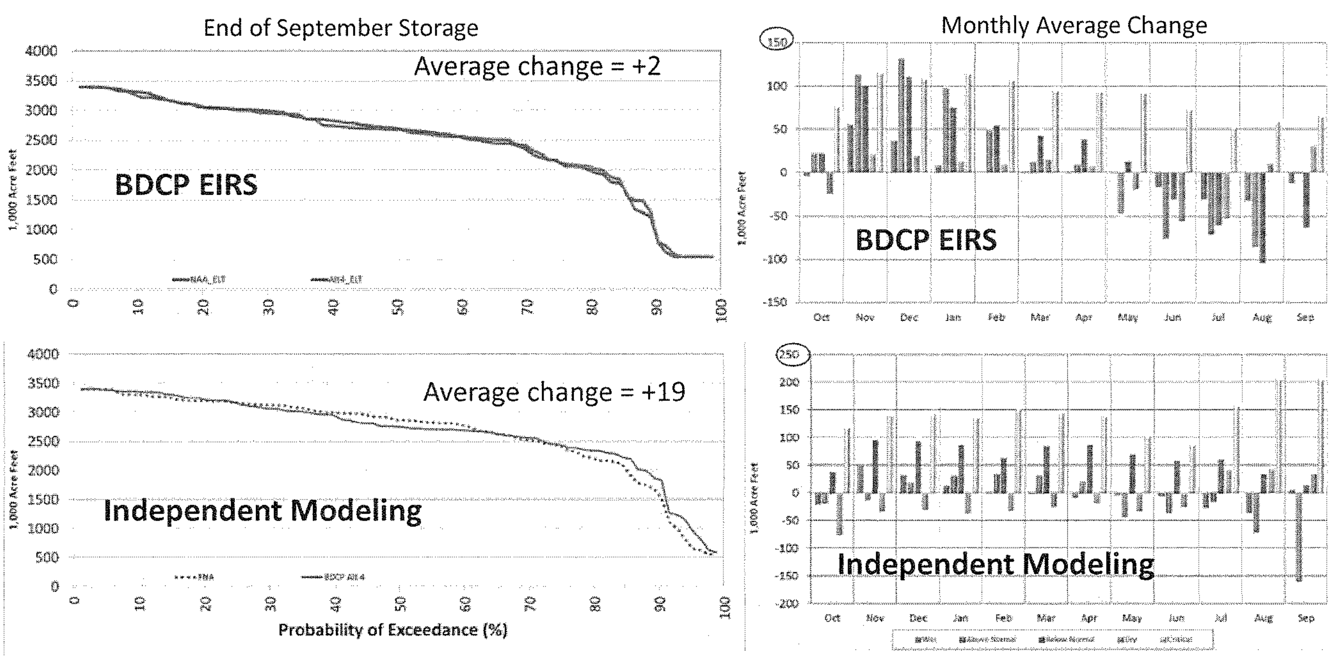
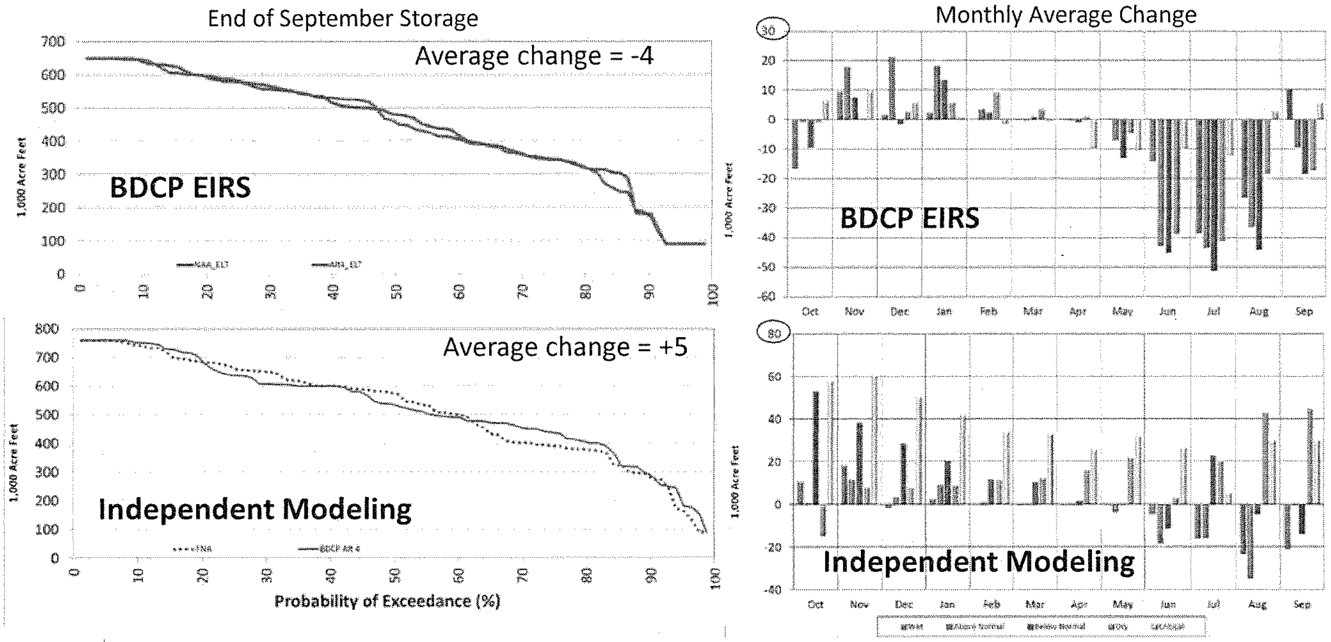


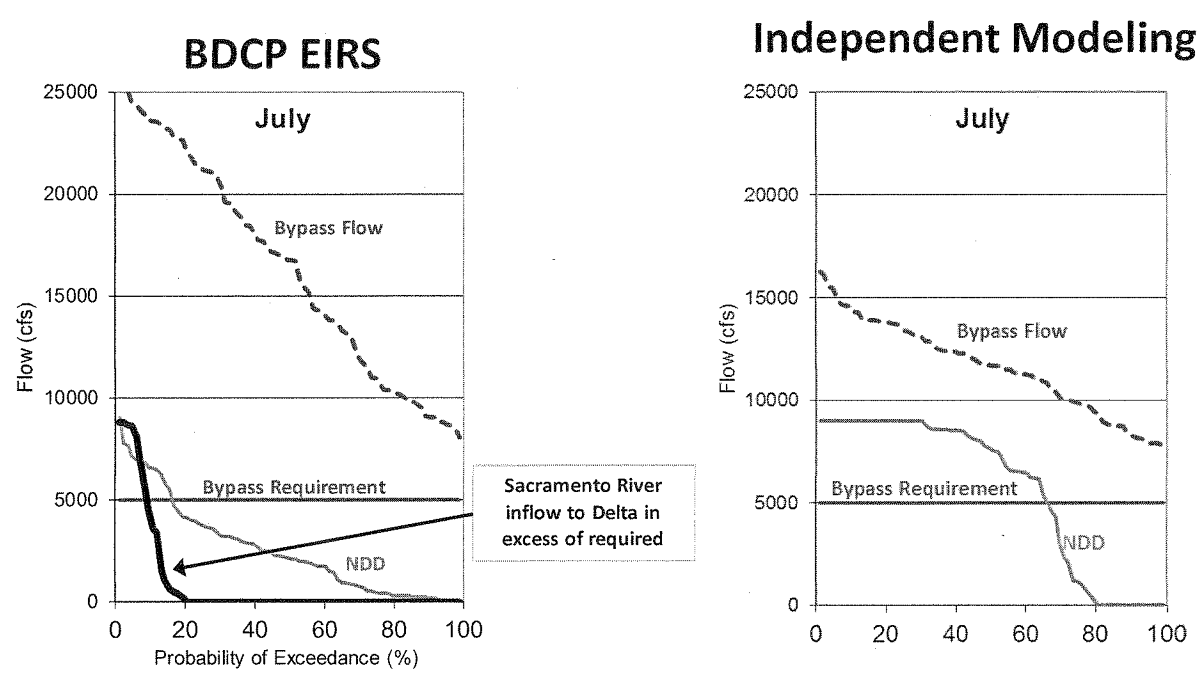
Figure 59. Result Difference: Folsom Storage



North Delta Diversions

Independent modeling shows greater NDD during July and other months because the BDCP EIRS modeling includes artificially high Sacramento River bypass flow requirements. Figure 60 contains exceedance probability plots of Sacramento River required bypass, Sacramento River bypass flow, NDD, and excess Sacramento River flow to the Delta. As can be seen in Figure 60, bypass flow is always above the bypass requirement. The BDCP version of CalSim sets a requirement for Sacramento River inflow to the Delta that the independent modeling does not need in order to satisfy Delta requirements, therefore the NDD is higher in the independent modeling.

Figure 60. NDD, and Sacramento River Flow



Delta flows below the NDD facility

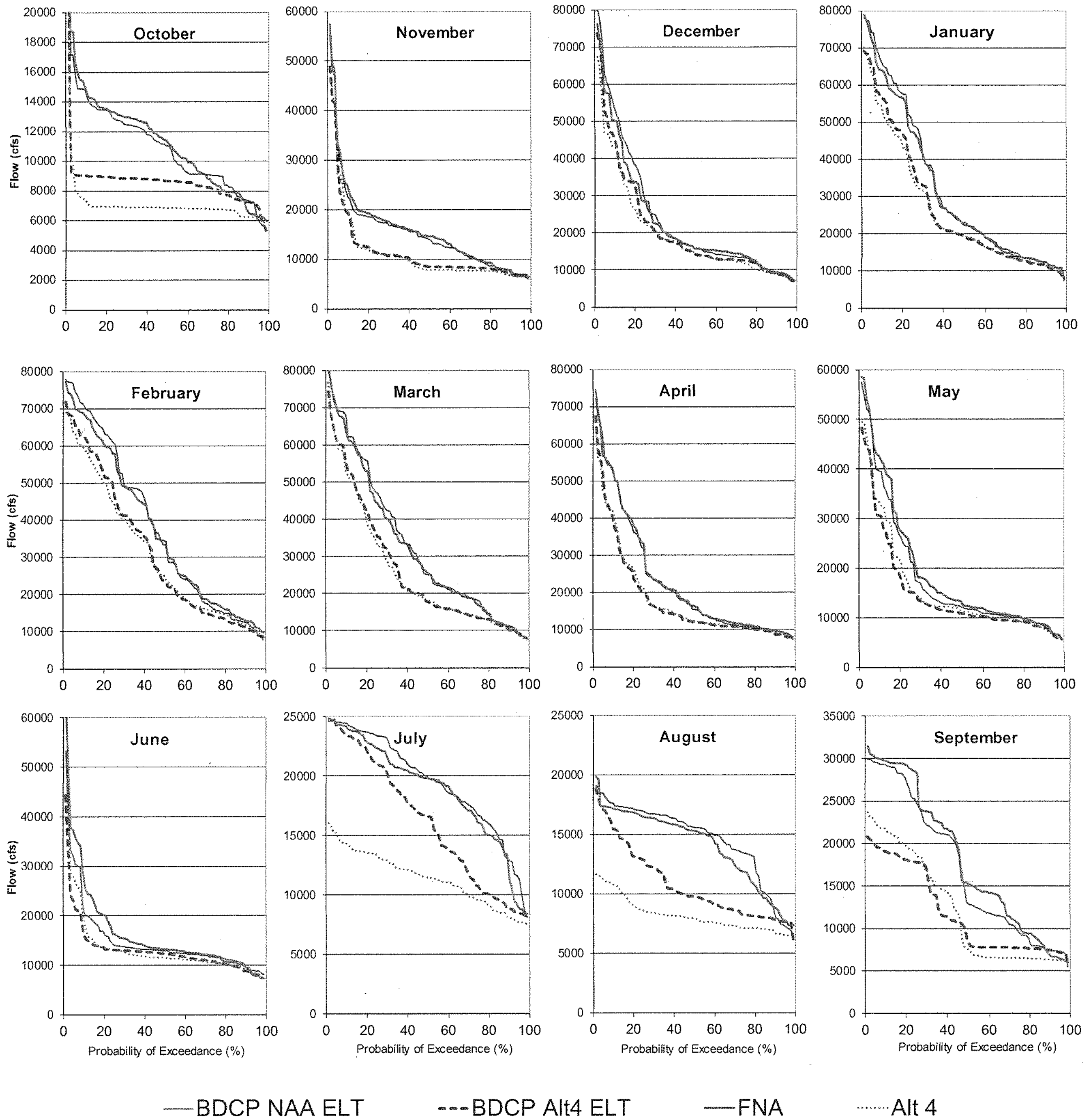
Figure 61 contains monthly exceedance probability plots for Sacramento River below the NDD for the following scenarios: 1) BDCP NAA-ELT, 2) BDCP Alt 4-ELT, 3) independent modeling FNA, and 4) independent modeling Alt 4. The most significant differences in flow changes occur in October, July, August, and September. Changes in Sacramento River flow entering the Delta are a key indicator of changes in interior Delta flows, water levels, and water quality.

For the month of October the independent modeling shows flow below the NDD to be about 2,000 cfs lower than the BDCP modeling. The difference in this month is largely due to reoperation (closure) of the cross channel gate to lessen the amount of Sacramento River flow at Hood necessary to maintain Rio Vista flow requirements downstream of the cross channel gates.

The most substantial difference between the BDCP and independent modeling occurs in July and August. The differences in these two months are primarily attributable to model fixes that have occurred since the BDCP modeling was performed. In the independent modeling, July flows are reduced on average about 7,500 cfs while BDCP shows a reduction of about 3,300 cfs. In the independent modeling August flows are reduced on average about 5,900 cfs while BDCP shows a reduction of about 3,900 cfs.

In the independent modeling September flows are reduced by about 6,100 cfs while BDCP modeling shows a reduction of about 5,300 cfs. The independent modeling shows Sacramento River flow entering the Delta to be about 7,000 cfs 50% of the time, BDCP modeling show Sacramento River flow is about 8,000 cfs 50% of the time.

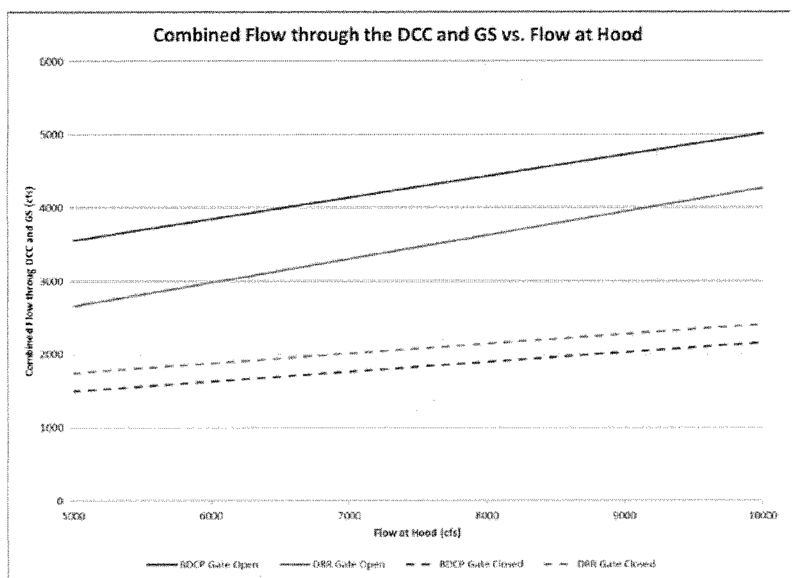
Figure 61. Sacramento River below Hood



Sacramento River water entering the Central Delta

In CalSim, flow through the DCC gate and Georgianna Slough from the Sacramento River into the Central Delta is assumed to be linearly dependent on flow at Hood. There are two linear relationships; one is used when the DCC gates are closed, and the other is used when the DCC gates are open. The 2013 SWP Delivery Reliability Report CalSim II modeling, and therefore our independent modeling, used different linear flow relationships than BDCP. The BDCP and 2013 DRR (and independent) flow relationships for both the open and closed gate conditions are compared in Figure 62. When Sacramento River flow at Hood is in the range from 5,000 cfs to 10,000 cfs the balance between Hood flow, required flow at Rio Vista, and DCC gate operation can affect upstream reservoir operations, SOD exports, and Delta outflow. As shown in Figure 62, given the same flow at Hood and DCC gates closed, the independent analysis will show slightly higher flow into the Central Delta (12% to 17% difference for the Hood flows in the 5,000 cfs to 10,000 cfs range). With DCC gates open the same flow at Hood, the independent analysis will show lower flow into the Central Delta (-15% to -25% difference for the Hood 5,000 cfs to 10,000 cfs range). Figure 63 and Figure 64 show the differences through the DCC and combined flow through the DCC and Georgiana Slough.

Figure 62. Flow through Delta Cross Channel and Georgiana Slough versus Sacramento River Flow at Hood



In addition to the differences in flow equations for portion of Sacramento River entering the interior Delta through the DCC and Georgiana Slough, the DCC gate operations were modified for the month of October. In the independent modeling, the DCC gate is operated to balance the amount of Sacramento River flow needed to meet flow standards at Rio Vista on the Sacramento River and flow needed to meet western Delta water quality. This changed operation often results in DCC gate closures for about 15 days during the month of October. The reduction in flow through the DCC during October can be seen in Figure 64.

Figure 63. Cross Channel Flow

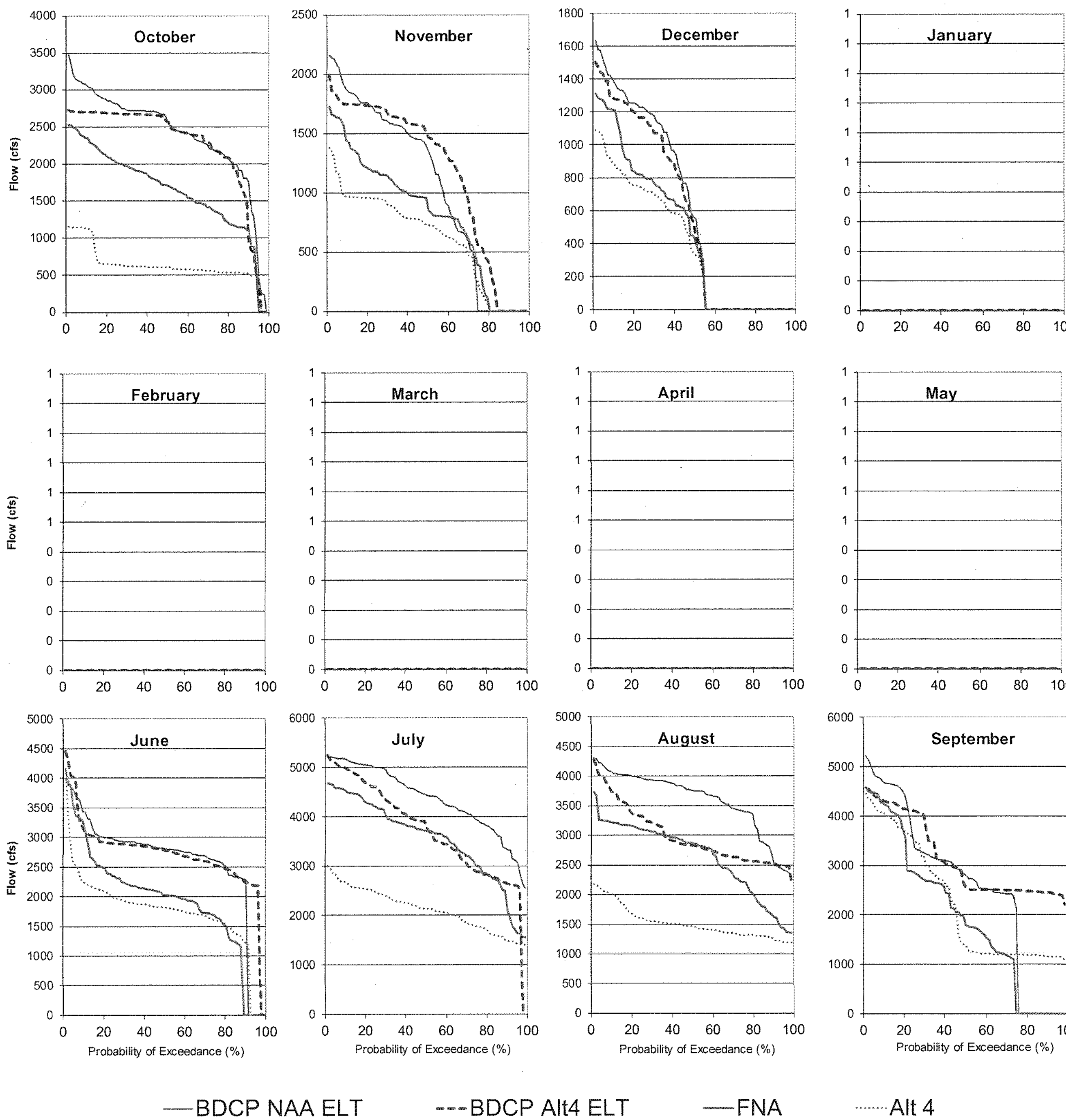
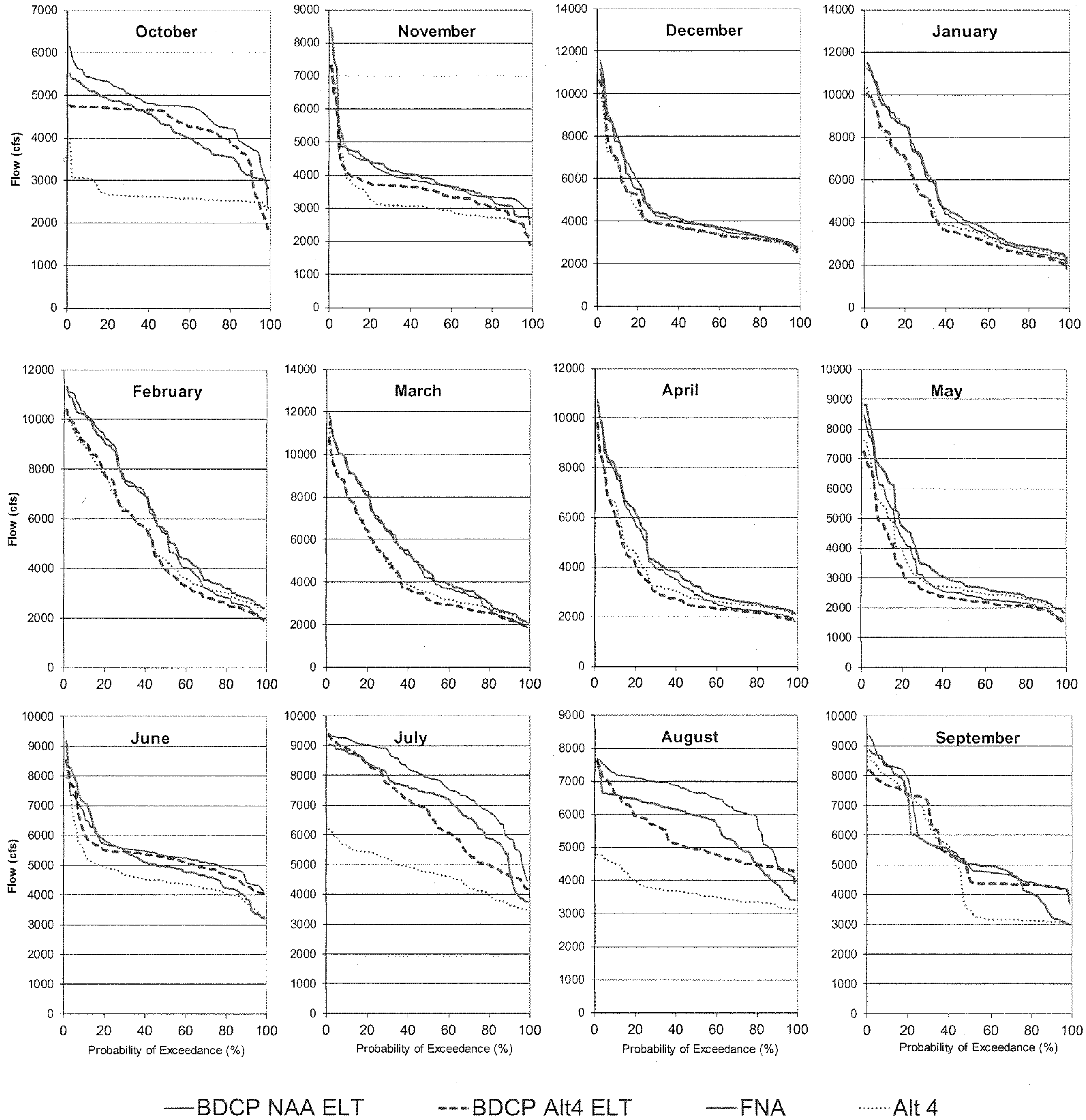


Figure 64. Flow through Delta Cross Channel and Georgiana Slough



Conclusions regarding BDCP effects

1. The amount of water exported (diverted from the Delta) may be about 200 thousand acre-feet (TAF) per year higher than the amount disclosed in the Draft EIRS. This total represents
    - about 40 TAF/yr more water diverted and delivered to the SWP south of Delta contractors, and
    - about 160 TAF/yr more water diverted and delivered to the CVP south of Delta contractors.

2. Our independent analysis using the revised CalSim II model estimates that, under the No Action Alternative (without the BDCP), total average annual exports, for CVP and SWP combined, are estimated to be 4.86 million acre feet (MAF) in a Future No Action (FNA), and 5.61 MAF in the Alt 4 Scenario. BDCP modeling shows an increase in export of about 540 TAF and independent modeling shows an increase of about 750 TAF.

3. Delta outflow would decrease by about 200 TAF/yr compared to the amount indicated in the Draft EIRS.
    - This lesser amount of Delta outflow has the potential to cause greater water quality and supply impacts for in-Delta beneficial uses and additional adverse effects on species. To determine the potential effects of the reduced amount of outflow, additional modeling is needed using tools such as DSM2.

4. Delta diversions are increased once the location of the North Delta intakes is accurately represented.
    - When the NDD location errors are corrected, modeling reveals that the North Delta intakes could divert about 680 TAF/yr more than what was disclosed in the BDCP Draft EIRS and
    - The amount of water diverted at the existing South Delta facilities would be about 460 TAF/yr less than what is projected in the BDCP Draft EIRS.

<u>Caveat Regarding Both BDCP Draft EIRS Modeling and Independent Modeling</u>
Hydrologic modeling of BDCP alternatives using CalSim II has not been refined enough to understand how BDCP may affect CVP and SWP operations and changes in Delta flow dynamics. Better defined operating criteria for project alternatives is needed along with adequate modeling rules to analyze how BDCP may affect water operations. Without a clear understanding of how BDCP may change operations, affects analysis based on this modeling may not produce reliable results and should be revised as improved modeling is developed.

MBK ENGINEERS
Water Resources ● Flood Control ● Water Rights

TECHNICALMEMORANDUM

DATE: July 25, 2014

TO: North Delta Water Agency

FROM: Walter Bourez, Patrick Ho, and Gary Kienlen

SUBJECT: Technical Comments on Bay-Delta Conservation Plan Modeling

This technical memorandum is a summary of MBK Engineers' findings and opinions on the hydrodynamic modeling performed in support of the draft environmental document for the Bay-Delta Conservation Plan (BDCP) for North Delta Water Agency (NDWA). The results of that modeling are summarized in Appendix 5A to the draft BDCP EIR/EIS.

This review of the BDCP modeling focuses on water quality, stage, flow, and velocity at numerous locations within the NDWA. Although, this memorandum focuses on the following locations, data for other locations reviewed are contained in the Appendix:

- Sacramento River at Emmaton
- Sacramento River at Three Mile Slough
- Sacramento River at Rio Vista
- Steamboat Slough at Sutter Slough
- North Fork Mokelumne River
- Cache Slough at Ryer Island
- Barker Slough at North Bay Aqueduct (NBA)
- Shag Slough at Reclamation District (RD) 2068 intake

No Action Alternative

Assumptions used in CalSim II water operations modeling and DSM2 Delta hydrodynamic modeling for the BDCP No Action Alternatives (NAA) are defined in the December 2013 Draft BDCP[1] and associated draft EIR/S. Those assumptions include changes to hydrology cause by climate change.

Climate Change

Analysis presented in the BDCP draft plan and draft EIR/EIS attempts to incorporate the effects of climate change at two future climate periods: Early Long Term (ELT) at approximately year 2025; and Late Long Term (LLT) at approximately year 2060. Although BDCP modeling includes both the ELT and

[1] The detailed assumptions are stated in BDCP draft EIR/EIS Appendix 5A.

LLT, the EIR/EIS relies on the LLT and only includes the ELT in Appendix 5. As described in the BDCP draft plan and draft EIR/EIS[2], other analytical tools were used to determine anticipated changes to precipitation and air temperature that is expected to occur under ELT and LLT conditions. Projected precipitation and temperature were then used to determine how much water is expected to flow into the upstream reservoirs. These time-series were then input to the CalSim II model to perform water operations modeling and determine Delta inflow, outflow, and exports.

A second aspect of climate change, the anticipated amount of sea level rise, is incorporated into the CalSim II model by modifying a subroutine that determines salinity within the Delta based on flows within Delta channels. Sea level rise is evaluated in greater detail through use of DSM2 using output from CalSim II. Effects of sea level rise will manifest as a need for additional outflow when Delta water quality is controlling operations to prevent seawater intrusion. In this technical memorandum, we do not critique the climate change assumptions themselves[3], we instead focus on effects of BDCP by comparing with project modeling to without project modeling.

There are three without Project ("baseline" or "no action") modeling scenarios used for the BDCP modeling analysis: No Action Alternative (NAA)[4], No Action Alternative at the Early Long Term (NAA – ELT), and No Action Alternative at the Late Long Term (NAA –LLT). Assumptions for NAA, NAA-ELT, and NAA-LLT are provided in the Draft EIR/EIS's modeling appendix[5]. The only difference between these scenarios is the climate-related changes made for the ELT and LLT conditions (Table 1).

Table 1. Scenarios Used to Evaluate Climate Change

	Climate Change Assumptions	
Scenario	**Hydrology**	**Sea Level Rise**
No Action Alternative (NAA)	None	None
No Action Alternative at Early Long Term (NAA-ELT)	Modified reservoir inflows and runoff for expected conditions at 2025	15 cm
No Action Alternative at Early Long Term (NAA-LLT)	Modified reservoir inflows and runoff for expected conditions at 2060	45 cm

Description of the BDCP Project

The BDCP contemplates a dual conveyance system that would move water through the Delta's interior or around the Delta through an isolated conveyance facility. The BDCP CalSim II files contain a set of studies evaluating the projected operation of a specific version of such a facility. Each Alternative was imposed on two baselines: the NAA-ELT scenario and the NAA-LLT scenario. The BDCP Preferred

[2] BDCP EIR/EIS Appendix 5A, Section A and BDCP HCP/NCCP plan Appendix 5.A.2
[3] This should not be read to imply that climate change assumptions are reasonable or considered correct or incorrect; the limited review reflects the scope of this memorandum.
[4] NAA is also called the Existing Biological Conditions number 2 (EBC-2) in the Draft Plan.
[5] BDCP EIR/EIS Appendix 5A, Section B, Table B-8.

Alternative, Alternative 4, has four possible sets of operational criteria, termed the Decision Tree. Key components of Alternative 4 ELT and Alternative 4 LLT are as follows:

The same system demands and facilities as described in the NAA with the following primary changes:

- three proposed North Delta Diversion (NDD) intakes of 3,000 cfs each;
- NDD bypass flow requirements;
- additional positive OMR flow requirements and elimination of the San Joaquin River I/E ratio and the export restrictions during Vernalis Adaptive Management Program;
- modification to the Fremont Weir to allow additional seasonal inundation and fish passage;
- modified Delta outflow requirements in the spring and/or fall (defined in the Decision Tree discussed below);
- relocation of the Emmaton salinity standard; redefinition of the E/I ratio;
- acquisition of 25,000 acres and 65,000 acres of in-Delta lands for ELT and LLT environments respectively for habitat restoration; and
- removal of current permit limitations for the south Delta export facilities.

The changes (benefits or impacts) of the operation due to Alternative 4 are highly dependent upon the assumed operation of not only the NDD and the changed regulatory requirements associated with those facilities, but also by the assumed integrated operation of existing CVP and SWP facilities. The modeling of the NAA Scenarios introduces significant changes in operating protocols suggested primarily to react to climate change. The extent of the reaction does not necessarily represent a likely outcome, and thus the Reviewers have little confidence that the NAA baselines are a valid representation of a baseline from which to compare an action Alternative. However, a comparison review of the Alt 4 to the NAA illuminates operational issues in the BDCP modeling and provides insight as to where benefits or impacts may occur.

BDCP Alternative 4 has four possible sets of operational criteria, termed the Decision Tree, that differ based on the "X2" standards that they contemplate:

- Low Outflow Scenario (LOS), otherwise known as operational scenario H1, assumes existing spring X2 standard and the removal of the existing fall X2 standard;
- High Outflow Scenario (HOS), otherwise known as H4, contemplates the existing fall X2 standard and providing additional outflow during the spring;
- Evaluated Starting Operations (ESO), otherwise known as H3, assumes continuation of the existing X2 spring and fall standards;
- Enhanced spring outflow only (not evaluated in the December 2013 Draft BDCP), scenario H2, assumes additional spring outflow and no fall X2 standards.

While it is not entirely clear how the Decision Tree would work in practice, the general concept is that, prior to operation of the NDD, implementing authorities would select the appropriate decision tree scenario (from amongst the four choices) based on their evaluation of targeted research and studies to be conducted during planning and construction of the facility.

Our review examined the ESO (or H3) scenario (labeled Alt 4-ELT or Alt 4-LLT) because it employs the same X2 standards as are implemented in NAA-ELT and NAA-LLT. This allowed the Reviewers to focus the analysis on the effects of the BDCP operations independent of the possible change in the X2 standard.

Method of Review

The first part of the review focused on effects of Delta hydrodynamics determined by DSM2 models used in support of the EIRS. During a separate review of the CalSim II modeling used in support of the EIRS (Model), MBK Engineers and Dan Steiner found that the Model provided very limited useful information to understand the effects of BDCP. The Model contains erroneous assumptions, errors, and outdated tools, which result in impractical or unrealistic Central Valley Project (CVP) and State Water Project (SWP) operations. The unrealistic operations, in turn, do not accurately depict the effects of the BDCP. An independent CalSim II water operation modeling analysis was thus performed by MBK Engineers and a subsequent DSM2 Delta hydrodynamics modeling analysis was performed and provided by Contra Costa Water District. Assumptions used in the Independent CalSim II water operations modeling is described in "Report on Review of Bay Delta Conservation Program Modeling" (MBK, 2014). The independent DSM2 model excludes climate change and sea level rise in the NAA and Alt 4 scenarios. Since the Model used in support of the EIRS analyzes NDD and habitat restoration as inseparable project components, it is not possible to distinguish whether the effects of the project are due to NDD operations or the proposed habitat restoration. Moreover, it is possible, if not probable, that NDD could be constructed and operating for an extended period of time without the proposed habitat in place. Habitat restoration requires time to establish its intended functionality and effects to Delta hydrodynamics and salinity from operating the NDD itself cannot be evaluated under the Model. To separate and understand the effects, the independent DSM2 modeling included an NAA with habitat and an Alt 4 NDD without habitat as two additional scenarios.

The DSM2 Independent Modeling provides two Alternative 4 scenarios: 1) Alternative 4 NDD without climate change, sea level rise, and habitat restoration, 2) Alternative 4 NDD without Climate Change and sea level rise, but includes 25,000 acres of habitat. For basis of comparison, a No Action Alternative without climate change, sea level rise, and habitat was provided.

Outputs were extracted from the DSM2 modeling and flows, stage, velocities, and salinity under the alternative were compared against the baseline, i.e. Alt 4 ELT is compared to NAA ELT and Alt 4 LLT is compared to NAA LLT. DSM2 simulates from October 1974 to September 1991 and produces output at 15-minute intervals. Daily maximums, minimums, and averages are then calculated from the 15-minute data. To provide meaning to the data, daily exceedance charts were produced. Percent exceedance describes the portion of the dataset, expressed in percentages, that exceeds a specific level. For example, a 90% flow exceedance of 200,000 cfs means that 90% of the daily flow during the simulated period, i.e. October 1974 to September 1991, is greater than 200,000 cfs. Exceedances provide an overall view of the entire dataset in an ordered manner. When alternatives are plotted together, differences between the alternatives are easily distinguishable and potential project effects can be identified.

Hydrodynamics and salinity were reviewed at various locations within NDWA. For the purposes of this review particular locations reviewed include the NDWA Contract compliance points on the Sacramento River at Three Mile Slough, Rio Vista and Walnut Grove, Steamboat Slough at Sutter Slough, and the Mokelumne River at Walnut Grove. Another area of interest is the Cache Slough complex, which includes lower Cache Slough, Shag Slough, and Barker Slough due to the reviewers understanding that a majority of the habitat areas will be acquired from lands adjacent to the Cache Slough complex. The project's effects on river stage, flows, and velocities in this area is of interest to NDWA, particularly at the North Bay Aqueduct (NBA) pumping plant in Barker Slough and at the RD 2068 intake pumps in Shag Slough. For certain intakes, reduced river stage to levels below historical design elevations require additional energy usage at pumping plants, which increases pumping costs, while other intakes operating through a siphon will not operate. Furthermore, increased river stage may increase seepage, requiring additional maintenance for drainage. In the inner Delta, changes in cross channel gate operations at Walnut Grove will control the hydrodynamics of the Mokelumne River and therefore effects of flow, stage, and velocities along the Mokelumne River were reviewed.

Conclusions

BDCP Modeling

Figure 1 through Figure 16 illustrates hydrodynamics, and water quality under the NAA ELT and the Existing Conditions from the EIRS. Positive maximum values quantify daily outgoing or ebb tides while negative minimum values quantify daily incoming (reverse) or flood tides. Under the NAA ELT, daily positive flows and daily reverse flows increase, while daily maximum, average, and minimum stage are increased throughout the system when compared to existing conditions. As shown in Figure 1, for the Sacramento River at Emmaton, daily outgoing flows increase by an average of 4,335 cfs, while daily average reverse flow increase by 3,614 cfs. As illustrated in Figure 2, daily maximum, average, and minimum stage on the Sacramento River at Emmaton increases by approximately 0.5 feet when compared to existing. Sea level rise is a large component to the increase in stage. Similar effects are observed in velocities at Emmaton. Figure 3 illustrates increases in daily average outgoing and incoming velocity. Positive changes in daily maximum represent an increase in velocity on the outgoing tide while negative changes in daily minimum velocity respresent an increase in velocity on the incoming tide. Increased velocities have the potential to induce scouring along channels and undermine levee stability. Figure 6 illustrates the 14-day running average salinity, expressed as electrical conductivity in millimhos per centimeter, for the Sacramento River at Emmaton over the simulation period. The NDWA contract provision at Three Mile Slough is plotted to emphasize periods of contract compliance or non-compliance. Water quality is in compliance when the 14-day running average is less than the allowed salinity concentration. Likewise, water quality is non-compliant when the 14-day running average exceeds allowed salinity concentration. To summarize Figure 6, non-compliant days were counted for the simulation period and expressed as a percentage of non-compliant days in the simulation period or 6,209 days. Figure 5 illustrates the percentage of 6,209 days that were non-compliant and also quantifies the concentration in excess of contract compliance under the NAA-ELT and existing conditions. Overall, water quality in the Sacramento River at Three Mile Slough is worse under NAA-ELT when compared to existing conditions. Under the existing conditions, 472 days were non-compliant under NDWA contract provisions, while 736 days were non-compliant under the NAA-ELT. Similar effects to flows, stage, velocities, and water quality are observed in the Sacramento River at Three Mile Slough, the Sacramento River at Rio Vista, Steamboat Slough at Sutter Slough, Barker Slough at the NBA pumping plant, and Shag slough at RD 2068's pumping plant, illustrated from Figure 6 through Figure 16.

Figure 17 through Figure 31 illustrates percent exceedances of hydrodynamics and water quality under the NAA-ELT and Alt 4-ELT. In the Sacramento River at Emmaton and Rio Vista, under Alt 4-ELT, daily positive flows and daily reverse flows increase, while daily average flow decreases when compared to

NAA-ELT. Moreover, daily maximum stage decreases, while daily minimum stage increases when compared to NAA-ELT. At Emmaton, daily average flow decreases by approximately 1,370 cfs, daily average positive flows increase by approximately 10,680 cfs, while daily average reverse flow increases by approximately 8,450 cfs as illustrated in Figure 17. Daily maximum stage decreases on an average of 0.32 feet, while daily minimum stage increases on average by approximately 0.37 feet as illustrated in Figure 18. Decreases in daily maximum stage and increases in daily minimum stage could be explained by the transport of flood and ebb tides into proposed habitat areas, which provides a dampening effect to hydrodynamics in the Delta system.

Although habitat areas are not clearly defined, the effects are observed at lower parts of the Delta system, such as the observations at Emmaton. Figure 26 illustrates an improvement in water quality in the Sacramento River at Rio Vista and at Three Mile Slough under Alt 4-ELT when compared to NAA-ELT. In Steamboat Slough at Sutter Slough, daily maximum, average, and minimum flows decrease under ALT 4-ELT as illustrated in Figure 27. As would be expected with decreased flows, decreases in stage also were also observed in Steamboat Slough, where daily average stage decreased by approximately 0.25 feet and the maximum stage is reduced on average by approximately 0.53 feet under Alt 4-ELT when compared to NAA-ELT. At the NBA pumping plant on Barker Slough daily maximum stage is decreased on average by approximately 0.6 feet, while daily minimum stage is increased on average by approximately 0.77 feet as illustrated in Figure 30. At RD 2068's pumping plant, daily maximum stage is reduced on average by 0.55 feet, while daily minimum stage is increased on average by approximately 0.57 feet as illustrated in Figure 31.

In summary, water quality is worsened under NAA ELT when compared with existing conditions. At Three Mile Slough, the number of days not compliant with NDWA water quality contract provisions has increased by 264 days under NAA ELT, compared to existing conditions. However, water quality improves under Alt 4 ELT when compared to NAA ELT. An assumption under the ELT climate change environment is a 15 cm sea level rise. Sea level rise increases stage throughout the Delta system, which may result in increased seepage and flood risk to Delta Islands. However, under the project alternative (Alt 4), daily maximum stages are reduced, while daily minimum stage increases when compared to NAA ELT.

Independent Modeling

Figure 32 through Figure 51 illustrates hydrodynamics and water quality under the NAA without habitat and NAA with habitat. Under NAA with habitat, daily positive flows and daily reverse flows increase in the Sacramento River at Emmaton and at Rio Vista, while daily average flow decreases when compared to NAA without habitat. Moreover, daily maximum stage decreases, while daily minimum stage increases when compared to NAA with habitat. At Emmaton, daily average flow increases by approximately 170 cfs, daily average positive flows increase by approximately 9,590 cfs, while daily average reverse flow increase by approximately 5,125 cfs as illustrated in Figure 32. Daily maximum stage decreases on an average of 0.31 feet, while daily minimum stage increases on average by approximately 0.36 feet as illustrated in Figure 33. Figure 36 and Figure 38 illustrates improvement in water quality in the Sacramento River at Emmaton and at Three Mile Slough under the NAA with habitat when compared to NAA without habitat. For Steamboat Slough at Sutter Slough, daily maximum, average, and minimum flows decrease under NAA without habitat as illustrated in Figure 43. Corresponding changes in stage are also observed; the daily average stage is reduced by approximately

0.1 feet, daily maximum stage is reduced on average by approximately 0.42 feet, while daily minimum stage is increased on average by 0.2 feet under NAA with habitat compared to NAA without habitat.

In the interior Delta, daily positive flow in the North Fork Mokelumne River increase on average by 1,137 cfs, while daily reverse flow increase on by 2,755 cfs as illustrated in Figure 46. Daily maximum stage decreases on average by approximately 0.72 feet while daily minimum stage increases on average by approximately 0.8 feet as illustrated on Figure 47. In Cache Slough at Ryer Island, daily maximum stage decrease on average by approximately 0.5 feet, while daily minimum stage increases by an average of approximately 0.5 feet. In Barker Slough at the NBA pumping plant daily maximum stage is reduced approximately 0.6 feet on average, while daily minimum stage is increased on average by approximately 0.76 feet as illustrated in Figure 50. At RD 2068's pumping plant, daily maximum stage is reduced on average by 0.52 feet, while daily minimum stage is increased an average of 0.56 feet as illustrated in Figure 51.

Figure 52 through Figure 71 compare the hydrodynamics and water quality under Alternative 4 with habitat and NAA without habitat. The effects are similar in pattern when compared to the models in support of the EIRS. In the Sacramento River at Emmaton and at Rio Vista, under Alt 4 with habitat, daily positive flows and daily reverse flows increase, while the daily average flows decrease when compared to NAA without habitat. Moreover, daily maximum stage decreases, while daily minimum stage increases when compared to NAA without habitat. At Emmaton, daily average flow decreases by approximately 1,800 cfs, daily average positive flows increase by 8,600 cfs, while daily average reverse flow increase by 7,460 cfs as illustrated in Figure 52. Daily maximum stage decreases by an average of 0.32 feet, while daily minimum stage increases by approximately 0.36 feet as illustrated in Figure 53. Figure 56 and Figure 58 illustrate worsening water quality in the Sacramento River at Rio Vista and at Three Mile Slough under Alt 4 with habitat when compared to NAA without habitat. In Steamboat Slough at Sutter Slough, daily maximum, average, and minimum flows decrease under ALT 4 with habitat as illustrated in Figure 63. Daily average stage is reduced by 0.29 feet, while daily maximum stage is reduced on average by 0.56 feet under Alt 4 with habitat when compared to NAA without habitat. In the interior Delta, daily positive flow in the North Fork Mokelumne River increase on average by 1,140 cfs, while daily reverse flow increases by 2,750 cfs as illustrated in Figure 66. Daily maximum stage decreases on average by approximately 0.72 feet while daily minimum stage increases on average by 0.8 feet as illustrated by Figure 67. In Cache Slough at Ryer Island, daily maximum stage decrease on average by ~0.53 feet, while daily minimum stage increase on average by ~0.5 feet. At the NBA pumping plant on Barker Slough daily maximum stage is reduced on average by ~0.62 feet, while daily minimum stage is increased on average by ~0.75 feet as illustrated in Figure 70. At RD 2068's pumping plant, daily maximum stage is reduced on average by ~0.54 feet, while daily minimum stage is increased on average by ~0.55 feet as illustrated in Figure 71.

Figure 72 through Figure 91 compare hydrodynamics and water quality under Alternative 4 without habitat and NAA without habitat. On the Sacramento River at Emmaton and Rio Vista, under Alt 4 without habitat, daily positive flows, daily reverse flows, and daily average flows decrease when compared to NAA without habitat. Changes in daily maximum, minimum, and average stage is immeasurable when compared to NAA without habitat. At Emmaton, daily average flow decreases by ~2,256 cfs, daily average positive flows decrease by ~1,058 cfs, while daily average reverse flow increase by ~2,652 cfs as illustrated in Figure 72. Figure 76 and Figure 78 illustrate worsening in water quality in the Sacramento River at Emmaton and at Three Mile Slough under Alt 4 without habitat when compared to NAA without habitat. In Steamboat Slough at Sutter Slough, daily maximum, average, and minimum flows decrease under ALT 4 with habitat as illustrated in Figure 83. Daily average stage is reduced by ~0.21 feet and daily maximum stage is reduced on average by ~0.13 feet. Daily average stage is reduced by 0.21 feet under Alt 4 without habitat when compared to NAA without habitat. In the interior Delta, daily positive flow in the North Fork Mokelumne River decrease on average by 232 cfs, while daily reverse flow increase on by 297 cfs as illustrated in Figure 86. Changes in stage are immeasurable under Alt 4 without habitat as illustrated in Figure 87. Daily maximum, minimum and average stage in Cache Slough at Ryer Island, at the NBA pumping plant on Barker Slough, and at RD 2068's pumping plant decrease by 0.02 feet as illustrated in Figure 89, Figure 90, and Figure 91.

The EIRS did not analyze the NDD without habitat restoration. Therefore, the impacts of the project cannot be adequately assessed if the NDD were to begin operating before habitat areas are acquired and established. Contrary to the Model in support of the EIRS, the independent analysis, without habitat, Alt 4 results worsening of water quality at Emmaton and Three Mile Slough when compared to NAA without habitat. Also, daily maximum, minimum, and average flow decrease at Emmaton and Rio Vista.

Recommendations

The EIR/S analysis assumes habitat restoration will be implemented and operating as fully intended under both the ELT and LLT scenarios. Even if the land is acquired for the proposed projects, habitat restoration is a time required process. Further, it is possible, if not probable, that NDD could be constructed and operating for an extended period of time without the habitat in place. The effects of NDD operations without habitat could have detrimental impacts, and should be quantified. For these reasons, the BDCP should analyze effects of operating the NDD without the habitat restoration and without the effects of climate change to assess both short term and long term impacts of the proposed project using the updated CalSim II operations and DSM2 hydrodynamics models.

No Action Alternative ELT and Existing Conditions (BDCP EIRS Modeling)

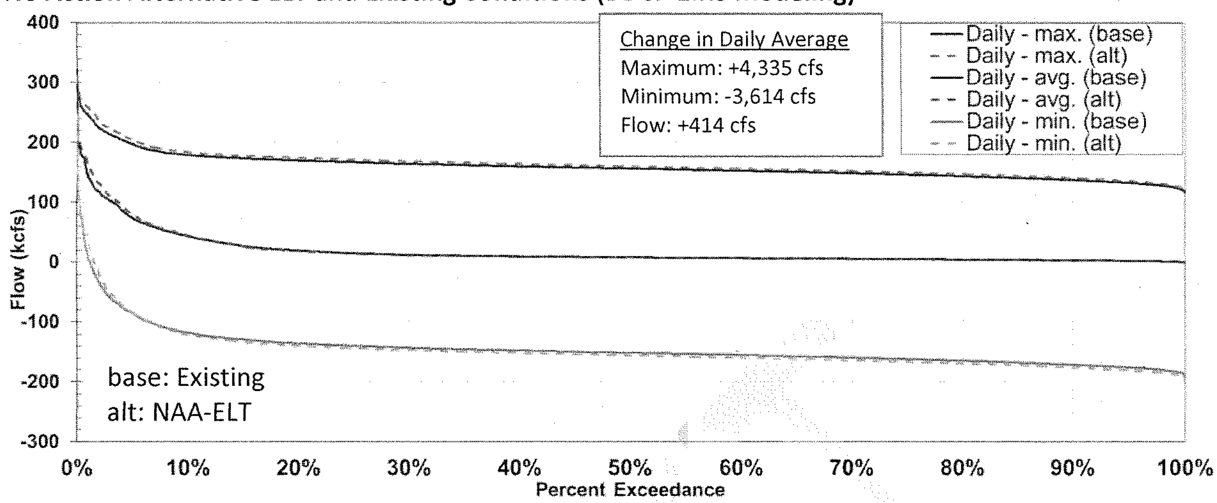


Figure 1. Daily Flow on the Sacramento River at Emmaton

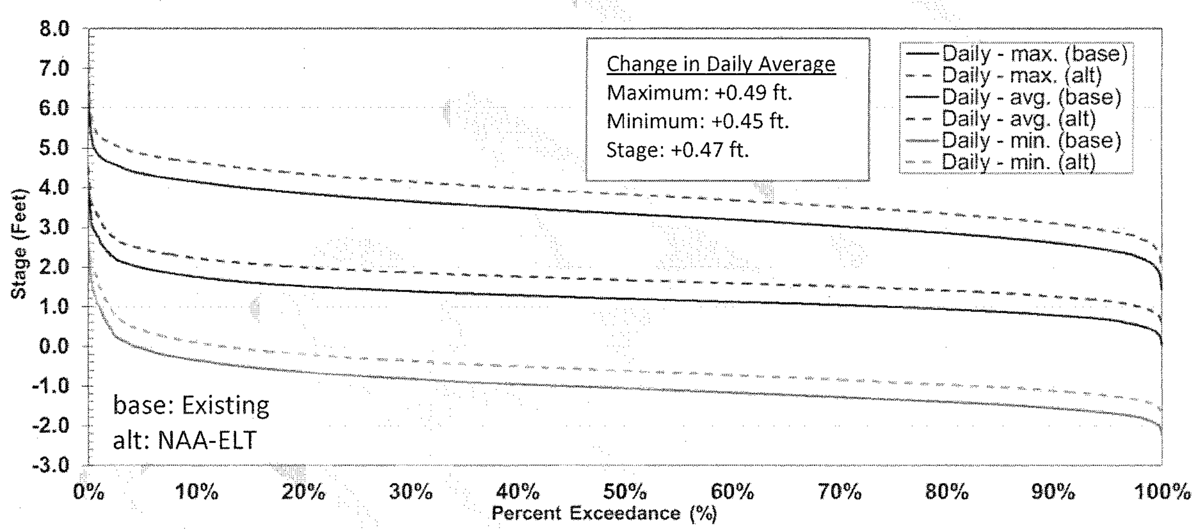


Figure 2. Daily Stage on the Sacramento River at Emmaton

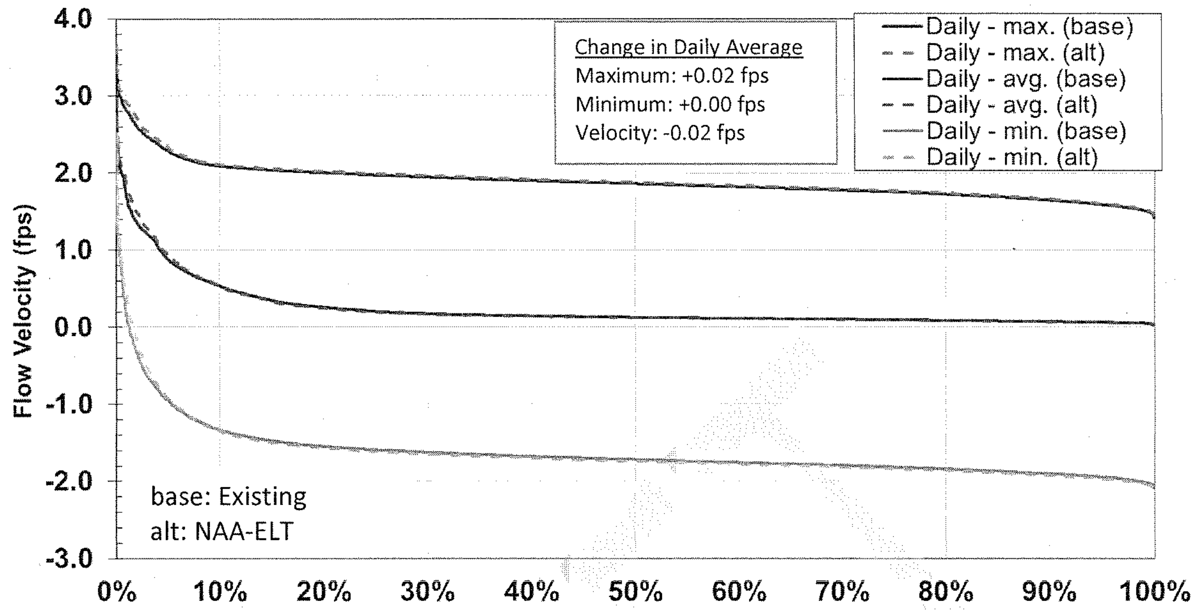


Figure 3. Daily Velocities on the Sacramento River at Emmaton

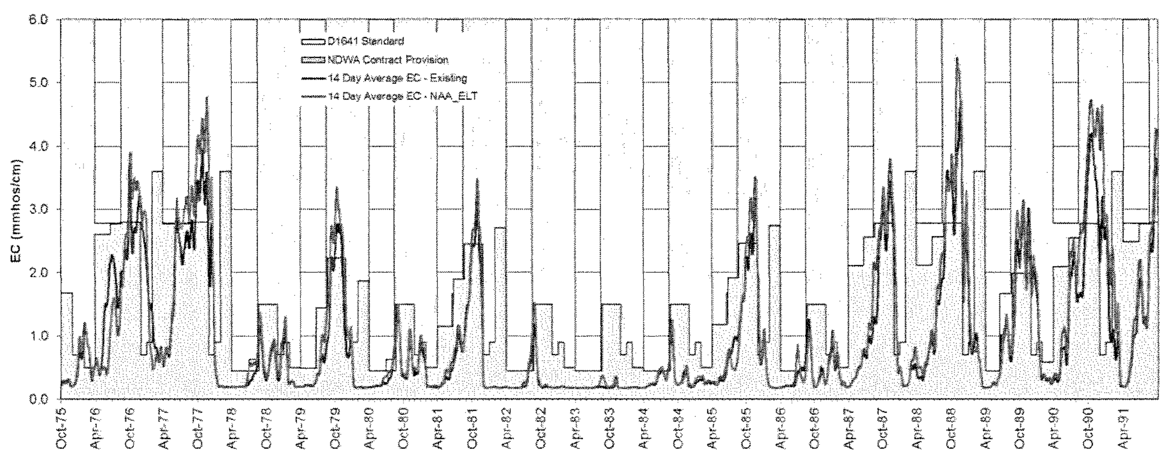


Figure 4. EC in the Sacramento River at Emmaton

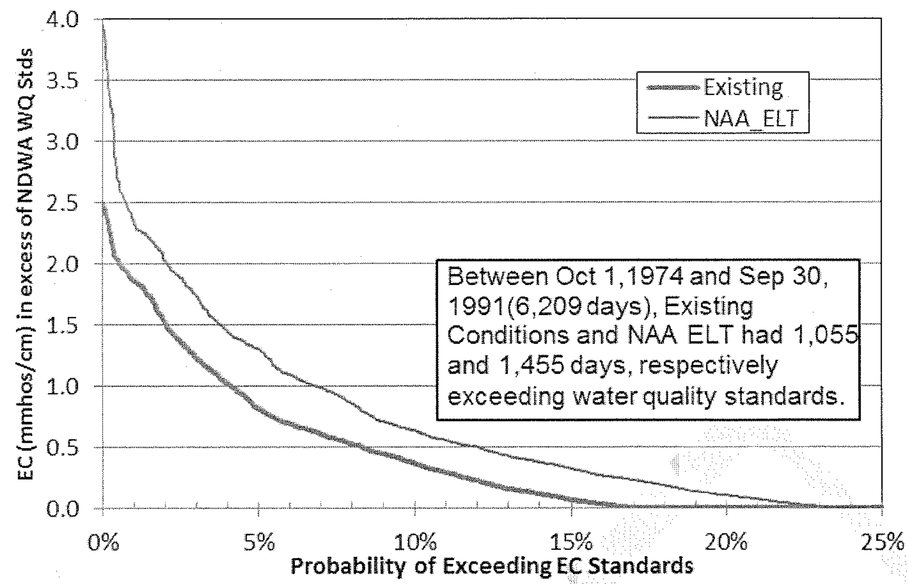


Figure 5. Probability of Exceeding EC Standards in the Sacramento River at Emmaton

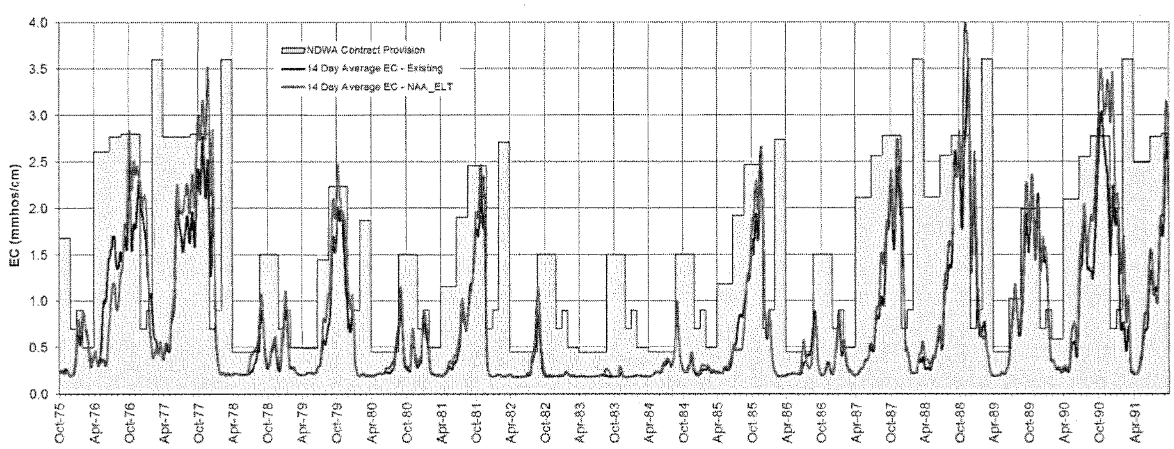


Figure 6. EC in the Sacramento River at Three Mile Slough

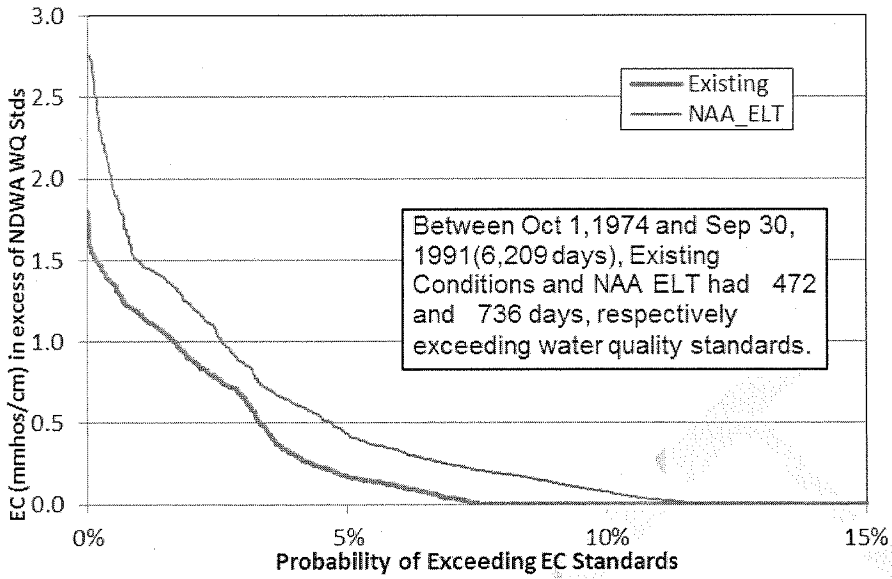


Figure 7. Probability of Exceeding EC Standards in the Sacramento River at Three Mile Slough

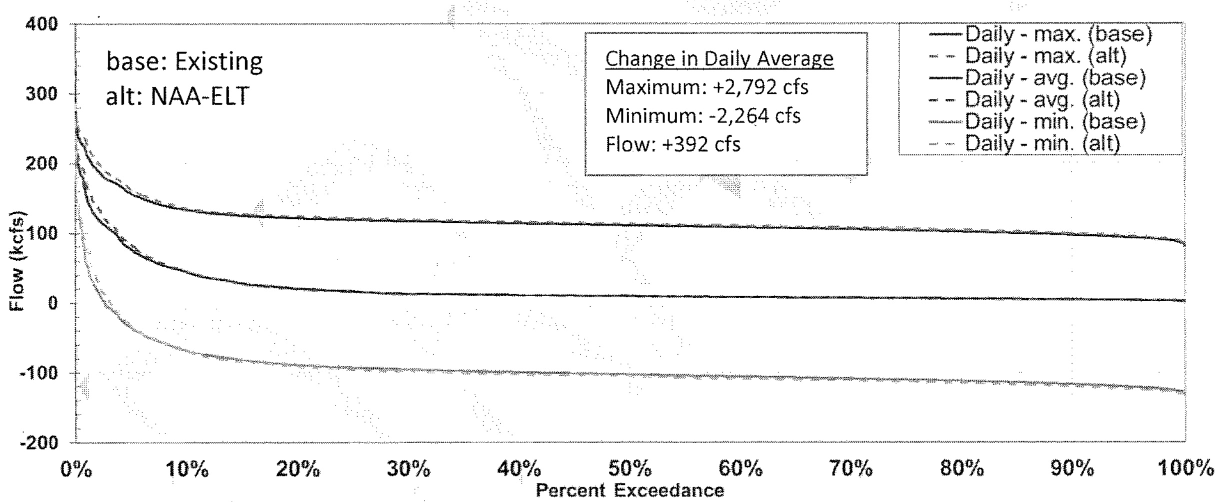


Figure 8. Daily Flow on the Sacramento River at Rio Vista

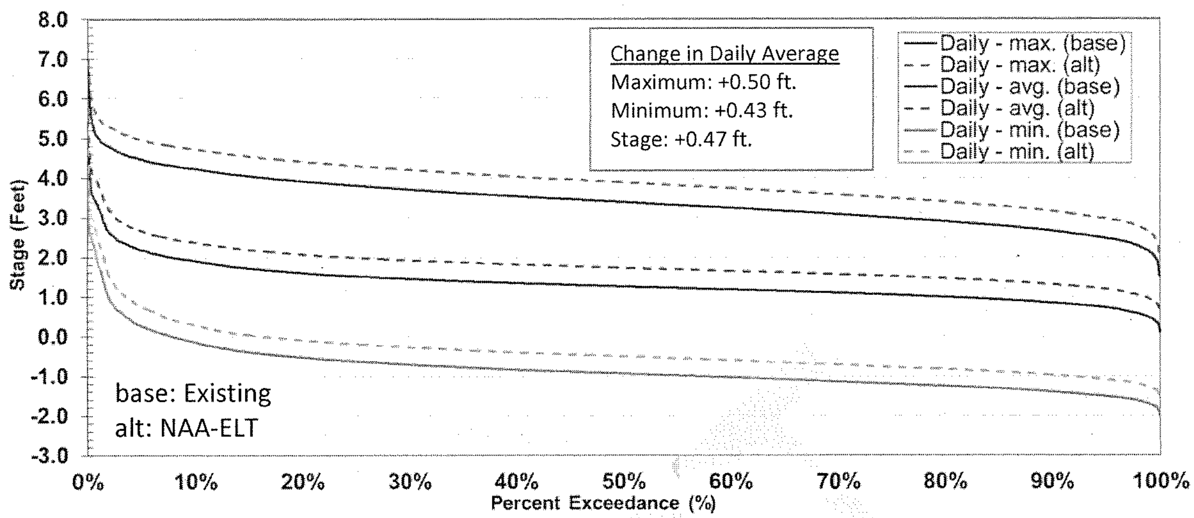


Figure 9. Daily Stage on the Sacramento River at Rio Vista

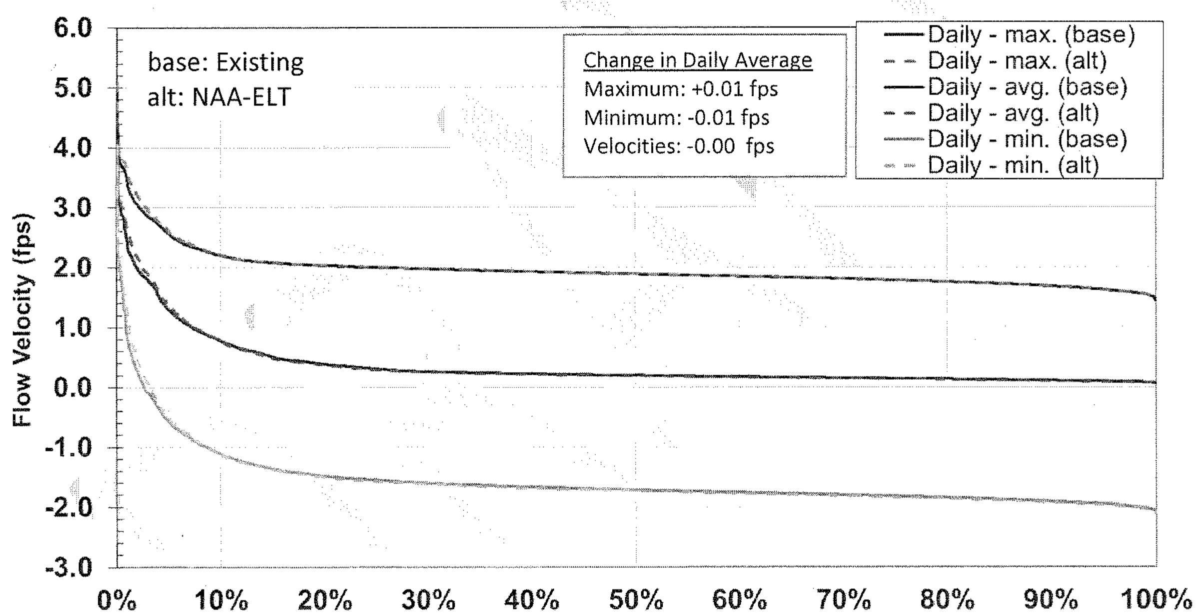


Figure 10. Daily Velocities on the Sacramento River at Rio Vista

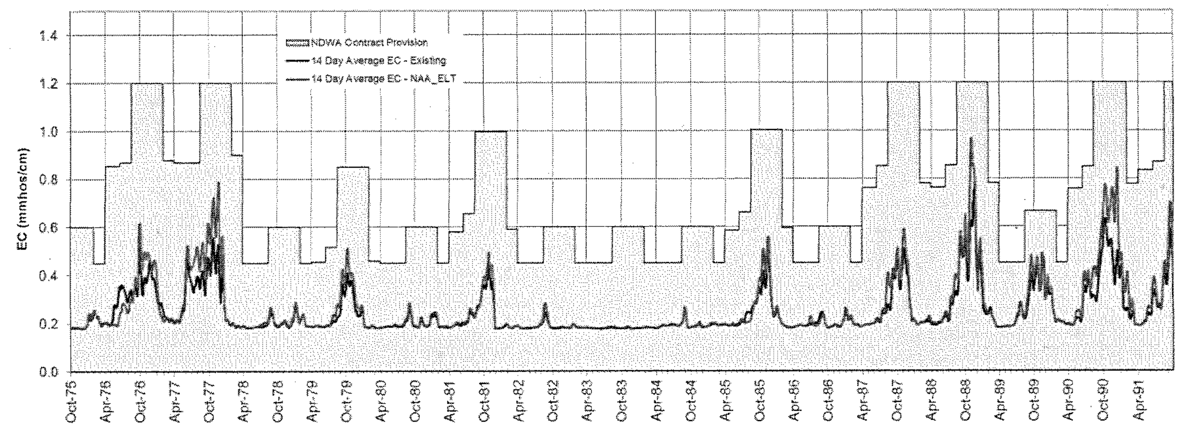


Figure 11. EC in the Sacramento River at Rio Vista

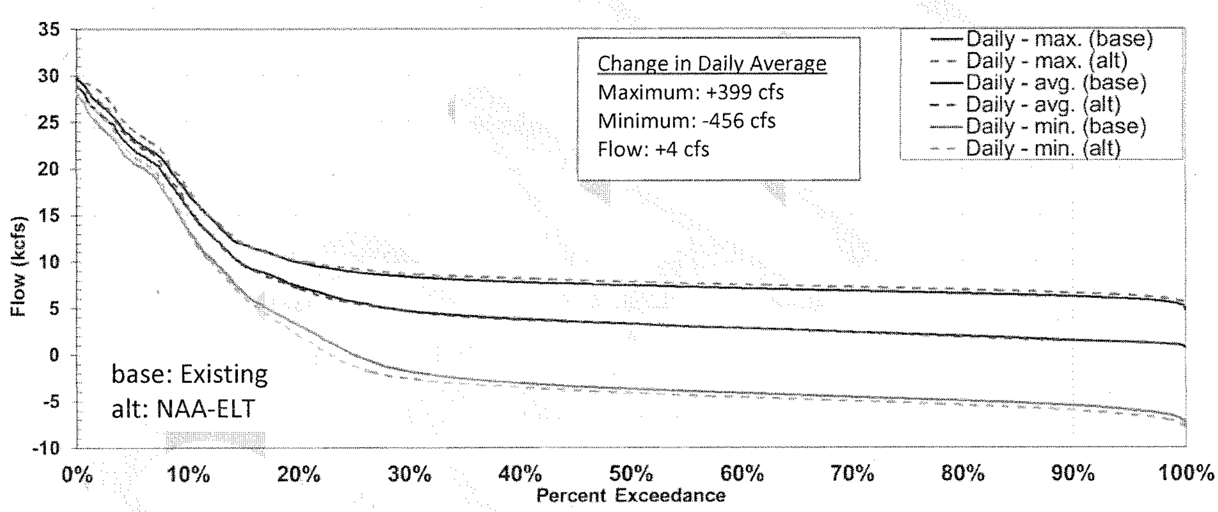


Figure 12. Daily Flow on Steamboat Slough at Sutter Slough

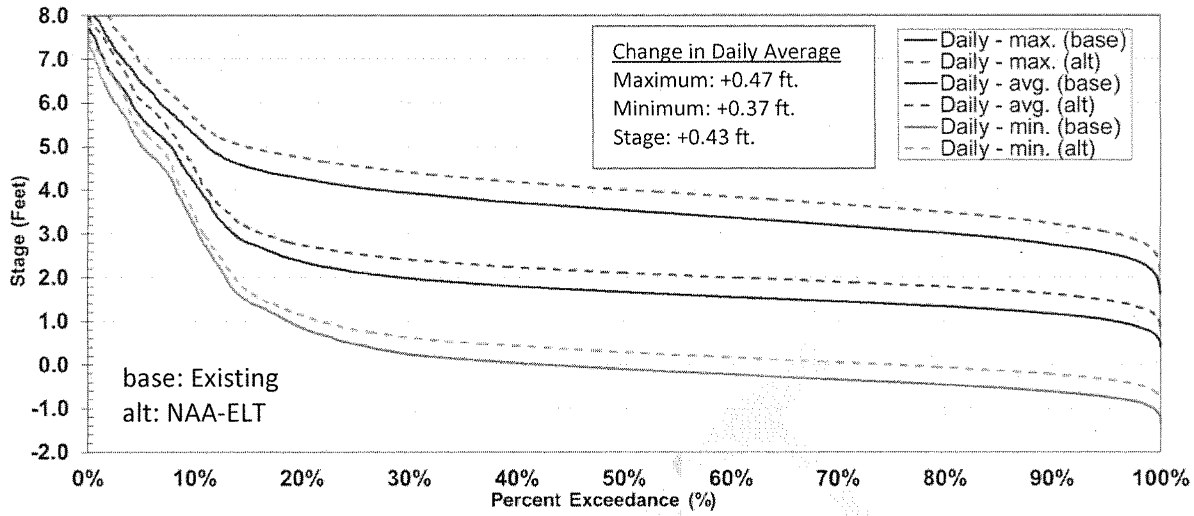


Figure 13. Daily Stage on Steamboat Slough at Sutter Slough

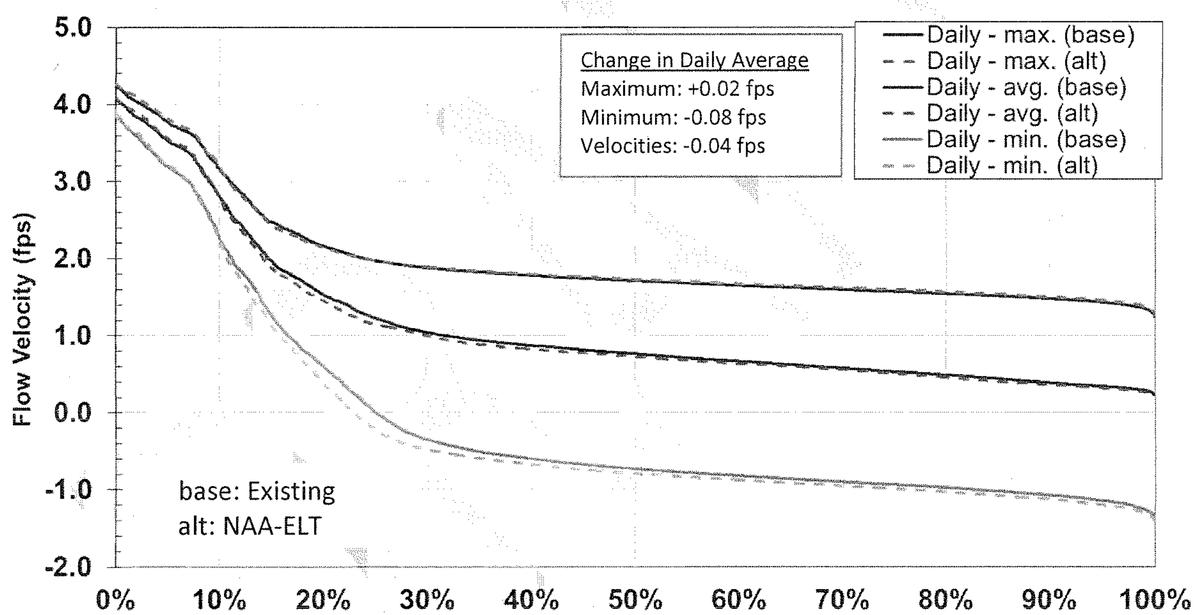


Figure 14. Daily Velocities on Steamboat Slough at Sutter Slough

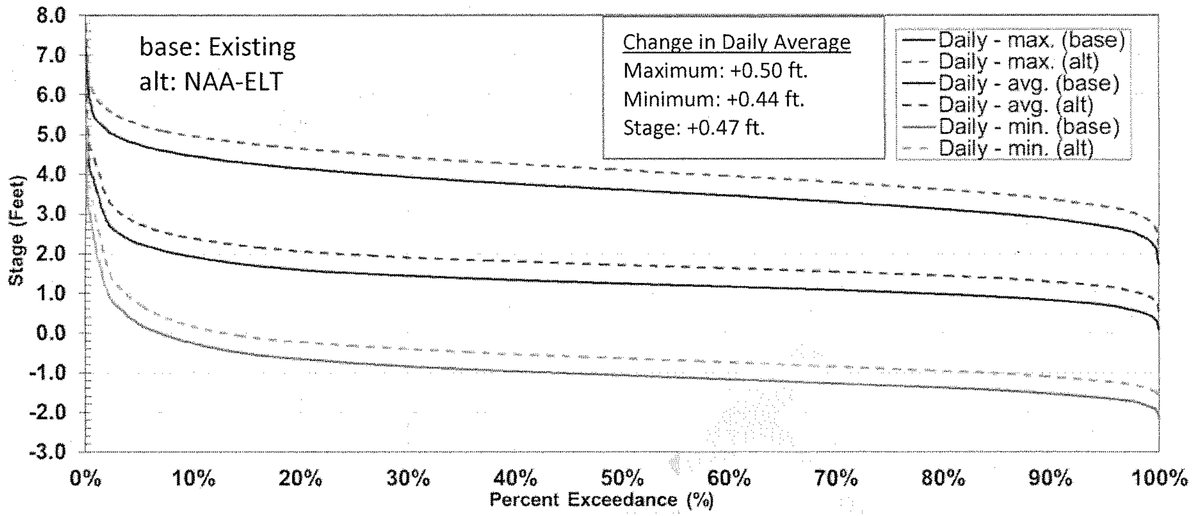


Figure 15. Daily Stage in Barker Slough at NBA Intakes

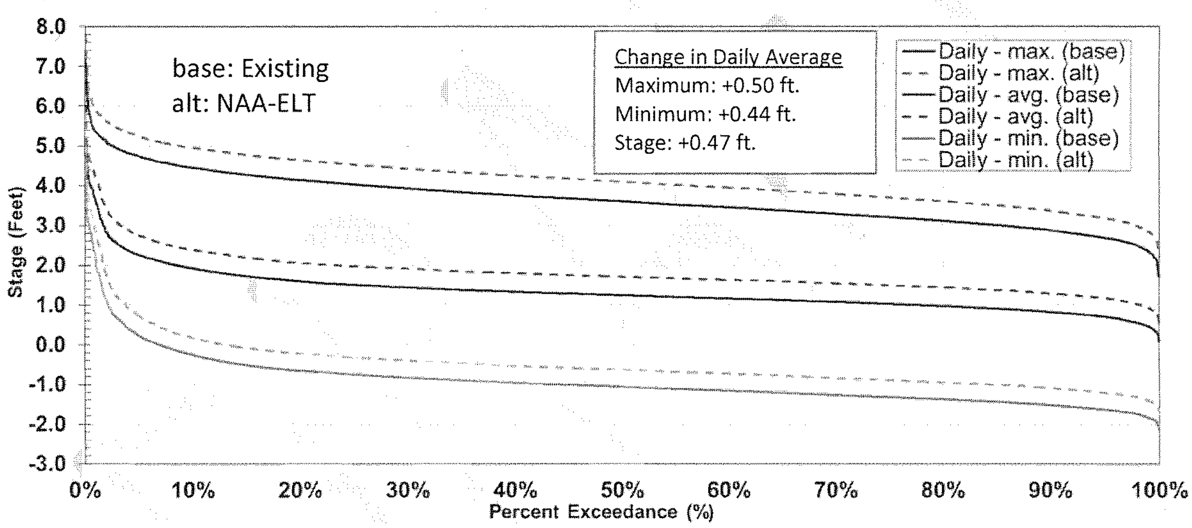


Figure 16. Daily Stage in Shag Slough (RD 2068 Pumping Plant)

No Action Alternative ELT and Alternative 4 ELT (BDCP EIRS Modeling)

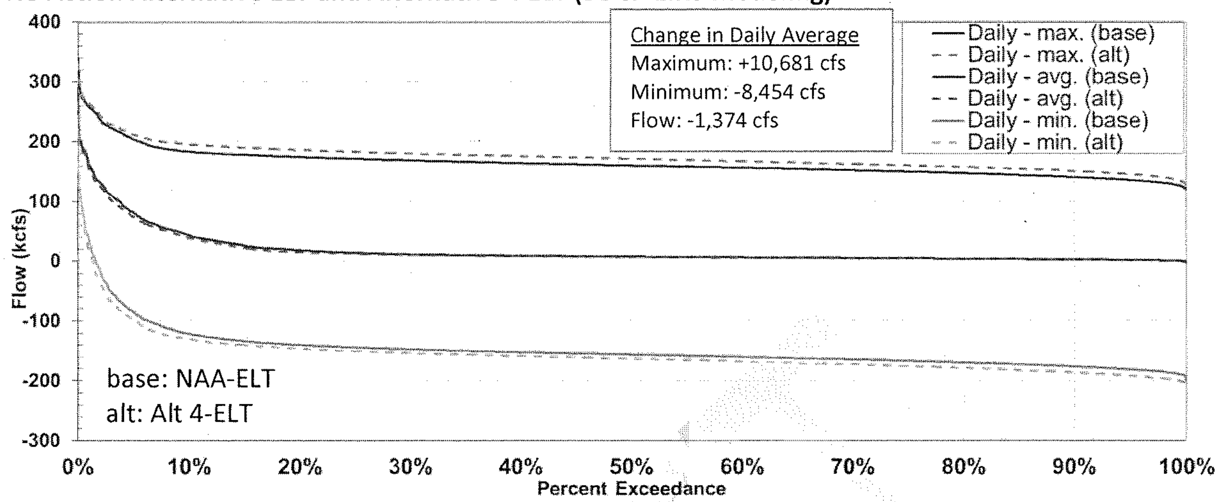


Figure 17. Daily Flow in the Sacramento River at Emmaton

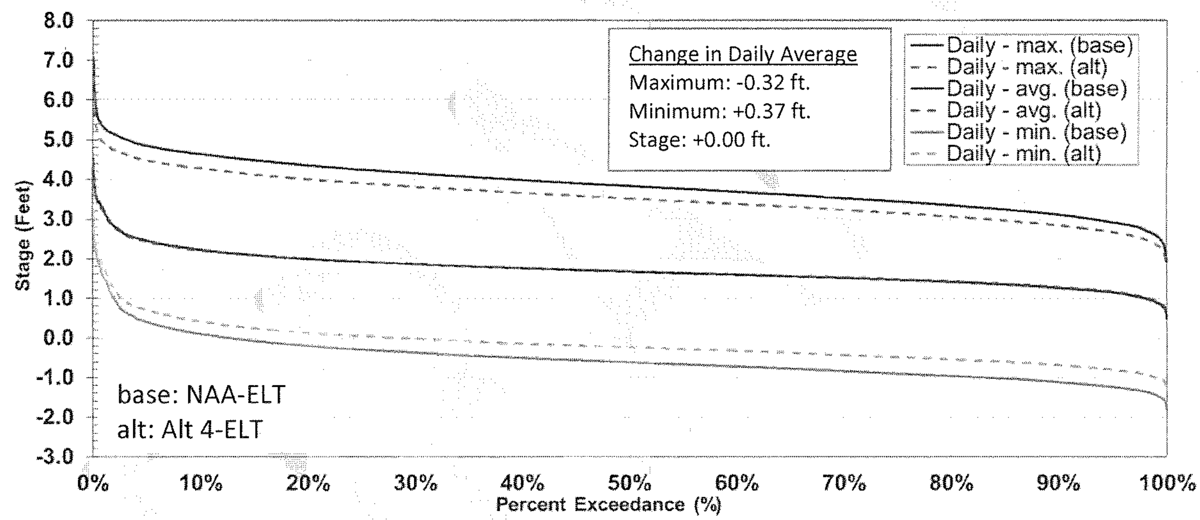


Figure 18. Daily Stage in the Sacramento River at Emmaton

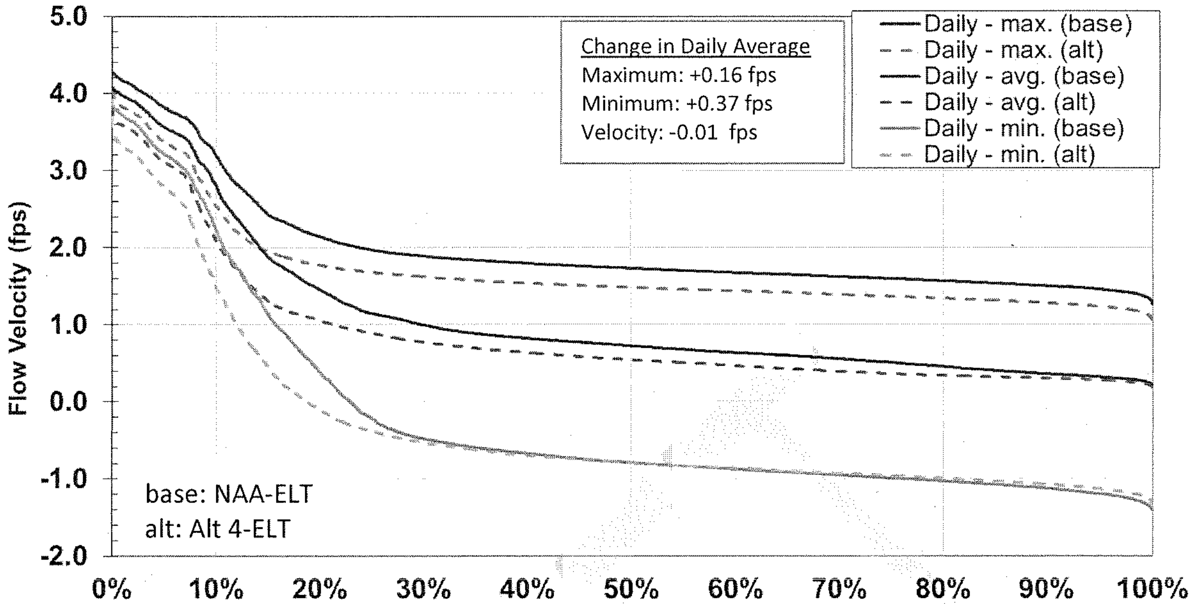


Figure 19. Daily Velocities in the Sacramento River at Emmaton

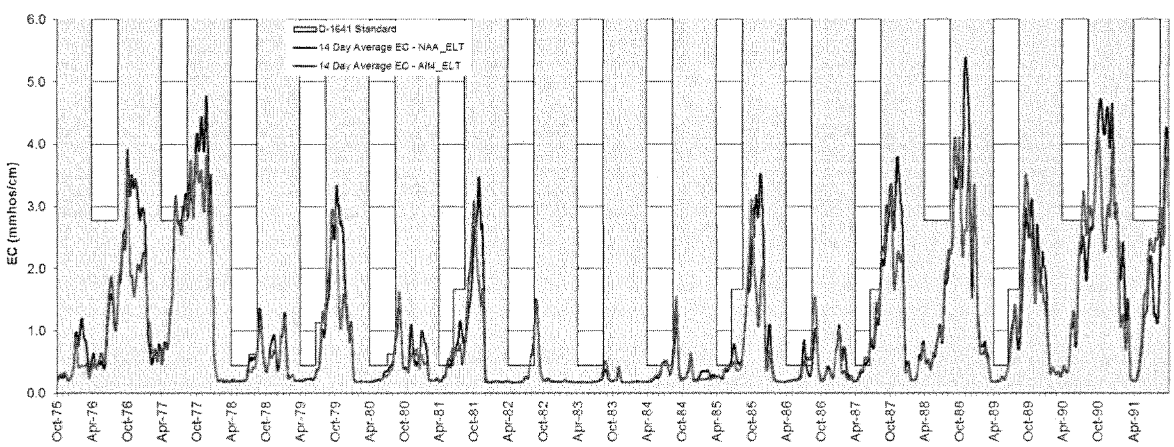


Figure 20. EC in the Sacramento River at Emmaton

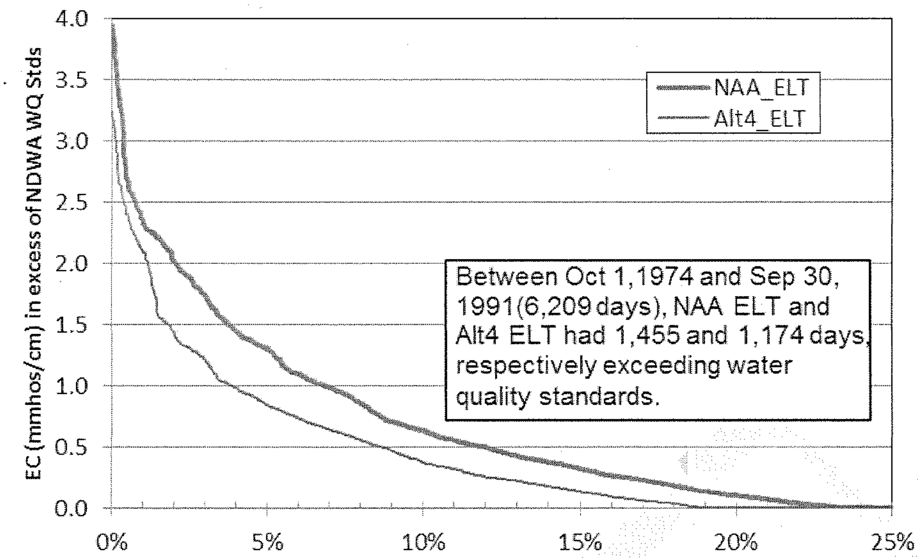


Figure 21. Probability of Exceeding EC Standards in the Sacramento River at Emmaton

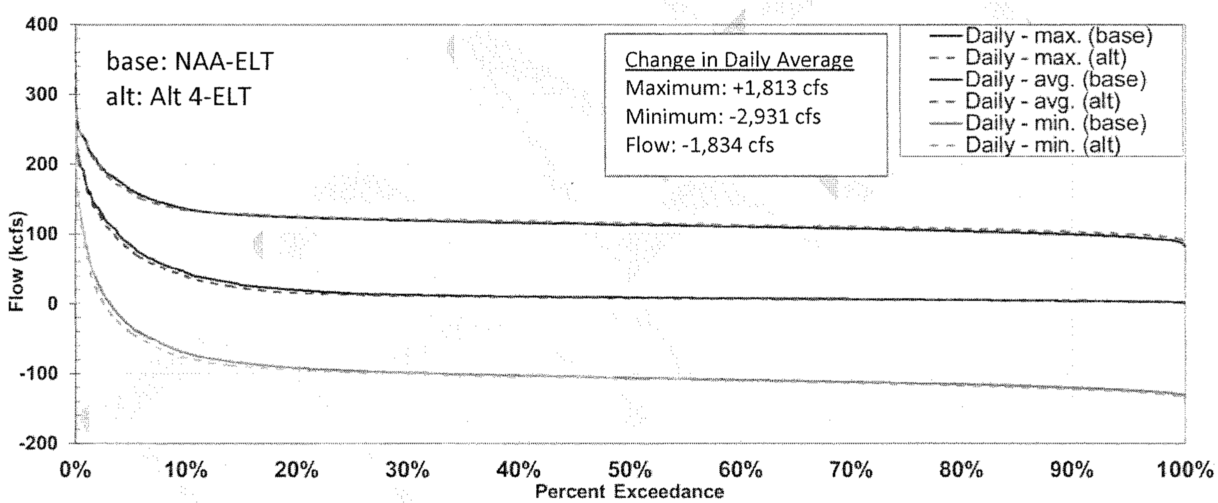


Figure 22. Daily Flow in the Sacramento River at Rio Vista

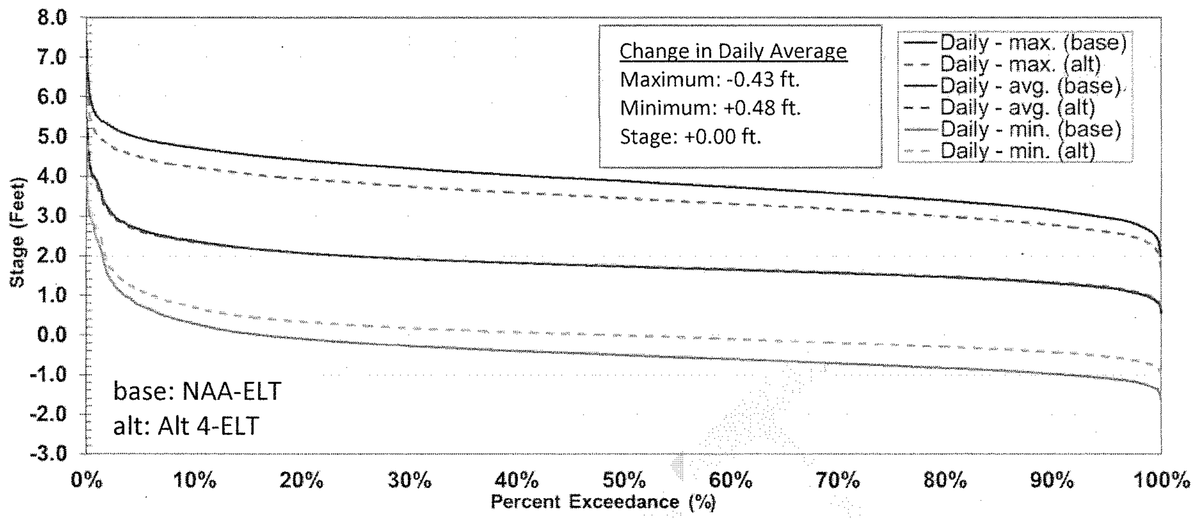


Figure 23. Daily Stage in the Sacramento River at Rio Vista

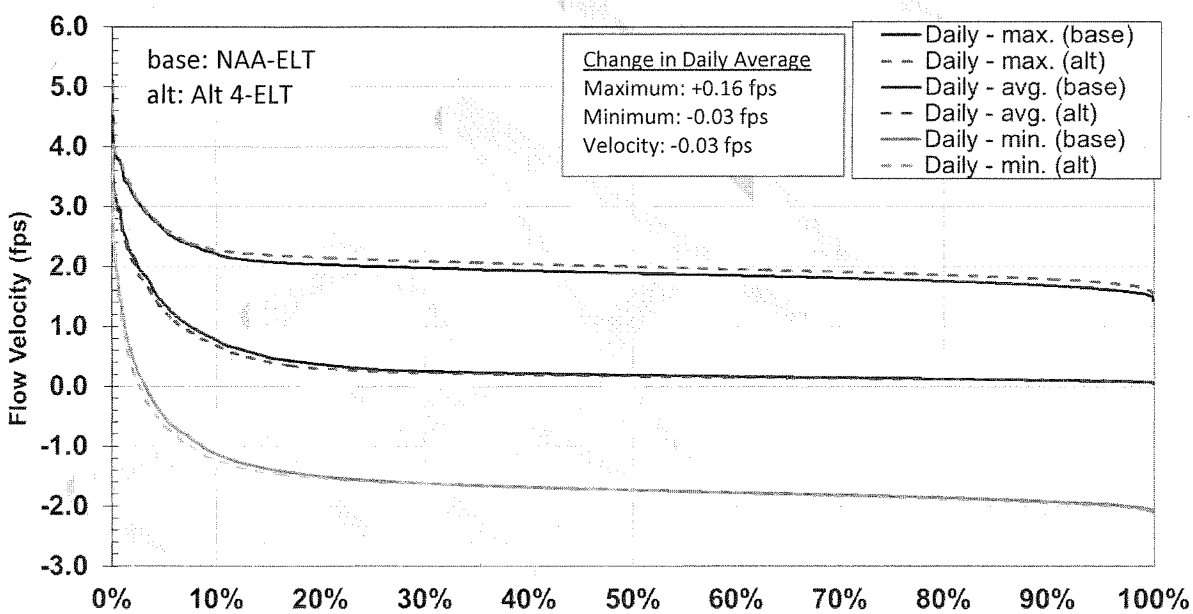


Figure 24. Daily Velocities in the Sacramento River at Rio Vista

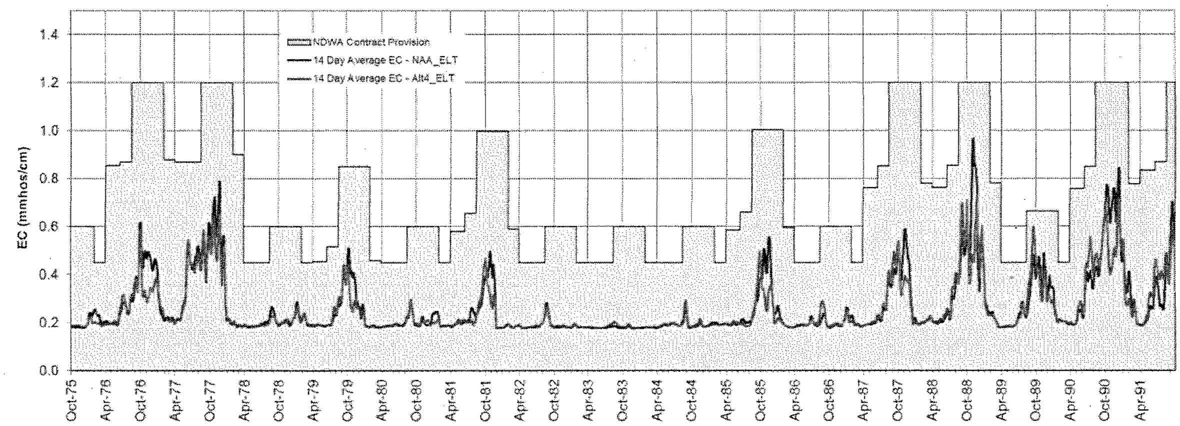


Figure 25. EC in the Sacramento River at Rio Vista

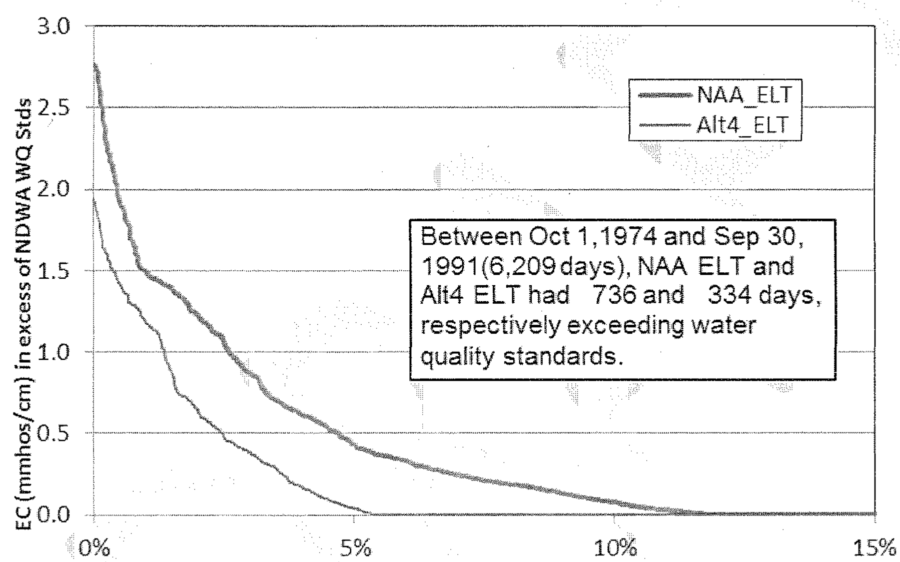


Figure 26. Probability of Exceeding EC Standards in the Sacramento River at Three Mile Slough

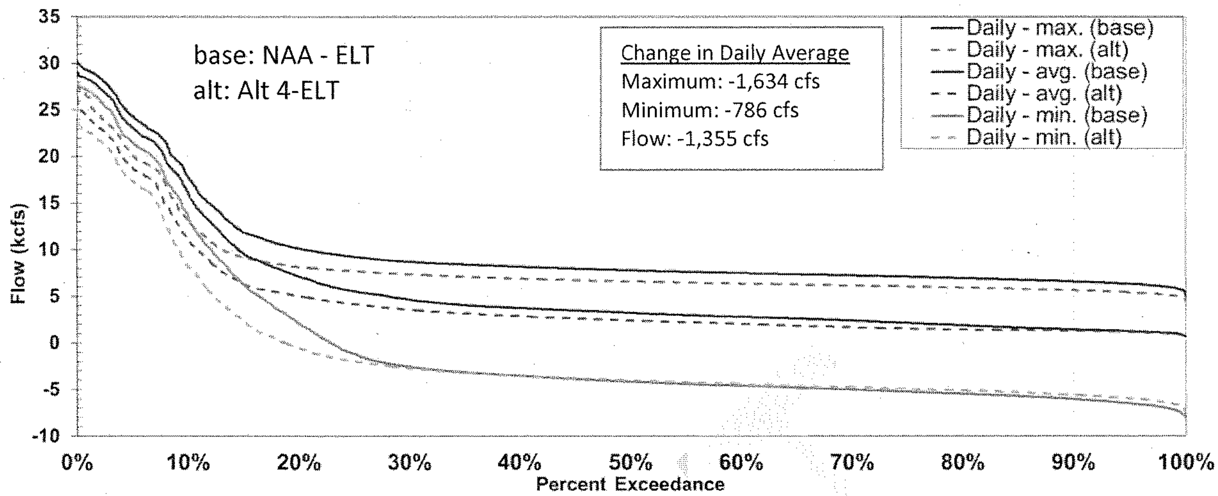


Figure 27. Daily Flow in Steamboat Slough at Sutter Slough

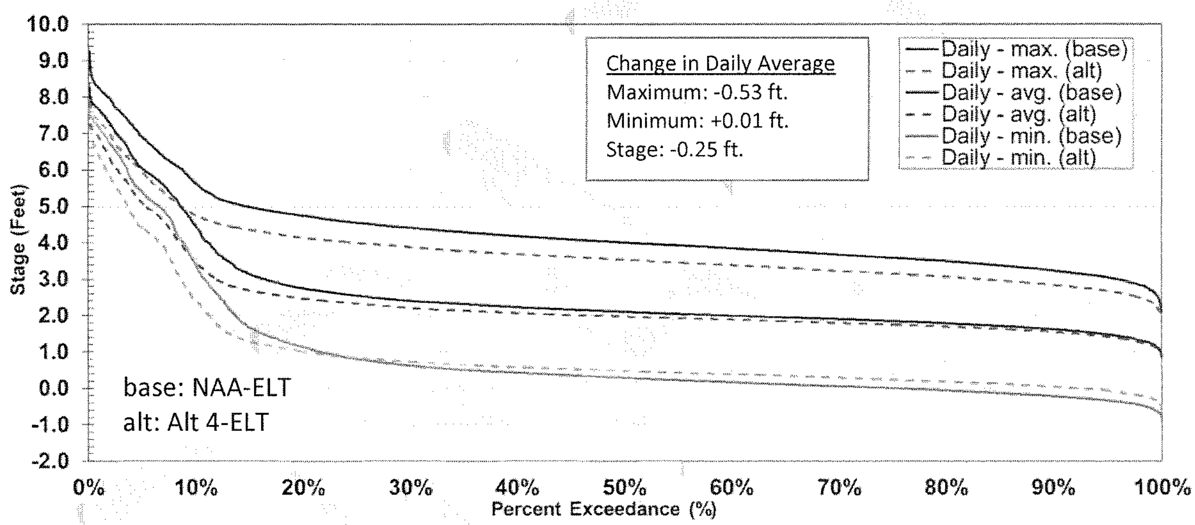


Figure 28. Daily Stage in Steamboat Slough at Sutter Slough

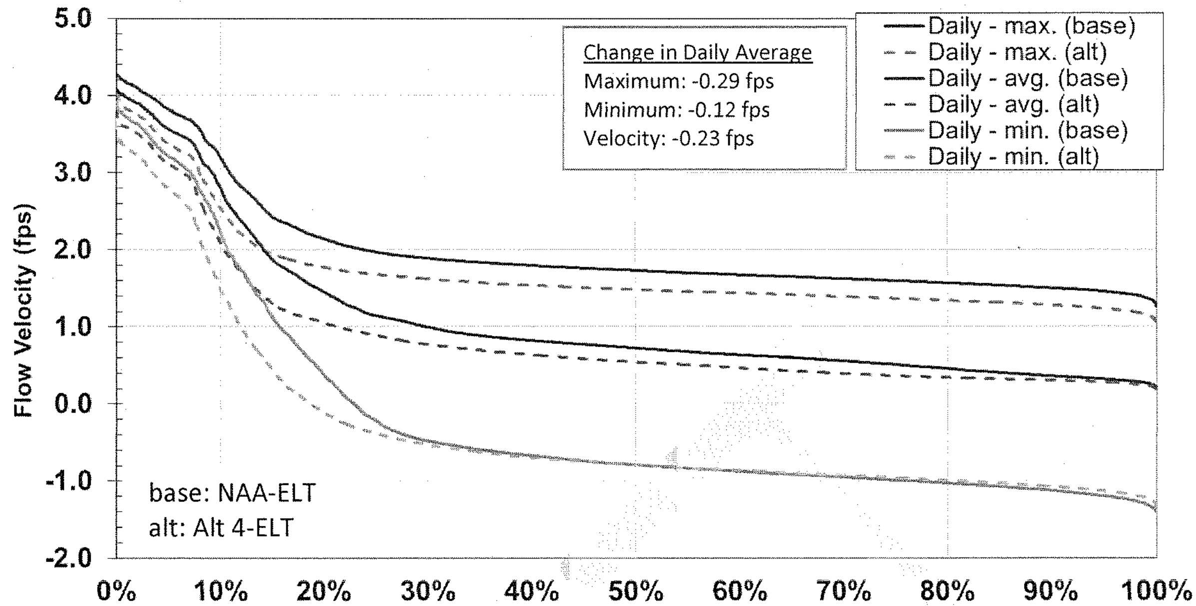


Figure 29. Daily Velocities in Steamboat Slough at Sutter Slough

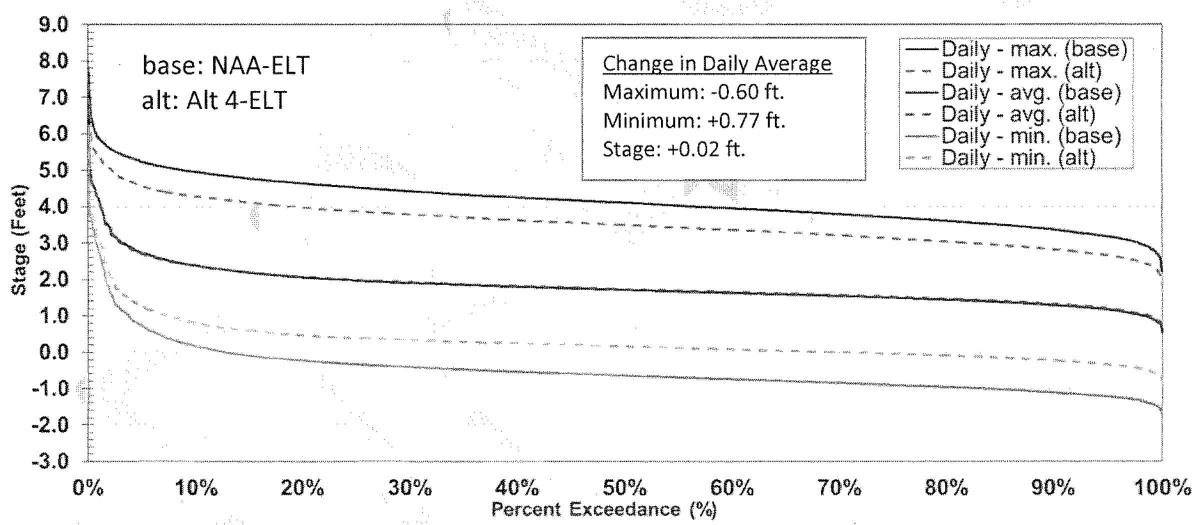


Figure 30. Daily Stage in Barker Slough at NBA Intakes

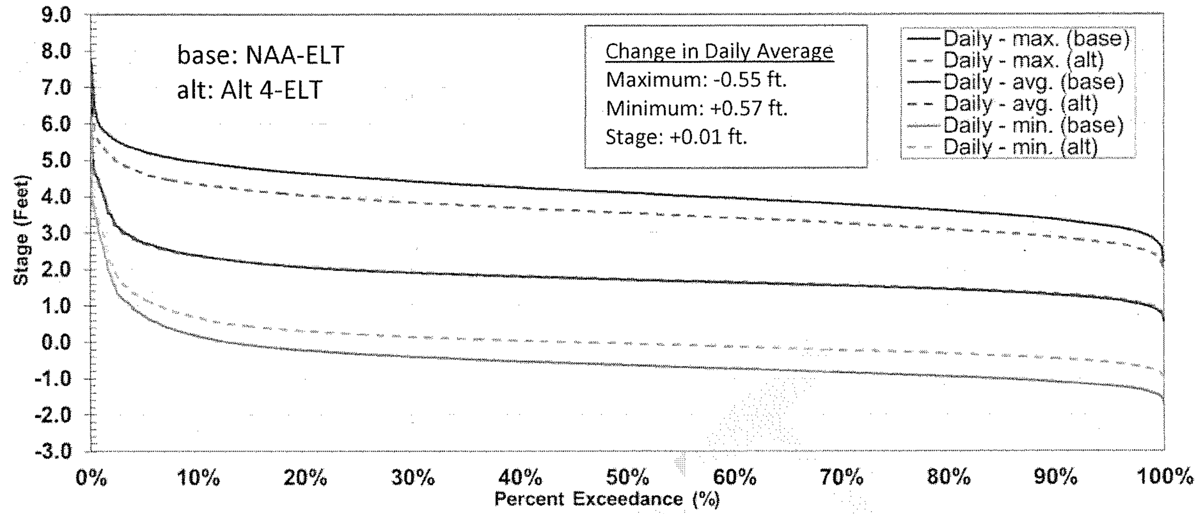


Figure 31. Daily Stage in Shag Slough (RD 2068 Pumping Plant)

No Action Alternative with Habitat and No Action Alternative without Habitat (Independent Modeling)

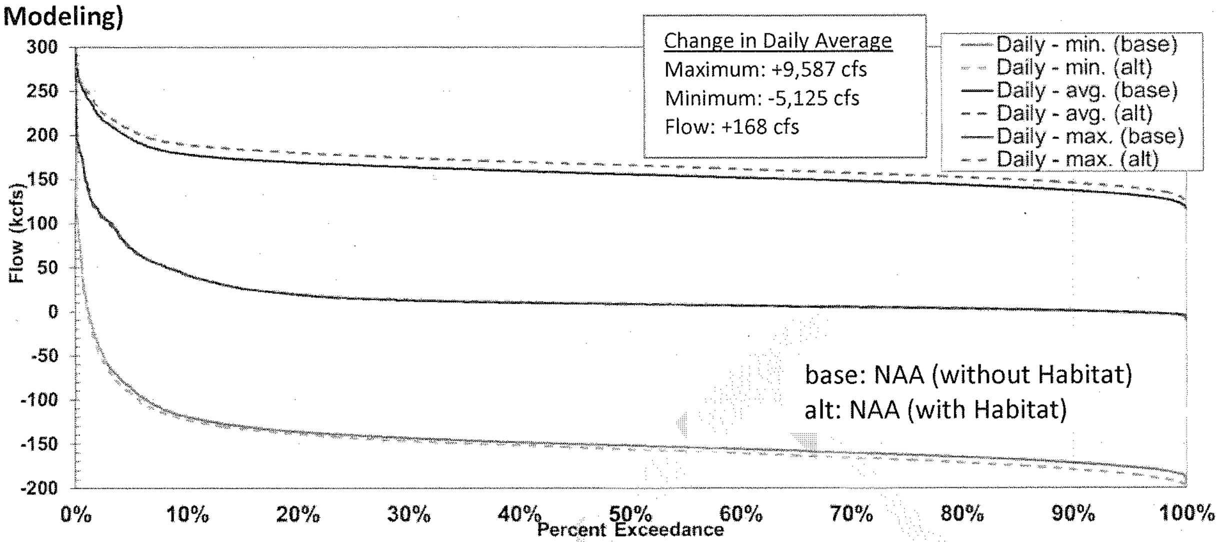


Figure 32. Daily Flow in Sacramento River at Emmaton

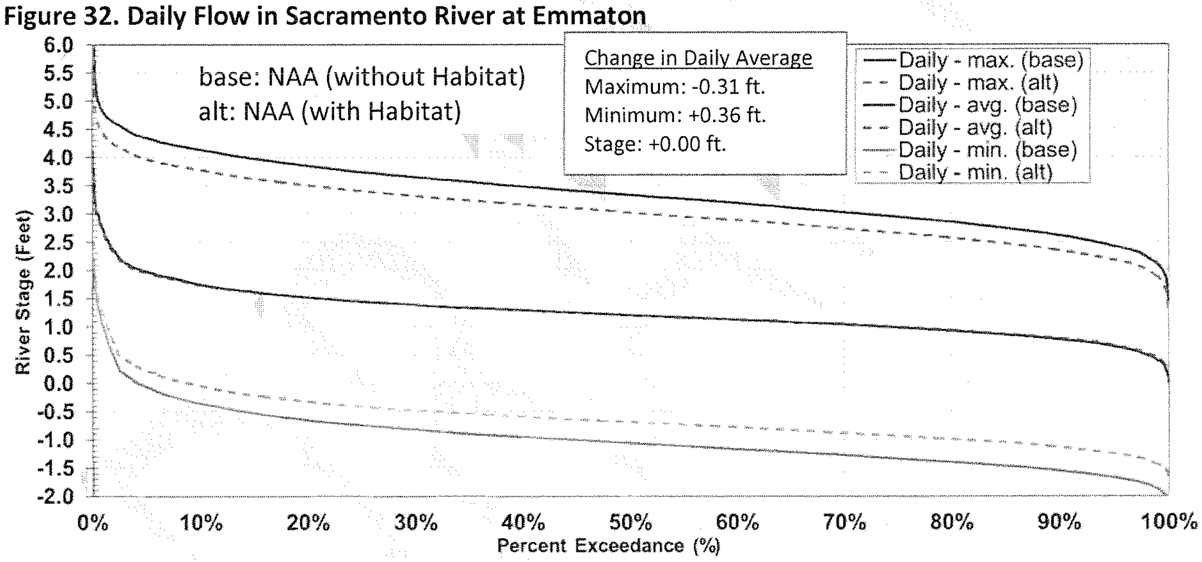


Figure 33. Daily Stage in Sacramento River at Emmaton

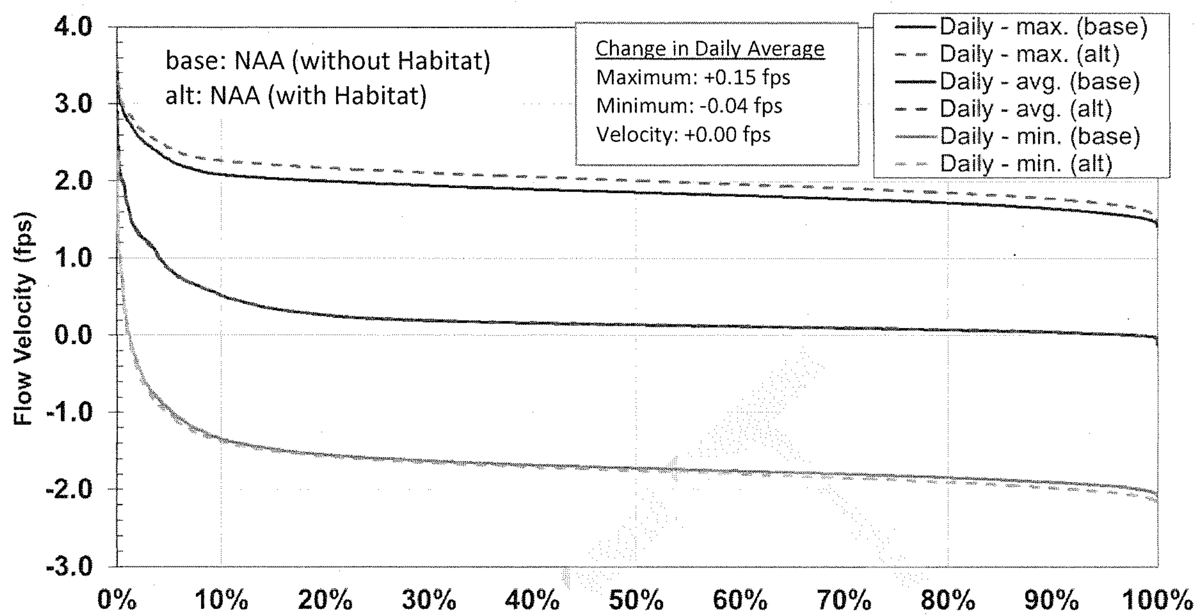


Figure 34. Daily Velocities in Sacramento River at Emmaton

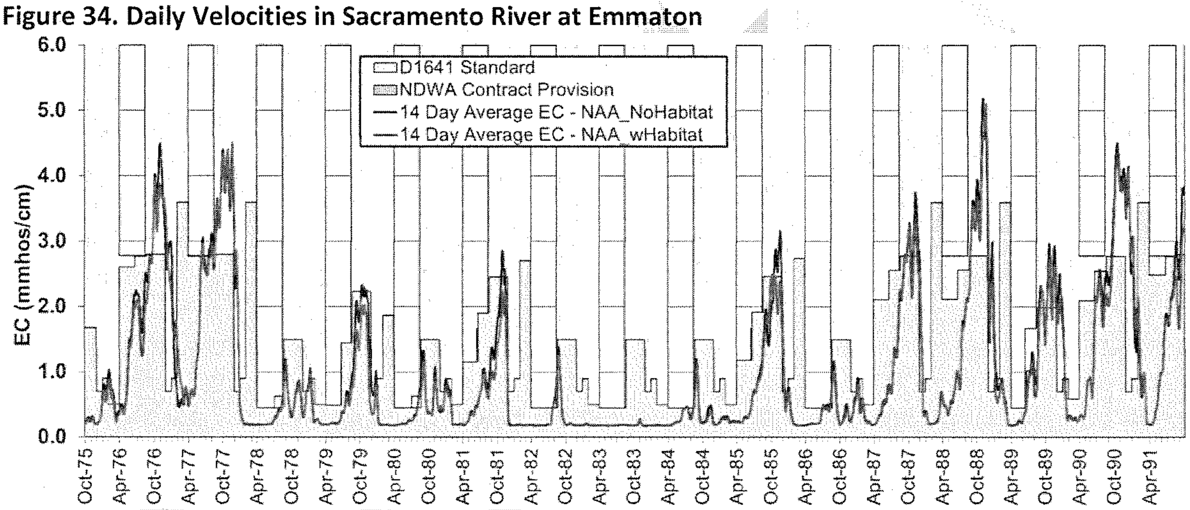


Figure 35. EC in the Sacramento River at Emmaton

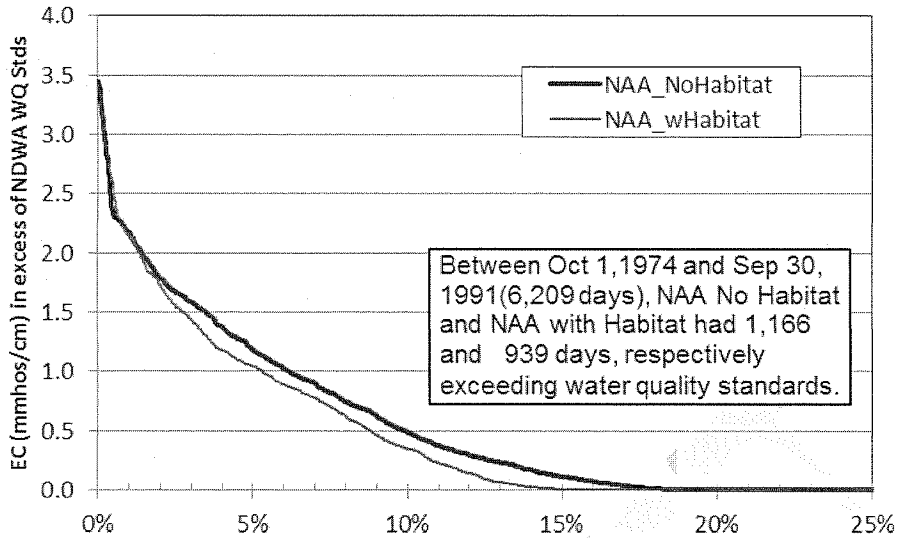


Figure 36. Probability of Exceeding EC Standards in the Sacramento River at Emmaton

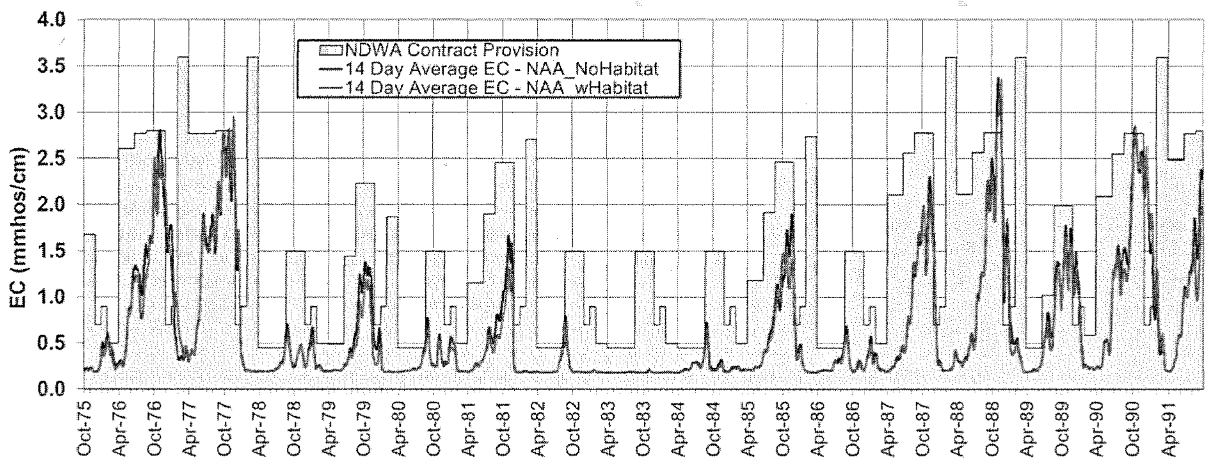


Figure 37. EC in the Sacramento River at Three Mile Slough

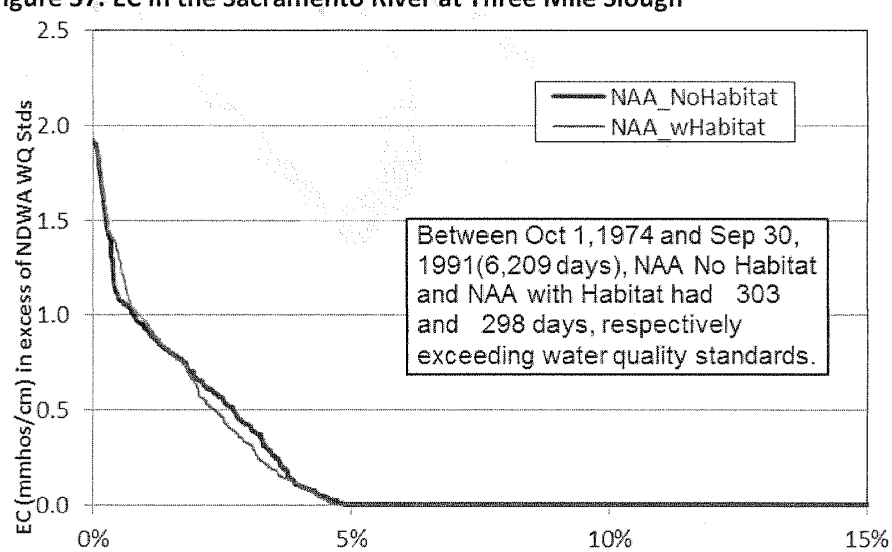


Figure 38. Probability of Exceeding EC Standards in the Sacramento River at Three Mile Slough

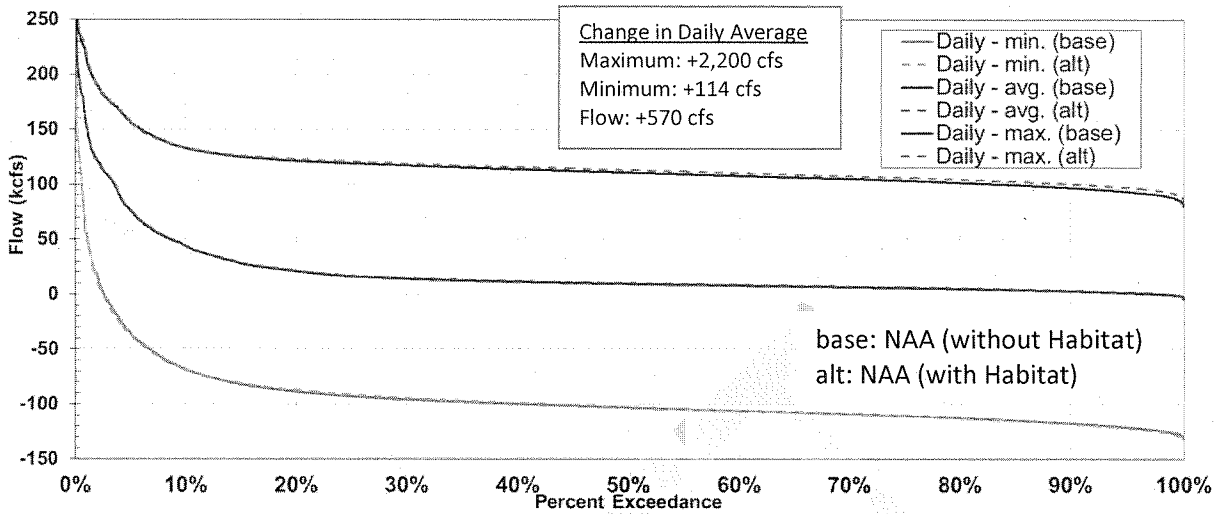


Figure 39. Daily Flow in Sacramento River at Rio Vista

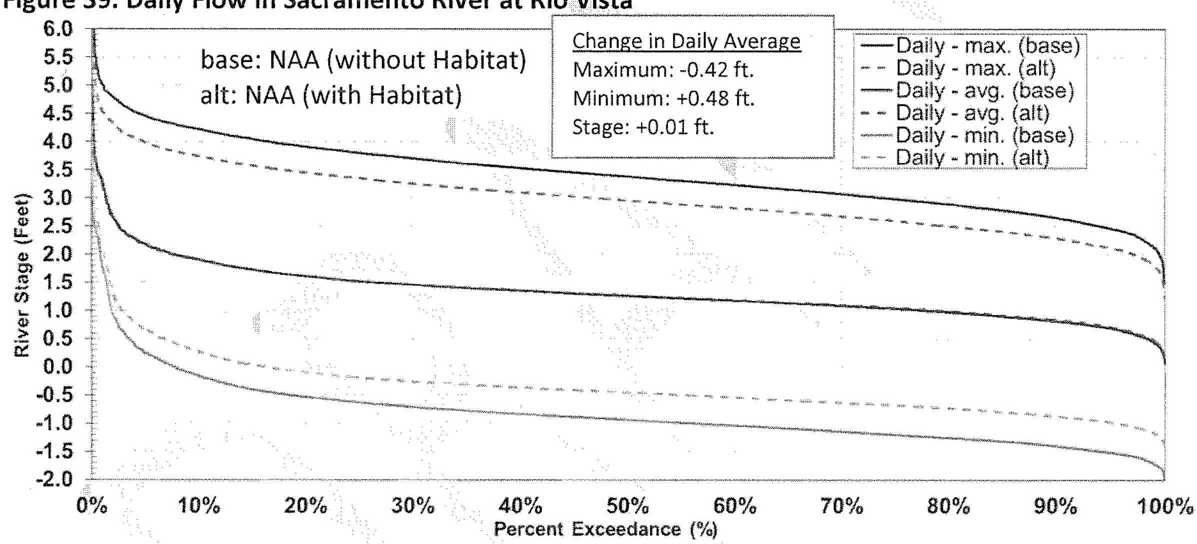


Figure 40. Daily Stage in Sacramento River at Rio Vista

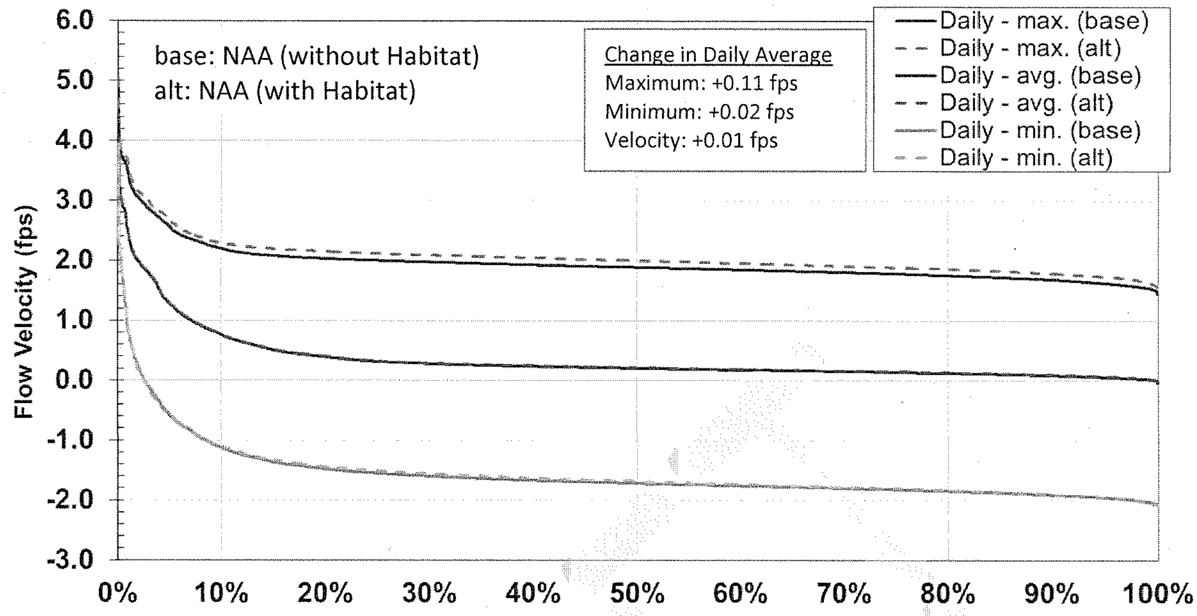


Figure 41. Daily Velocities in Sacramento River at Rio Vista

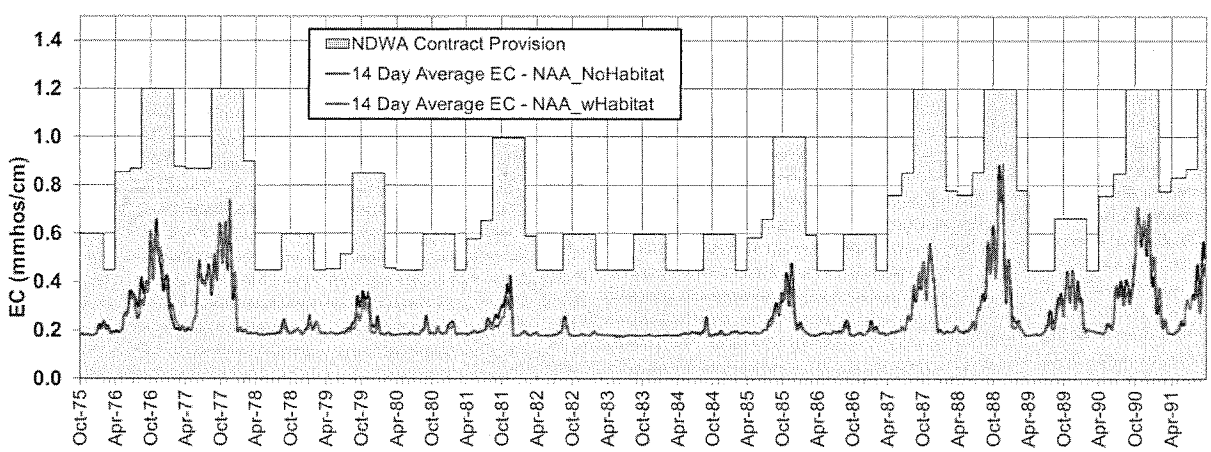


Figure 42. EC in the Sacramento River at Rio Vista

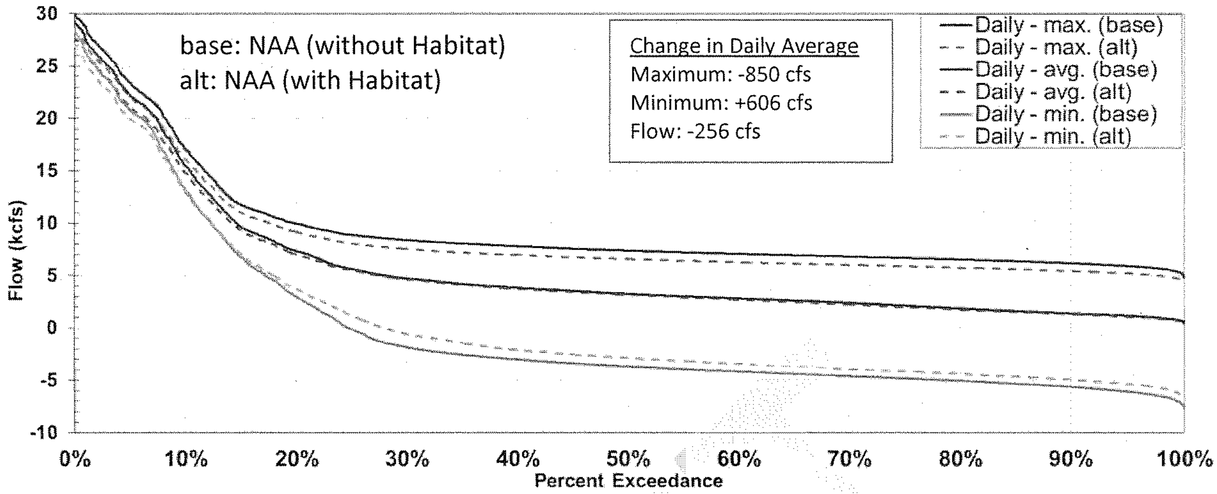


Figure 43. Daily Flow in Steamboat Slough at Sutter Slough

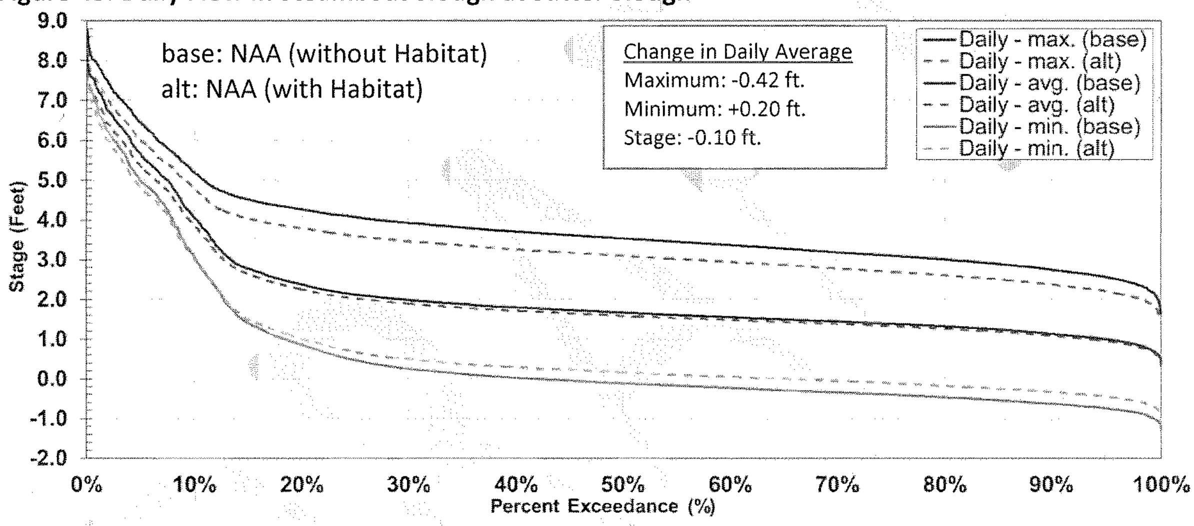


Figure 44. Daily Stage in Steamboat Slough at Sutter Slough

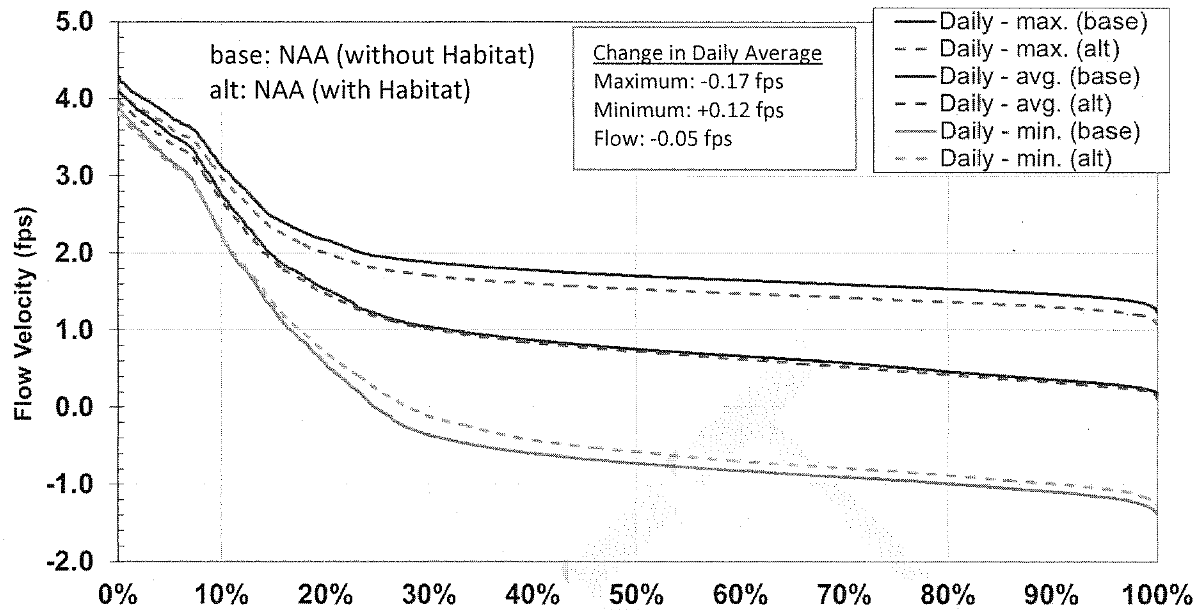


Figure 45. Daily Velocities in Steamboat Slough at Sutter Slough

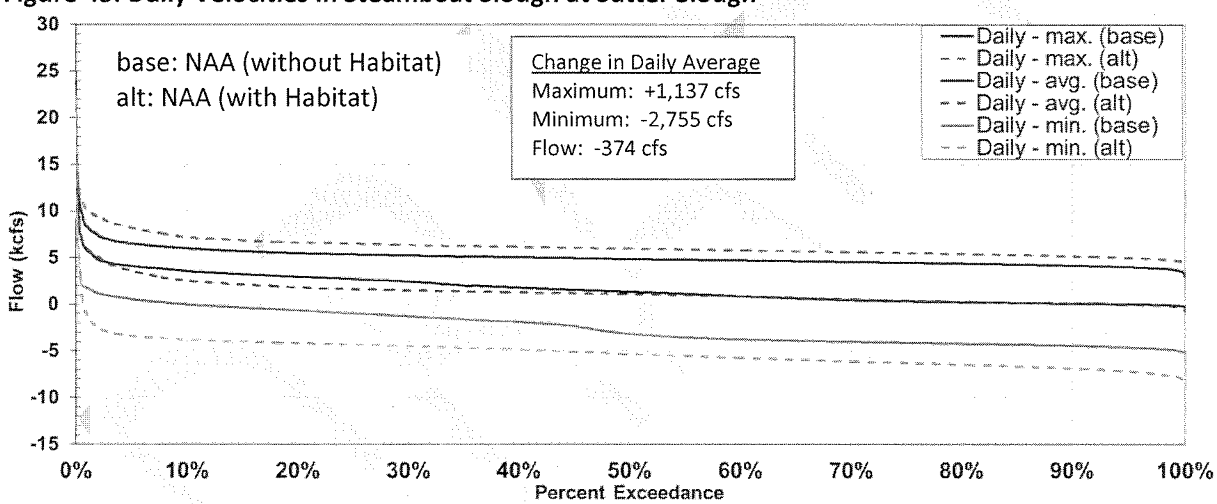


Figure 46. Daily Flow in North Fork Mokelumne River

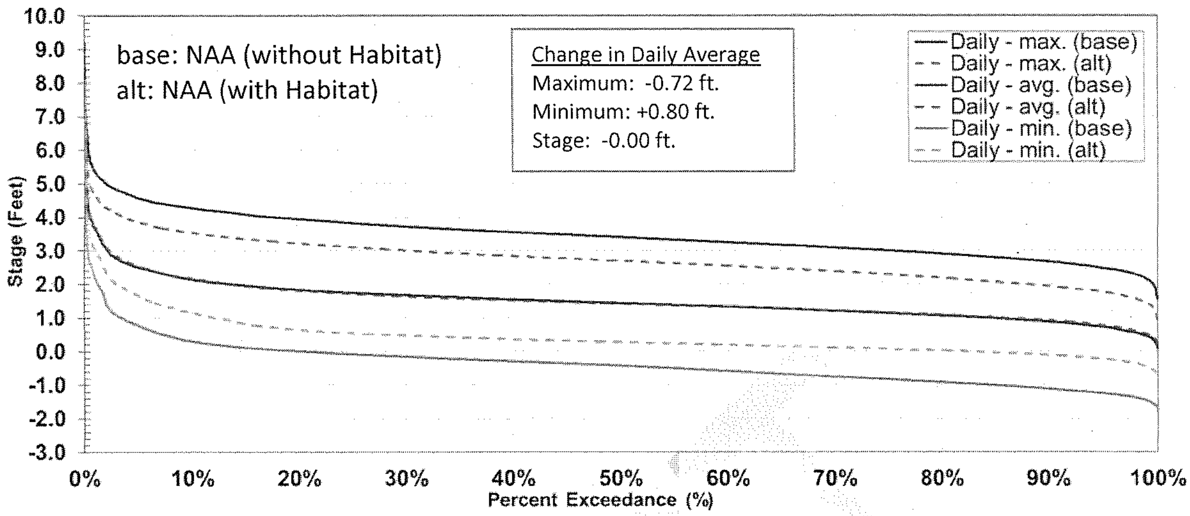


Figure 47. Daily Stage in North Fork Mokelumne River

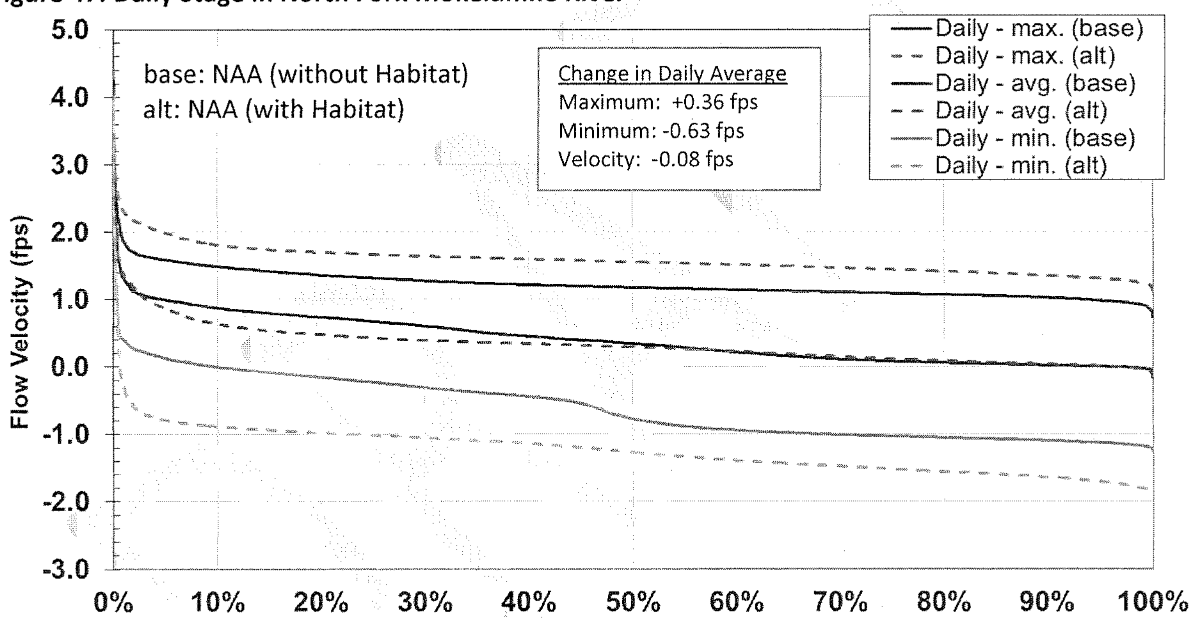


Figure 48. Daily Velocities in North Fork Mokelumne River

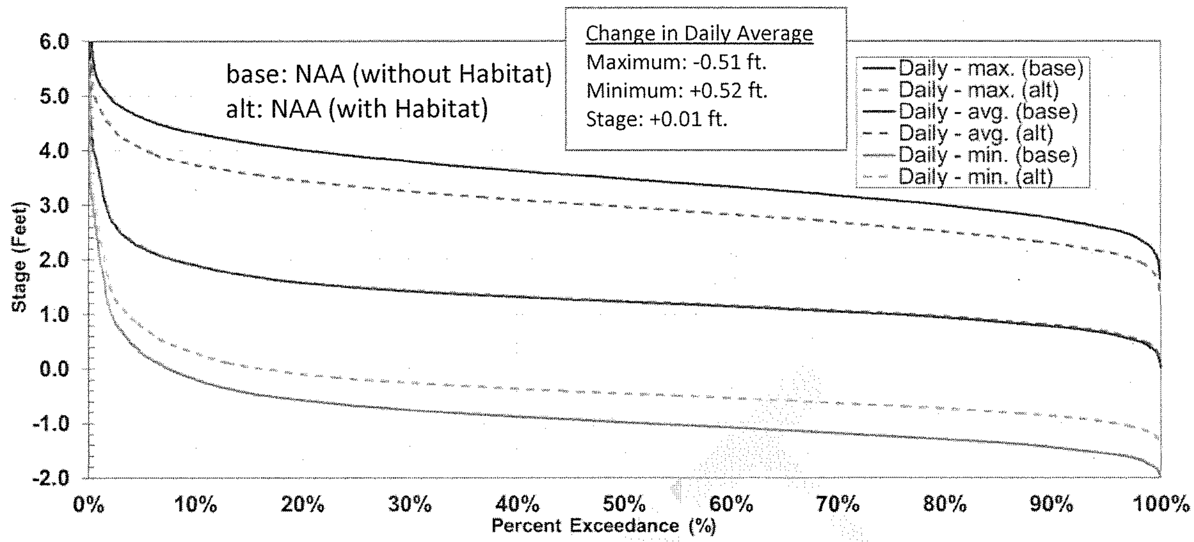


Figure 49. Daily Stage in Cache Slough at Ryer Island

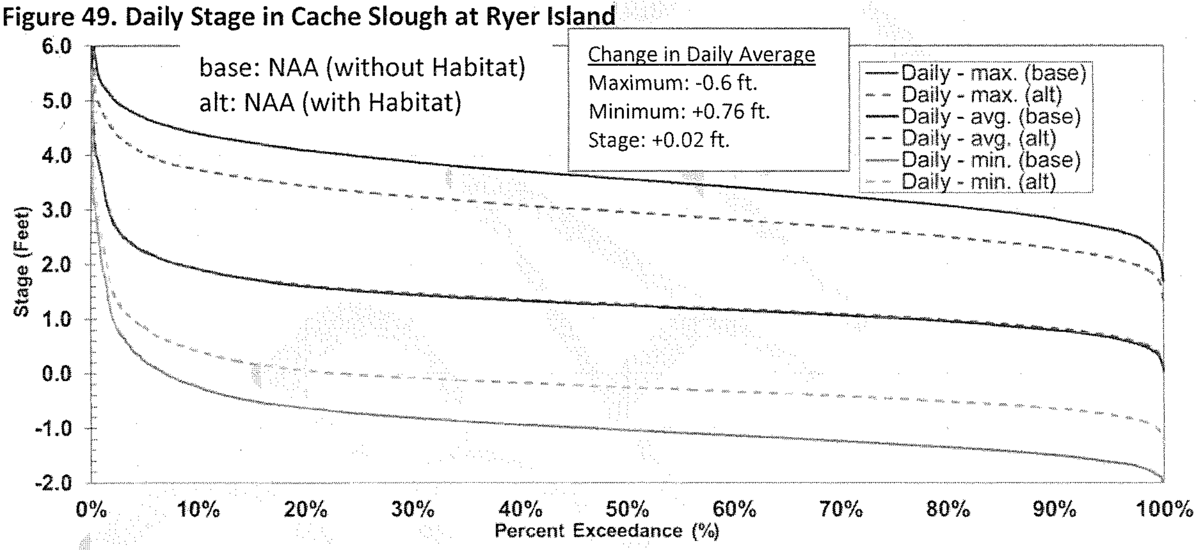


Figure 50. Daily Stage in Barker Slough at NBA Intakes

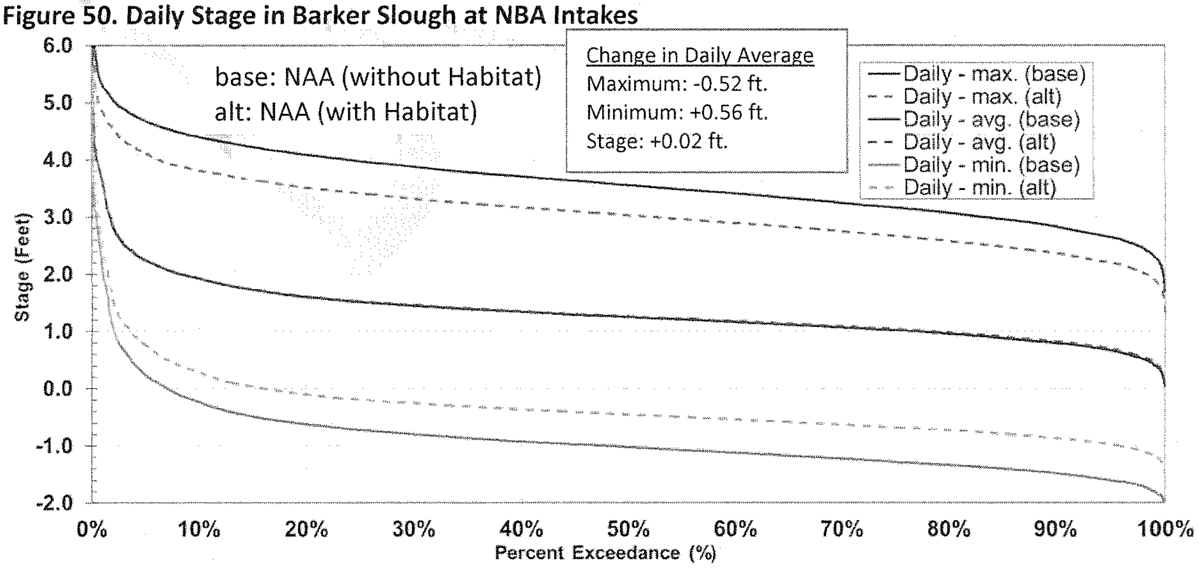


Figure 51. Daily Stage in Shag Slough at RD 2068 Intakes

Alternative 4 with Habitat and No Action Alternative without Habitat (Independent Modeling)

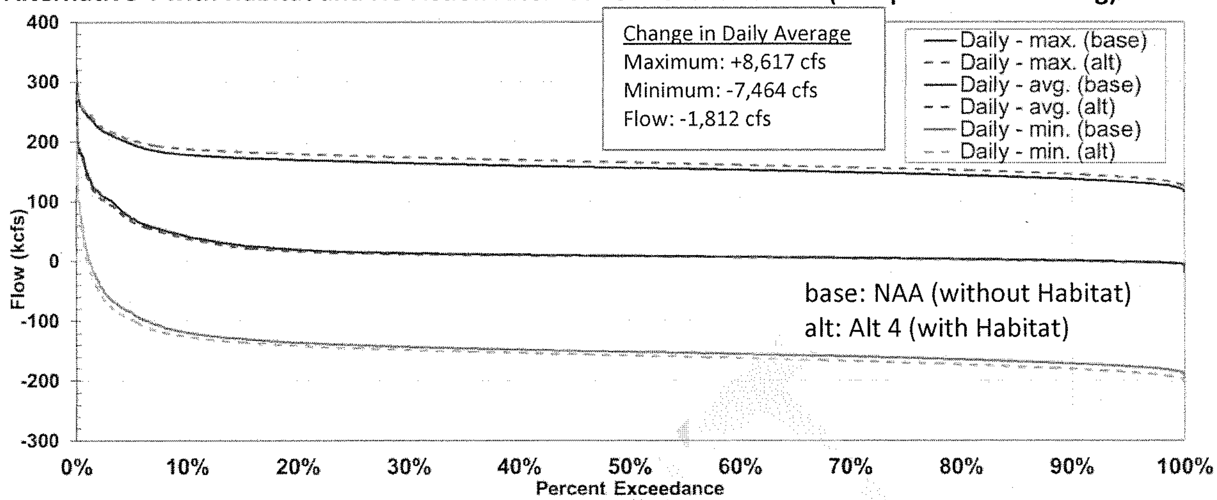


Figure 52. Daily Flow in Sacramento River at Emmaton

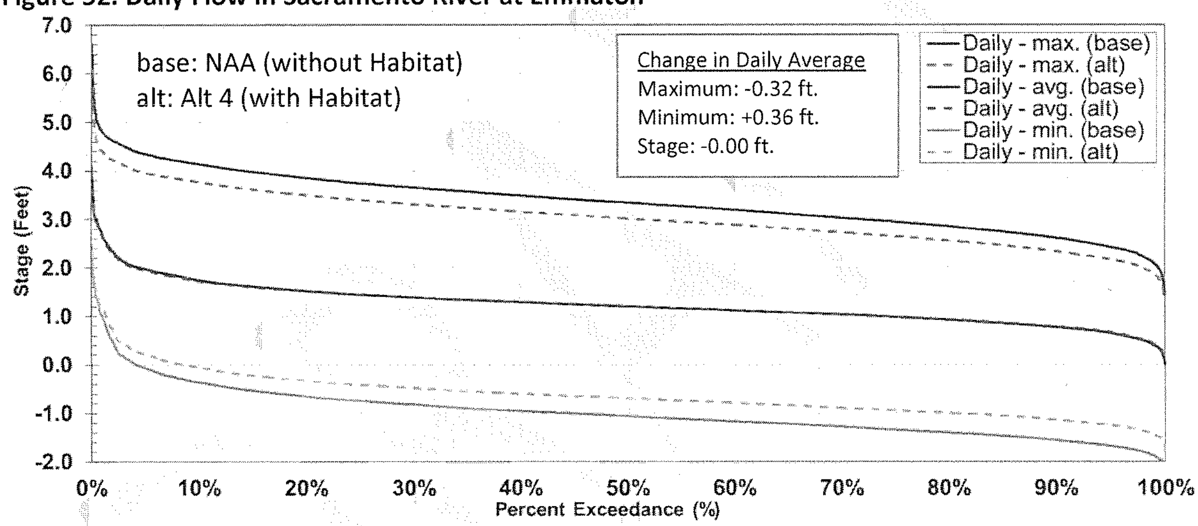


Figure 53. Daily Stage in Sacramento River at Emmaton

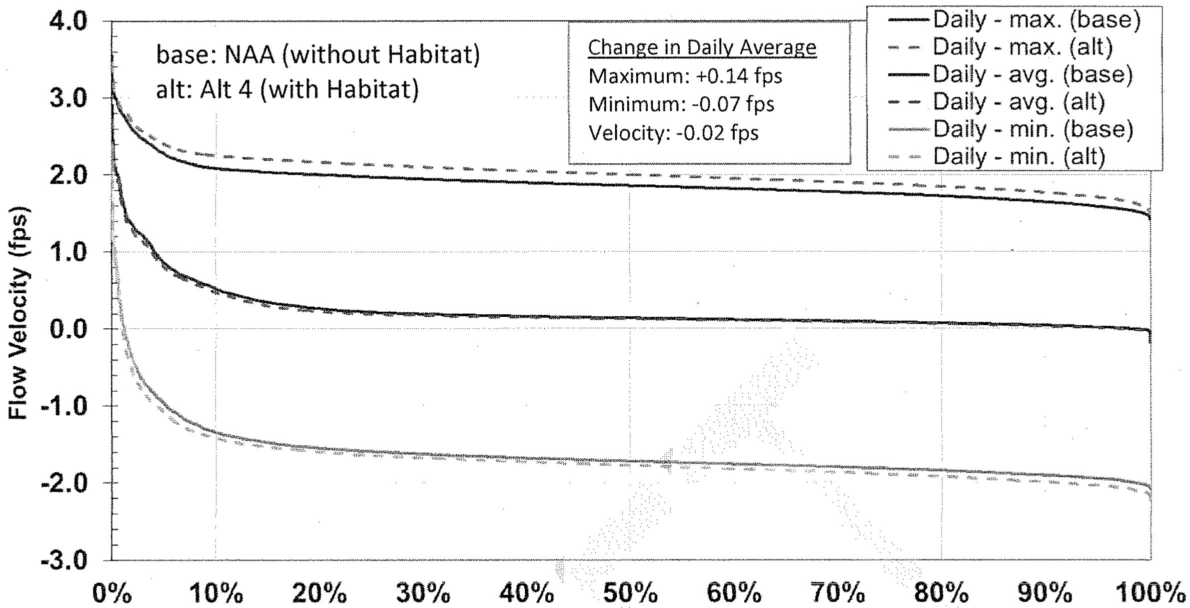


Figure 54. Daily Velocities in Sacramento River at Emmaton

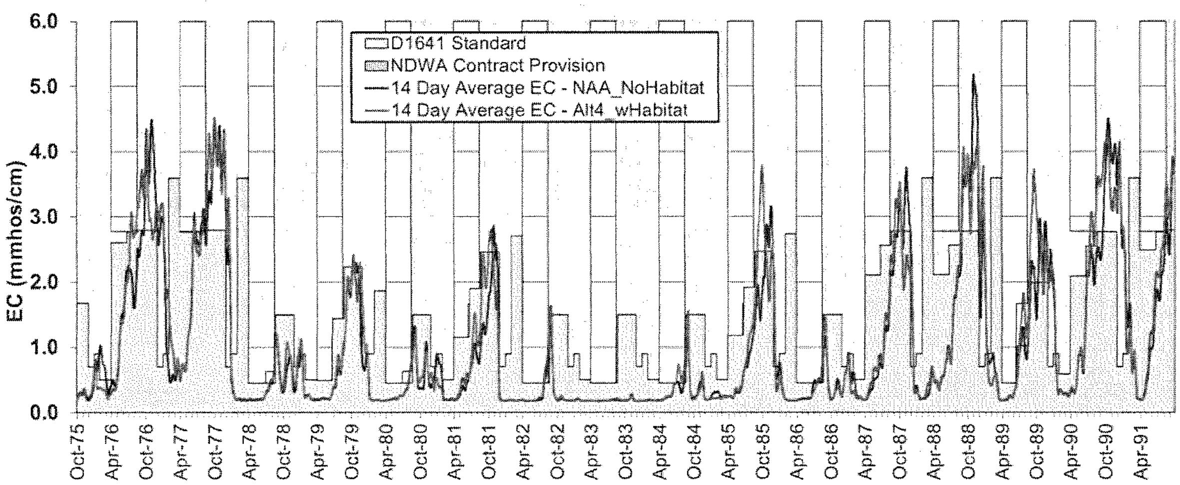


Figure 55. EC in the Sacramento River at Emmaton

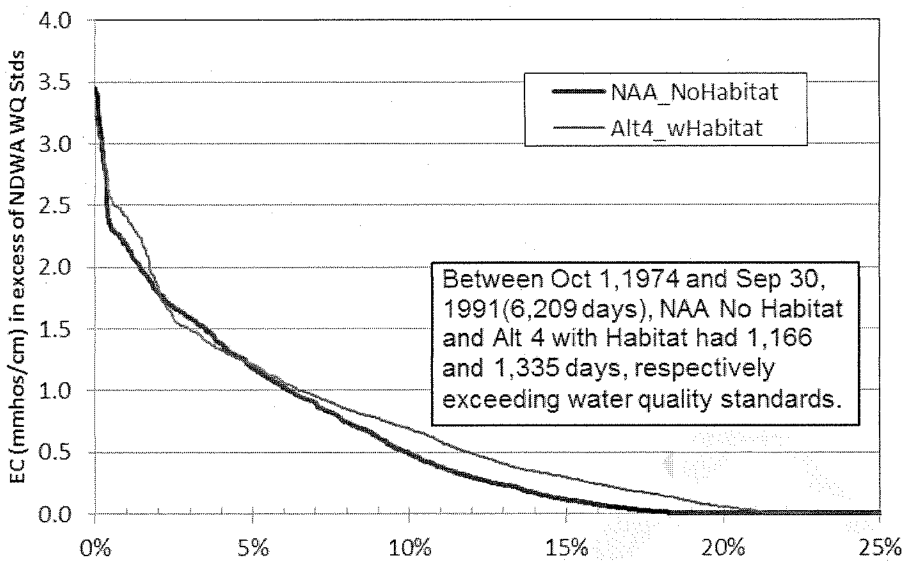


Figure 56. Probability of Exceeding EC Standards in the Sacramento River at Emmaton

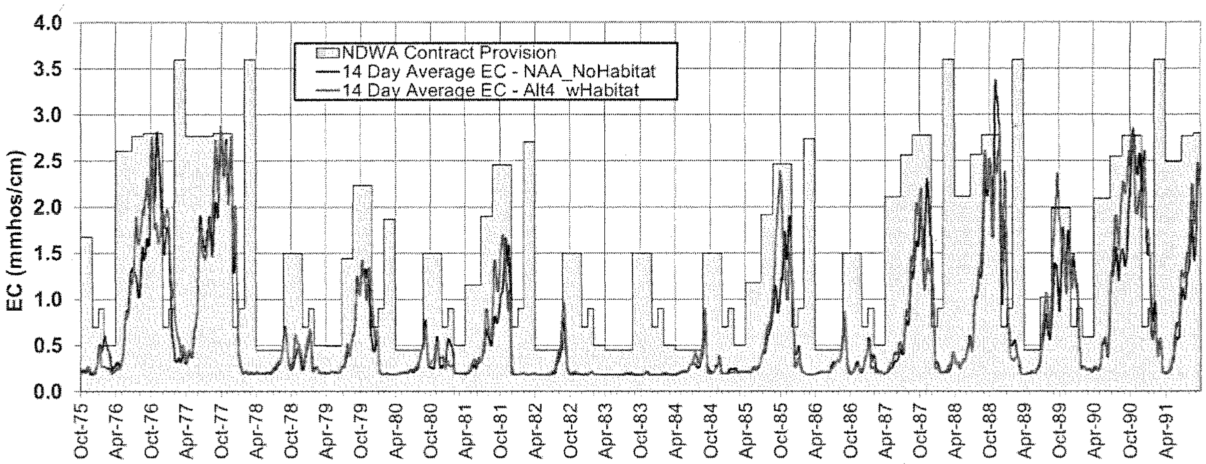


Figure 57. EC in the Sacramento River at Three Mile Slough

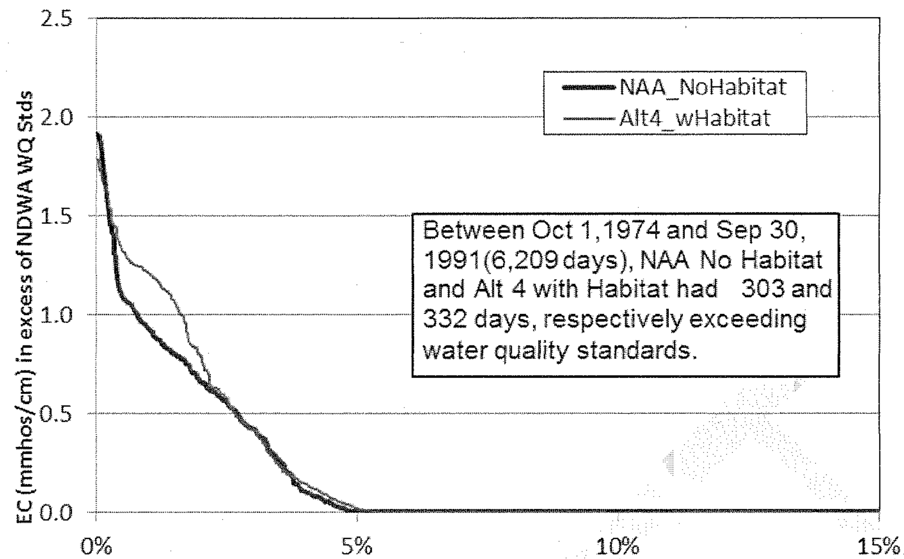


Figure 58. Probability of Exceeding EC Standards in the Sacramento River at Three Mile Slough

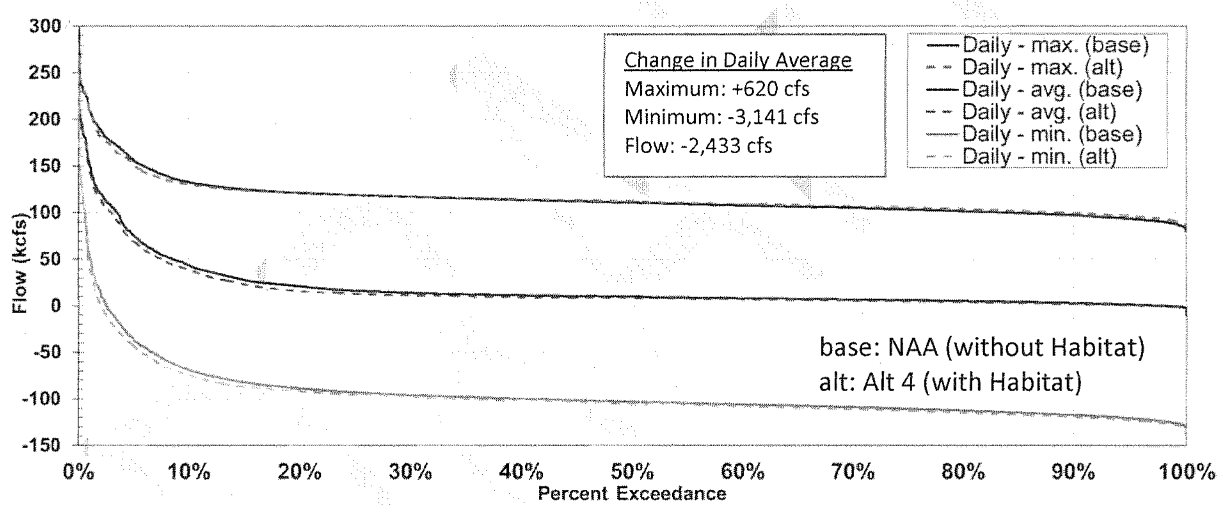


Figure 59. Daily Flow in Sacramento River at Rio Vista

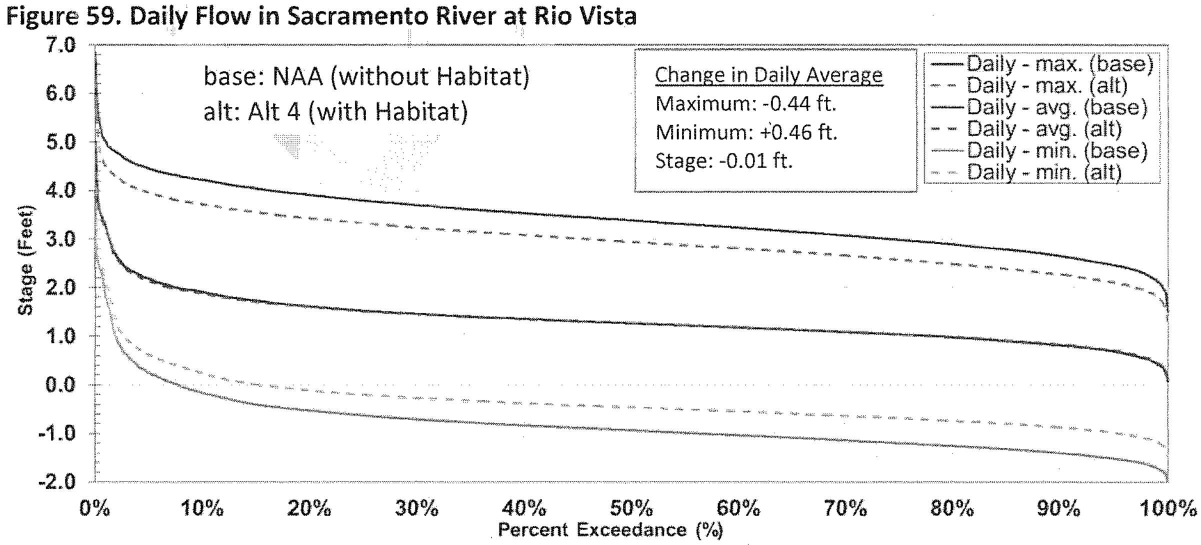


Figure 60. Daily Stage in Sacramento River at Rio Vista

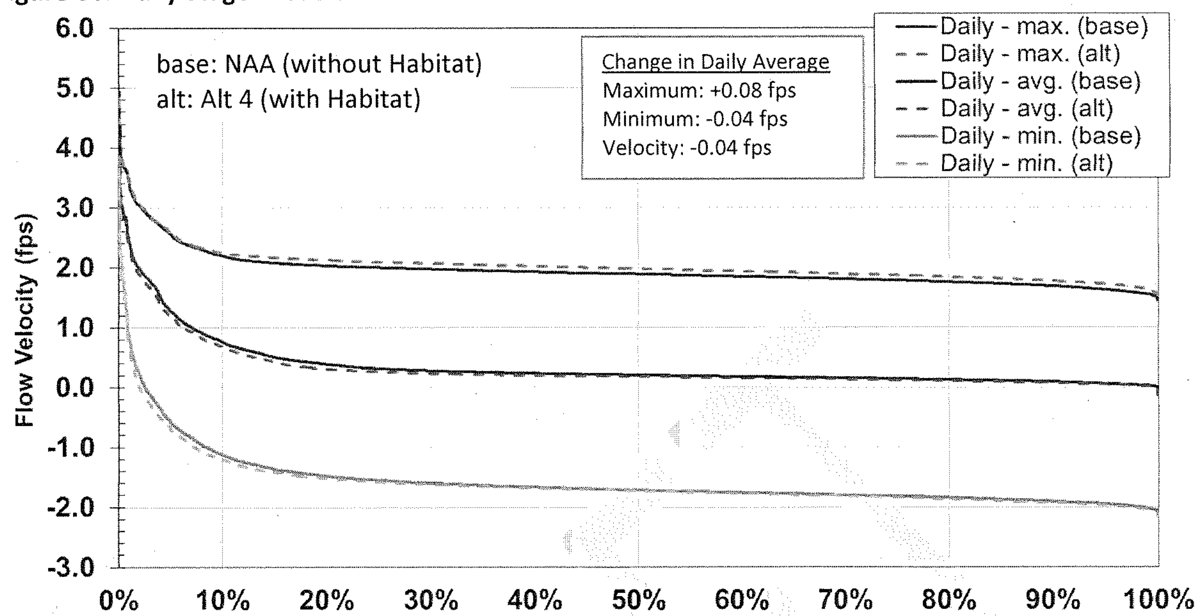


Figure 61. Daily Velocities in Sacramento River at Rio Vista

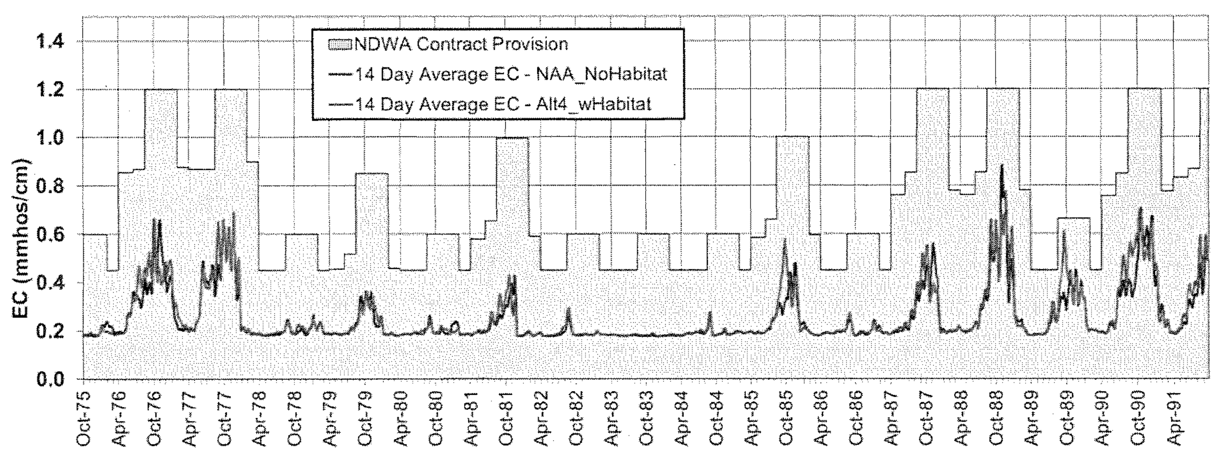


Figure 62. EC in the Sacramento River at Rio Vista

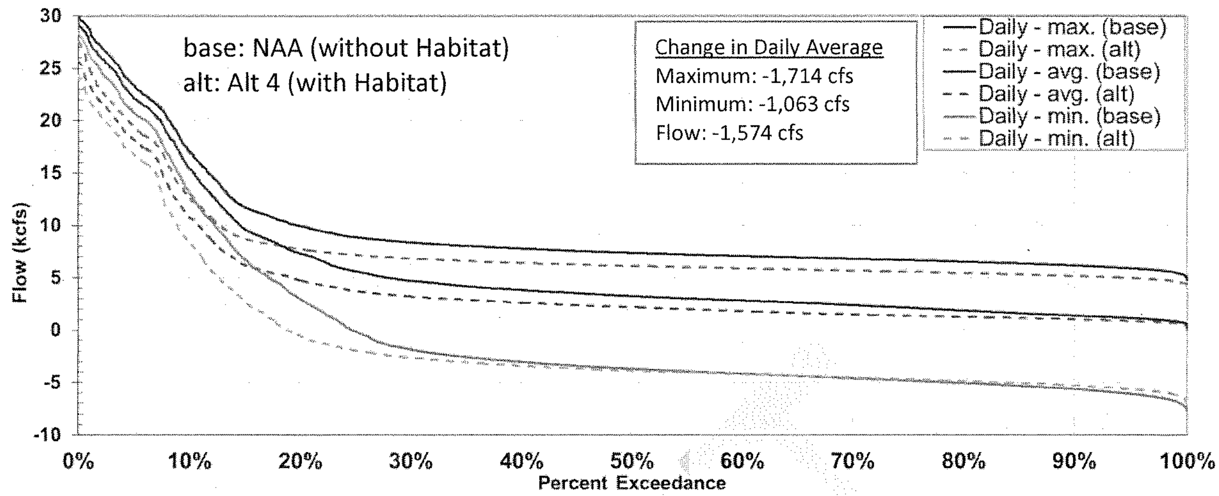


Figure 63. Daily Flow in Steamboat Slough at Sutter Slough

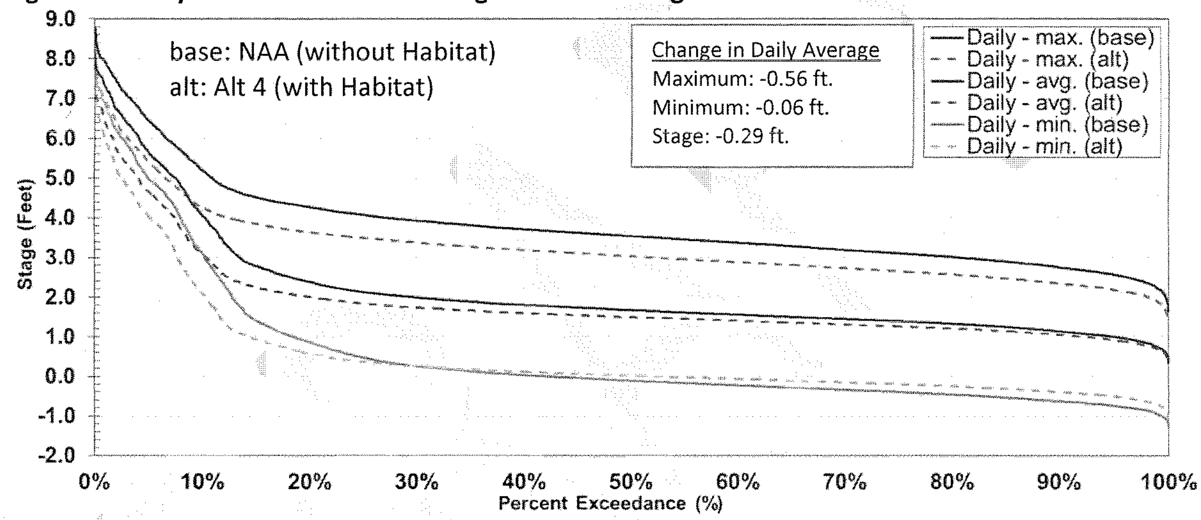


Figure 64. Daily Stage in Steamboat Slough at Sutter Slough

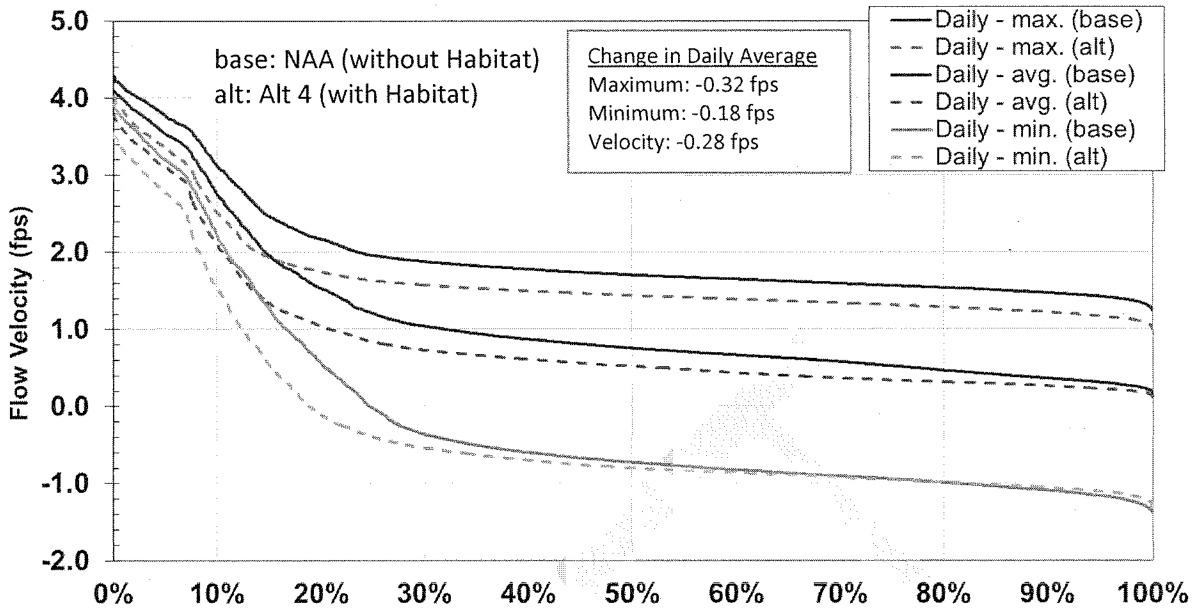


Figure 65. Daily Velocities in Steamboat Slough at Sutter Slough

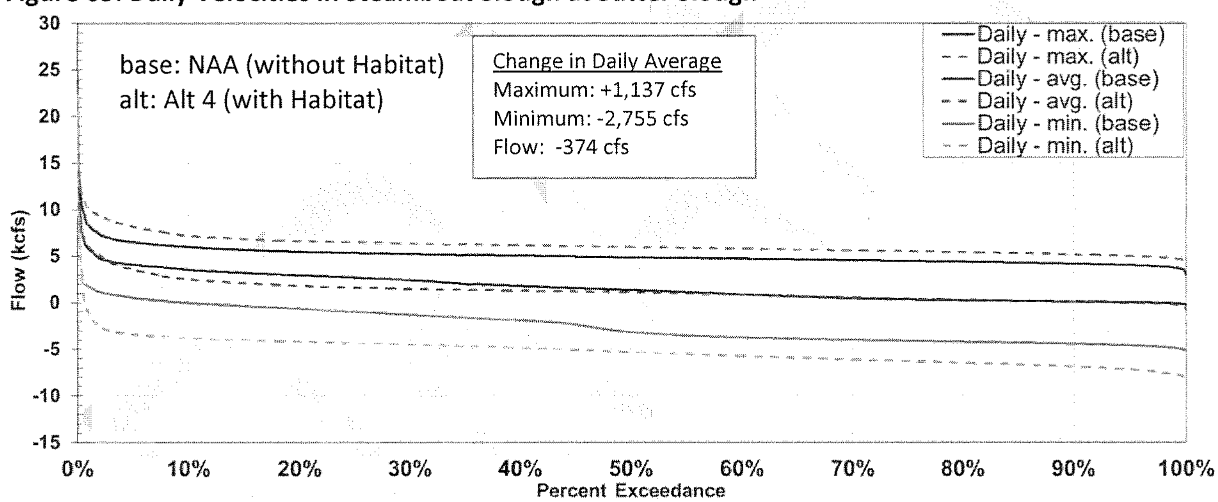


Figure 66. Daily Flow in North Fork Mokelumne River

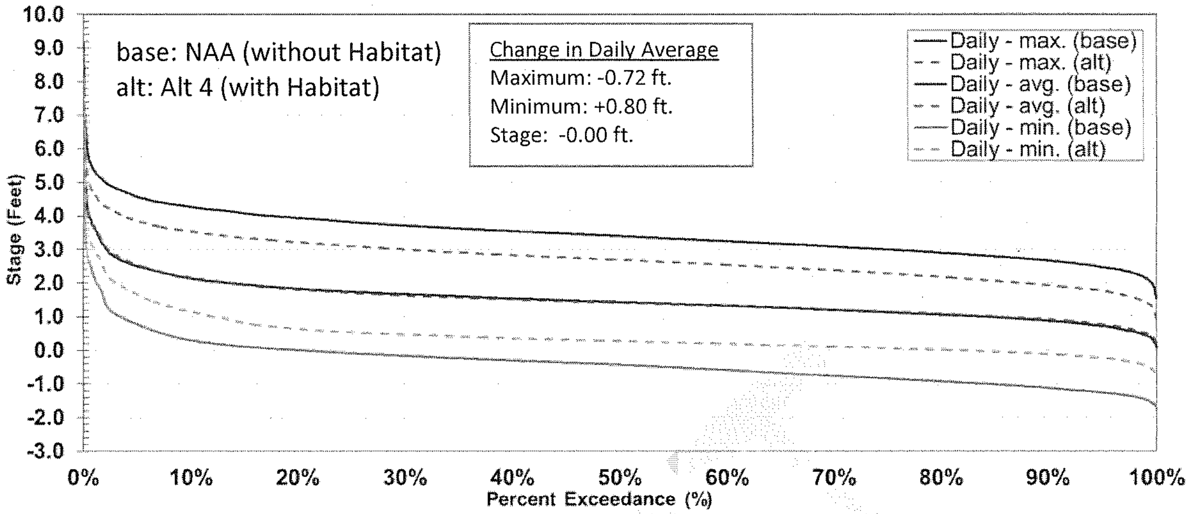


Figure 67. Daily Stage in North Fork Mokelumne River

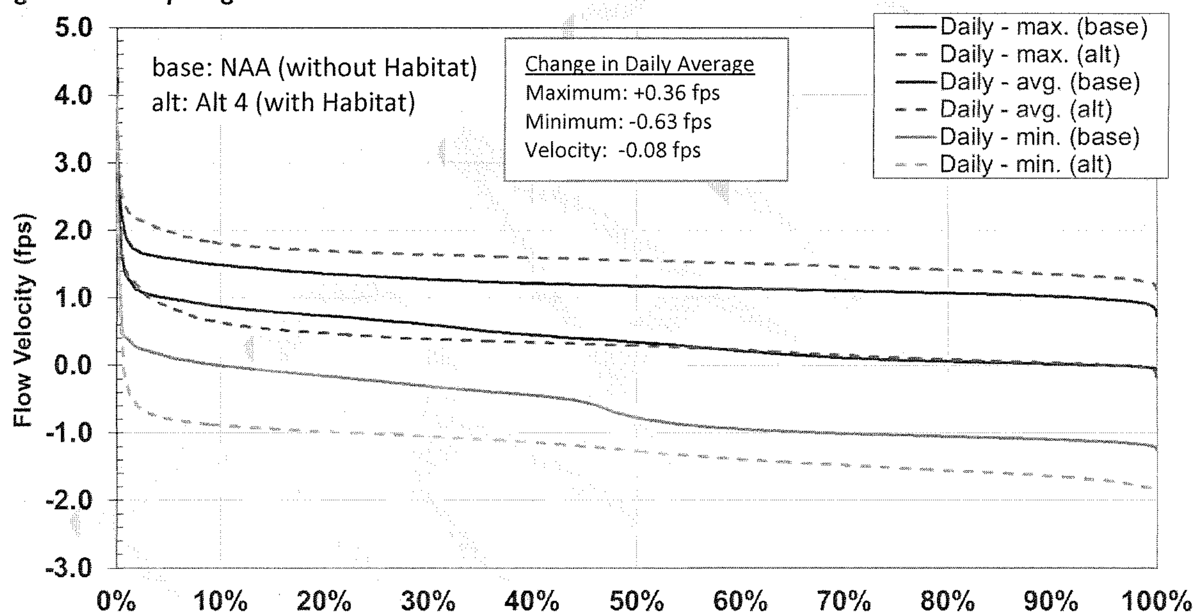


Figure 68. Daily Velocities in North Fork Mokelumne River

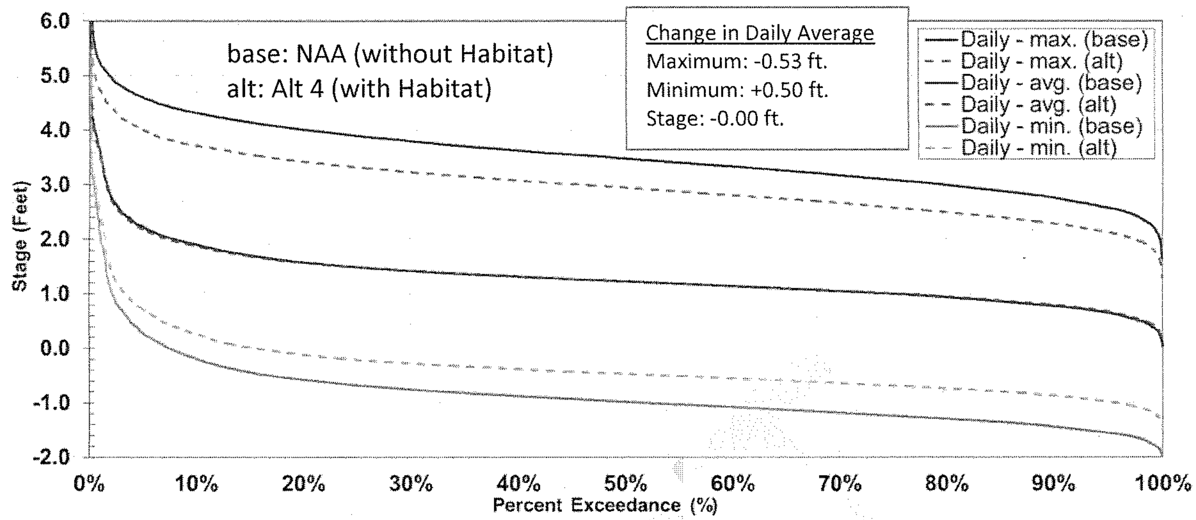


Figure 69. Daily Stage in Cache Slough at Ryer Island

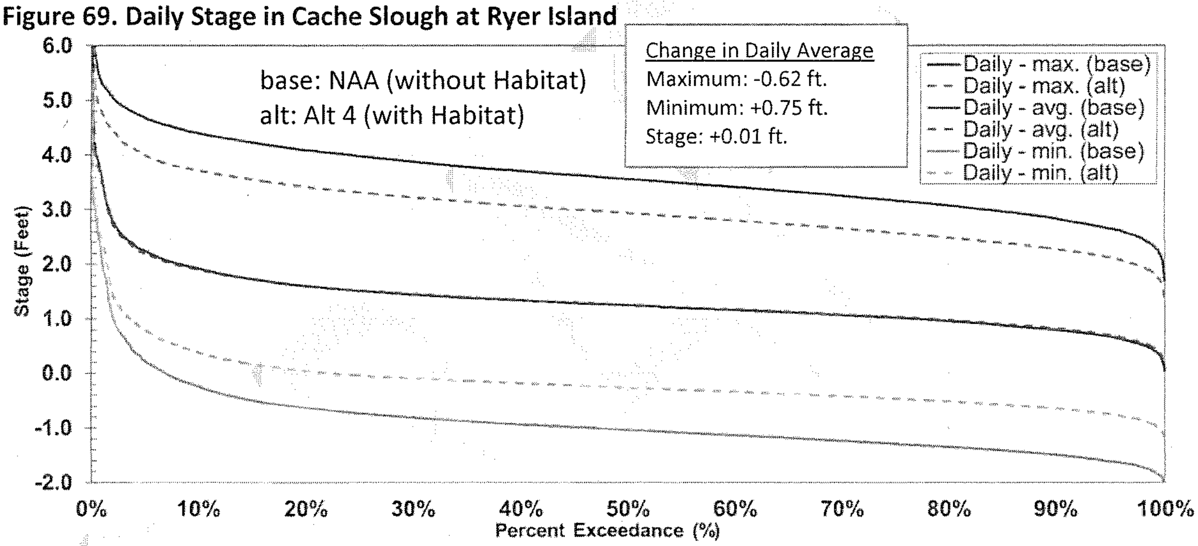


Figure 70. Daily Stage in Barker Slough at NBA Intakes

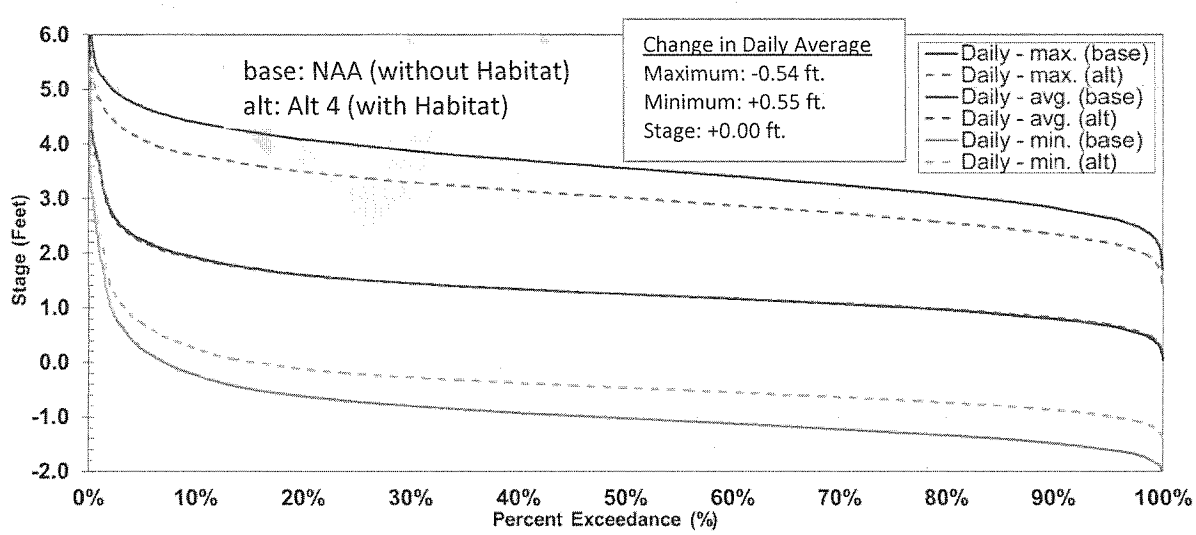


Figure 71. Daily Stage in Shag Slough at RD 2068 Intakes

Alternative 4 without Habitat and No Action Alternative without Habitat (Independent Modeling)

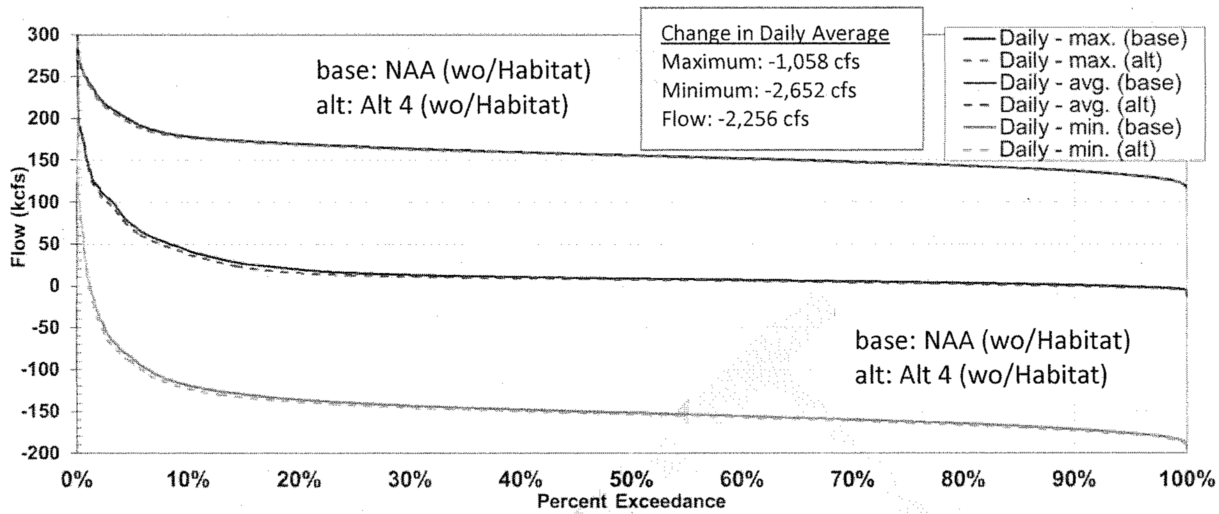


Figure 72. Daily Flow in Sacramento River at Emmaton

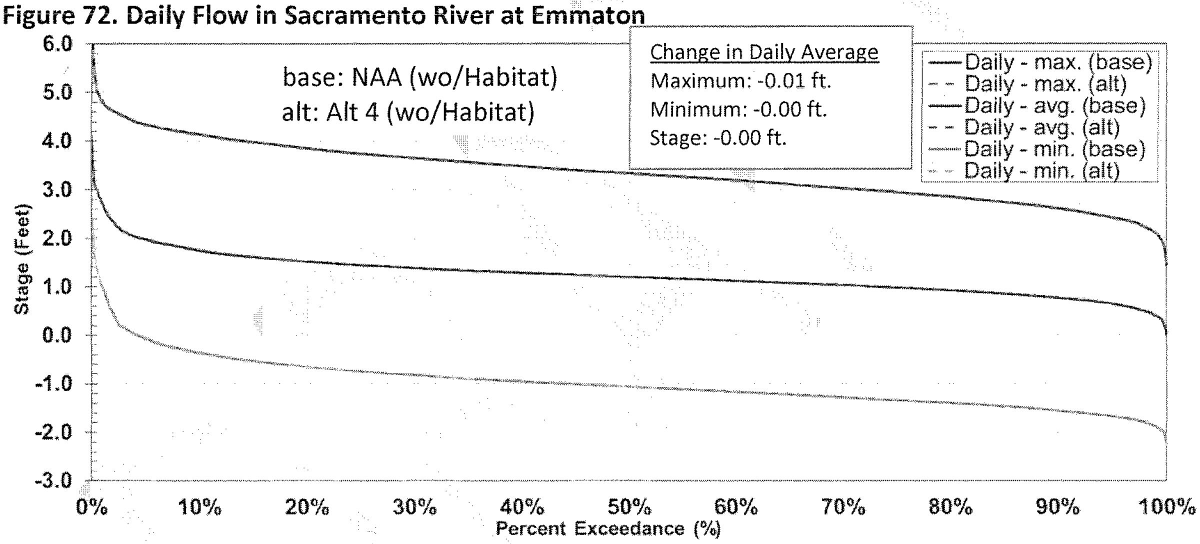


Figure 73. Daily Stage in Sacramento River at Emmaton

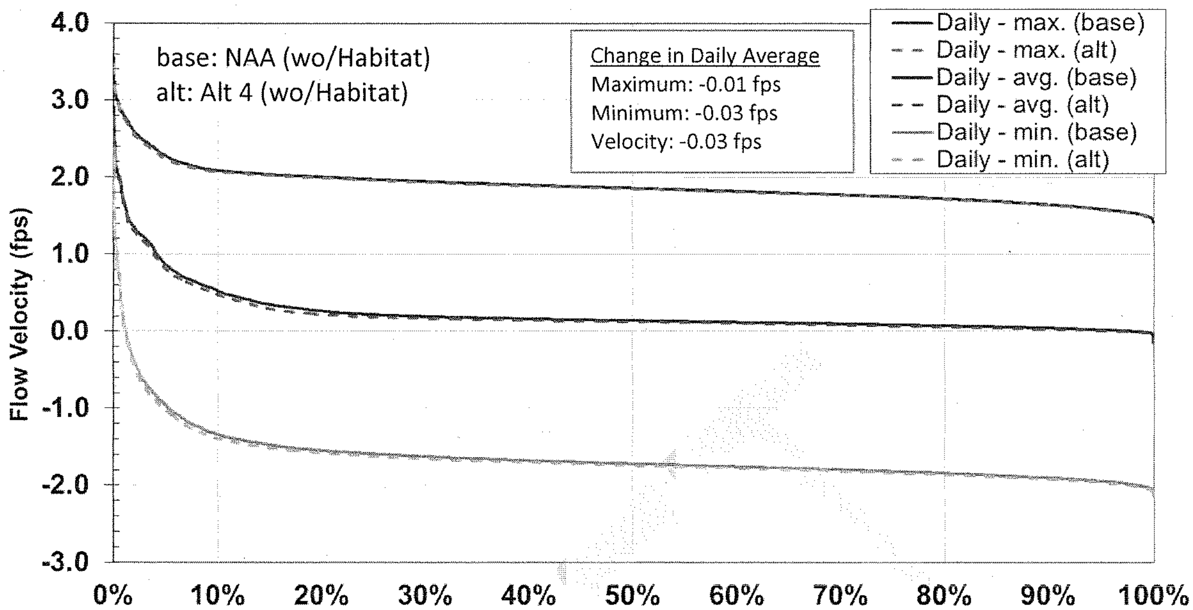


Figure 74. Daily Velocities in Sacramento River at Emmaton

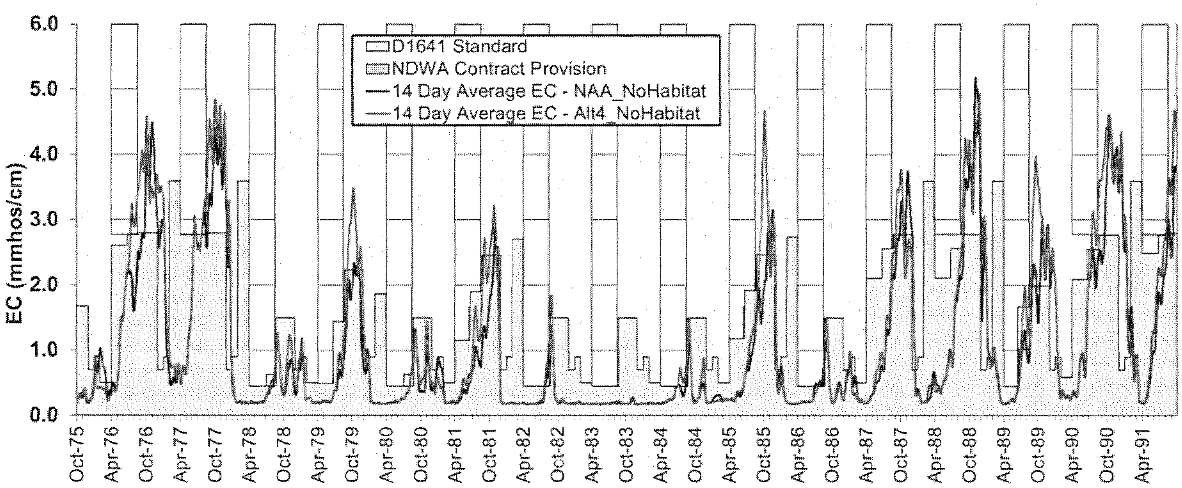


Figure 75. EC in the Sacramento River at Emmaton

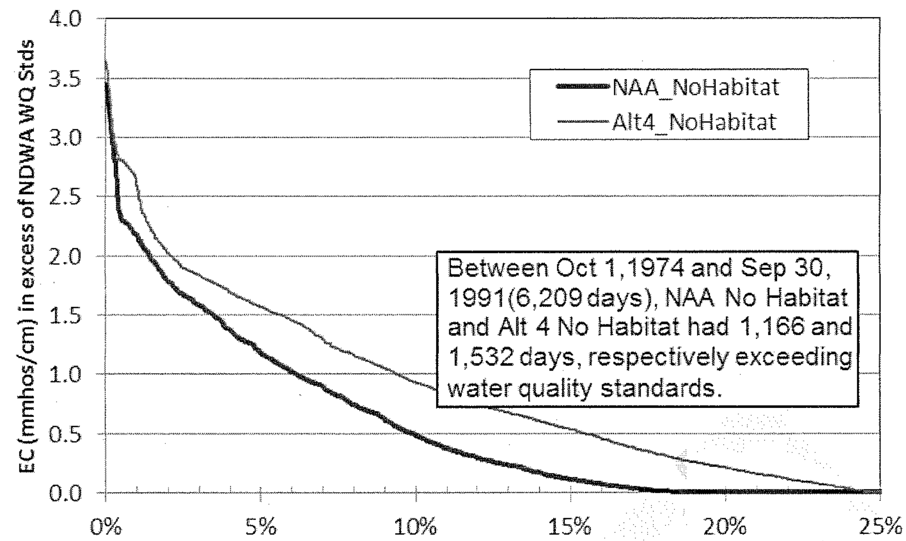


Figure 76. Probability of Exceeding EC Standards in the Sacramento River at Emmaton

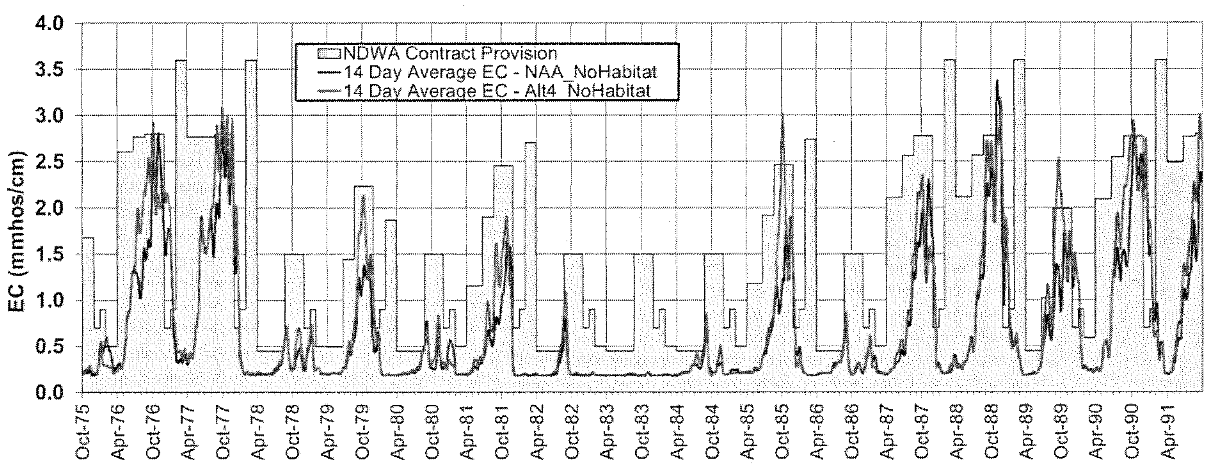


Figure 77. EC in the Sacramento River at Three Mile Slough

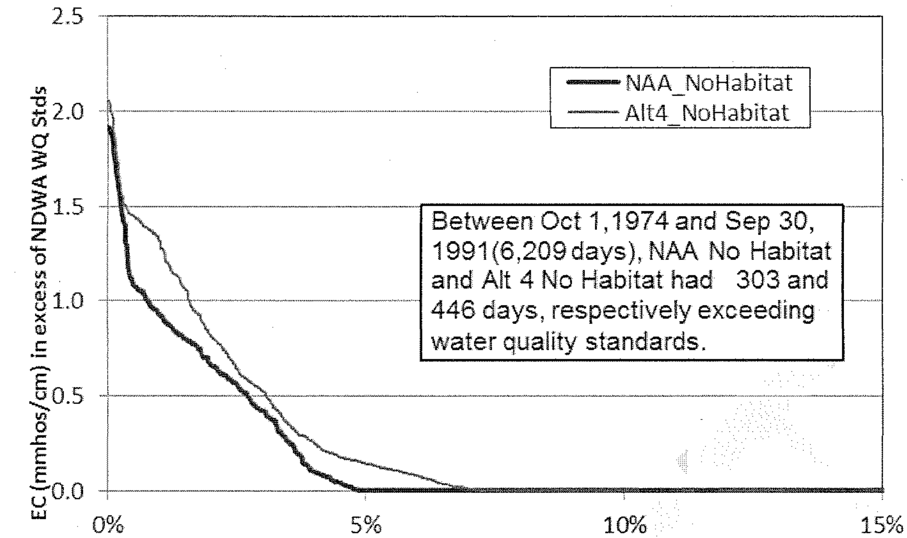


Figure 78. Probability of Exceeding EC Standards in the Sacramento River at Three Mile Slough

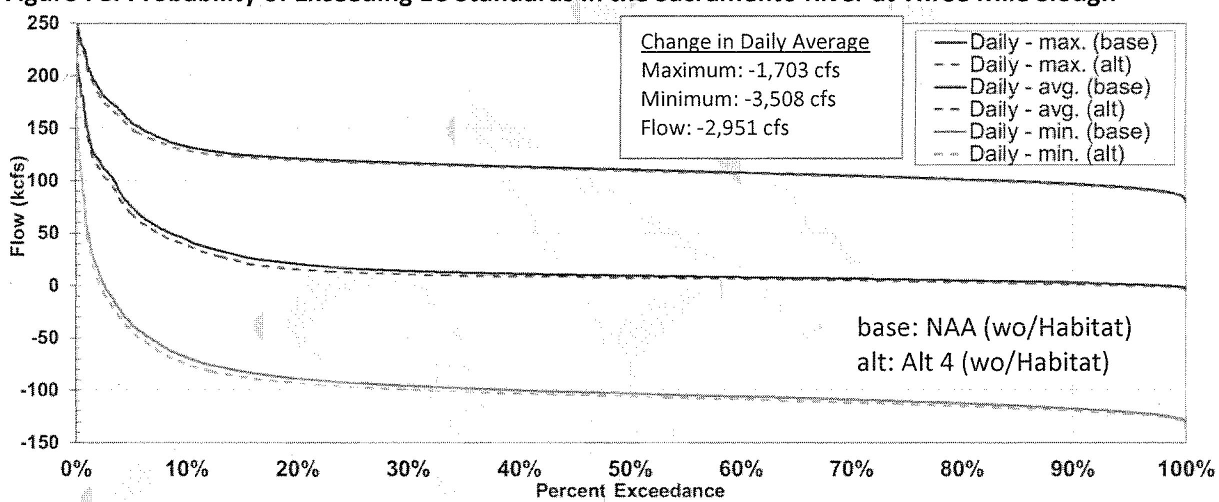


Figure 79. Daily Flow in Sacramento River at Rio Vista

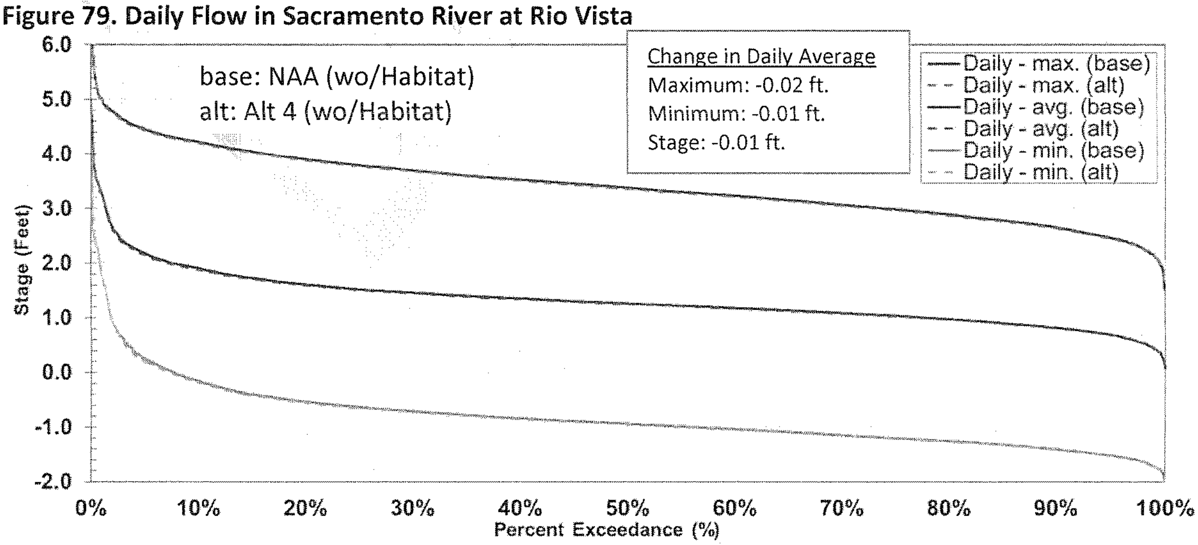


Figure 80. Daily Stage in Sacramento River at Rio Vista

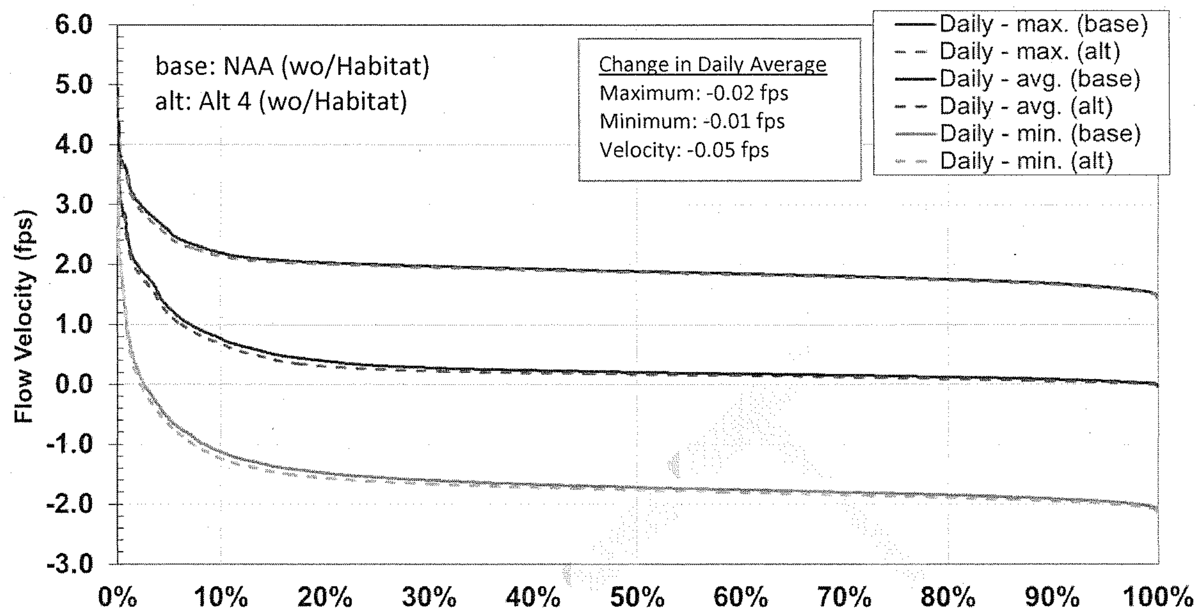


Figure 81. Daily Velocities in Sacramento River at Rio Vista

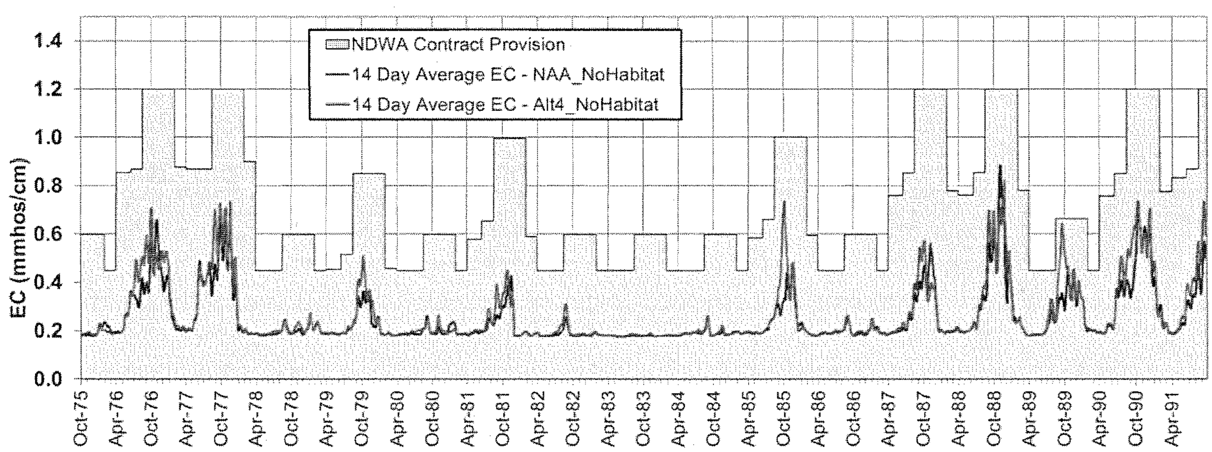


Figure 82. EC in the Sacramento River at Rio Vista

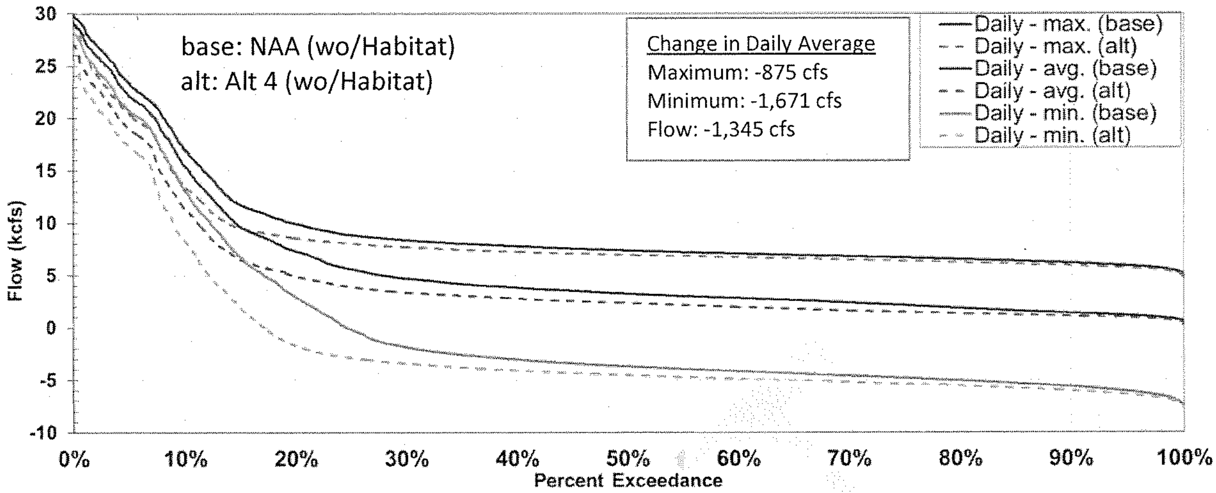


Figure 83. Daily Flow in Steamboat Slough at Sutter Slough

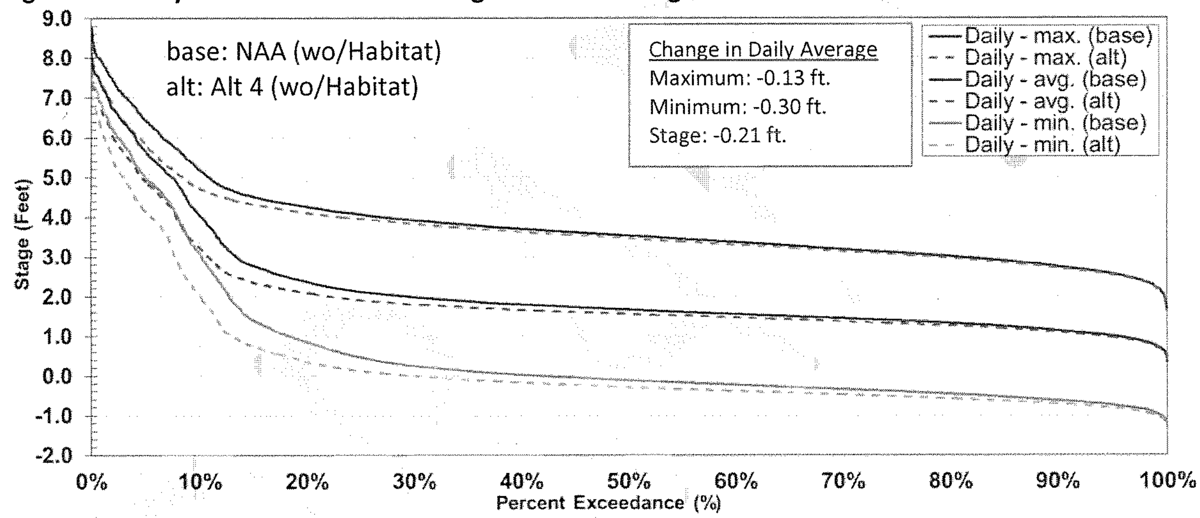


Figure 84. Daily Stage in Steamboat Slough at Sutter Slough

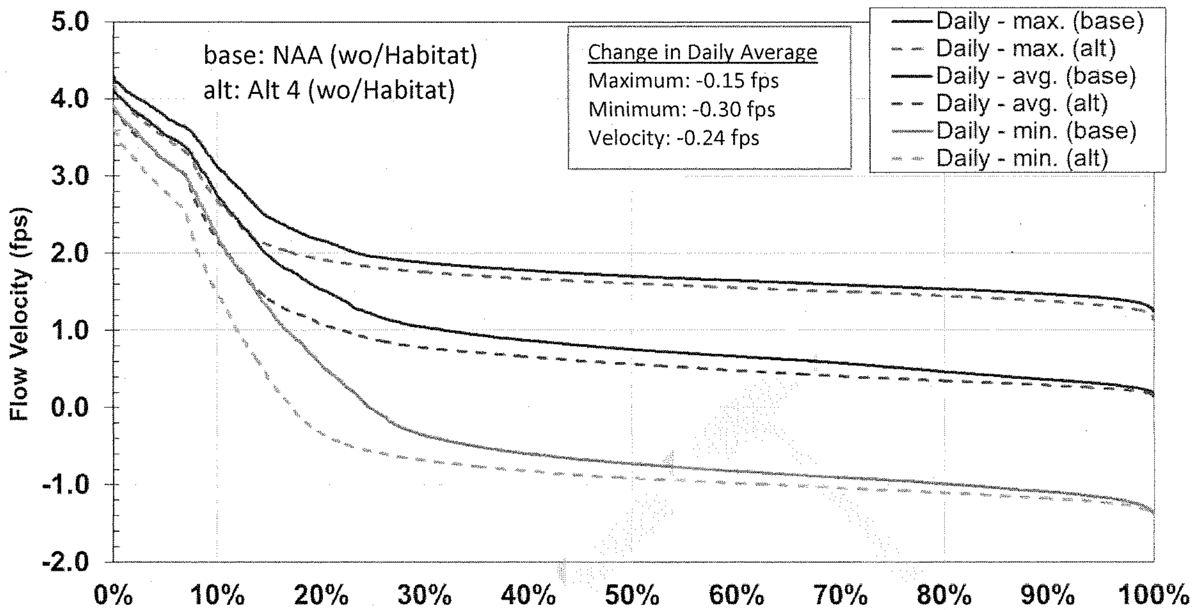


Figure 85. Daily Velocities in Steamboat Slough at Sutter Slough

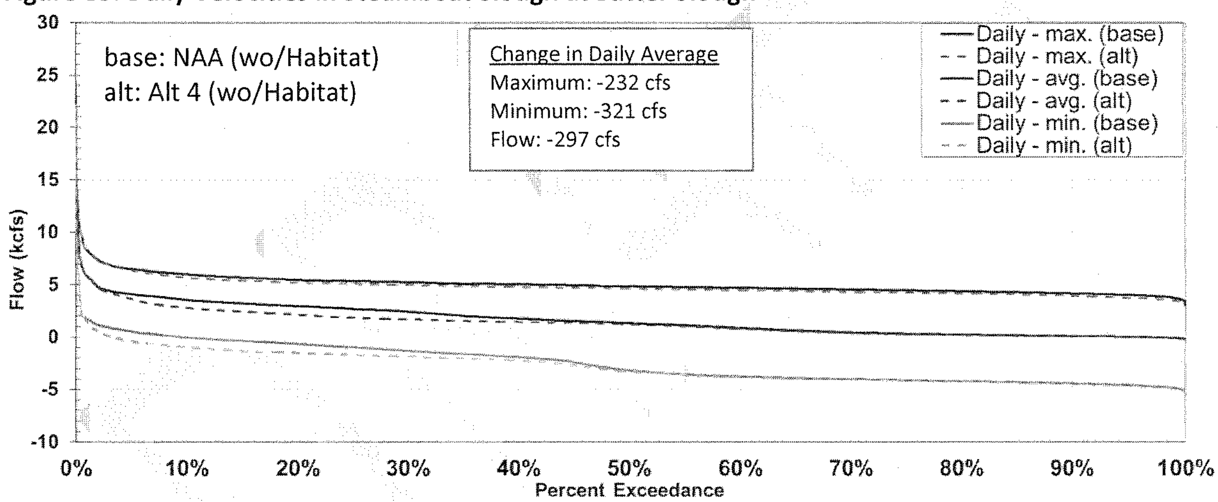


Figure 86. Daily Flow in North Fork Mokelumne River

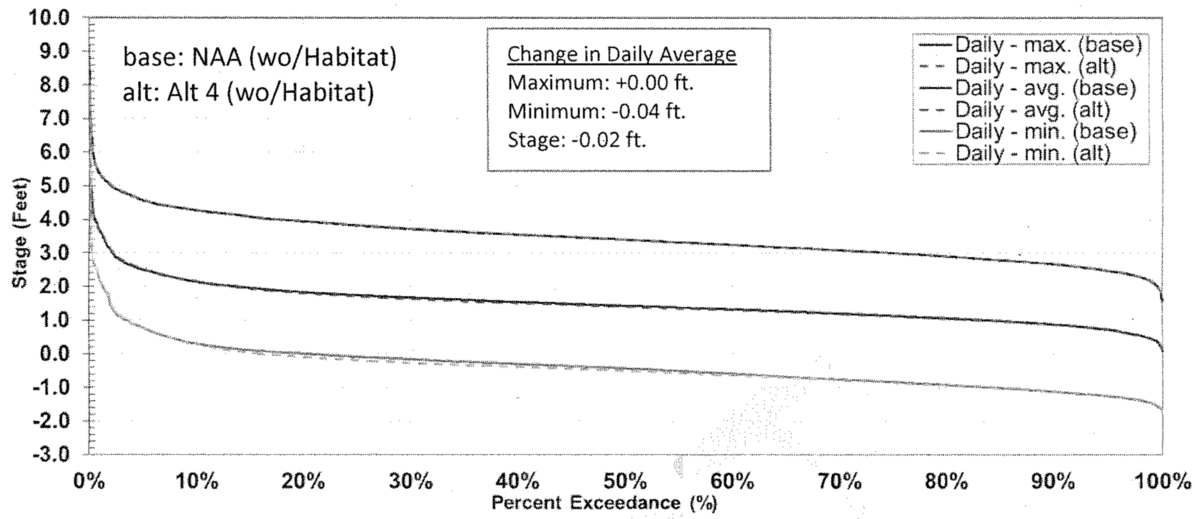


Figure 87. Daily Stage in North Fork Mokelumne River

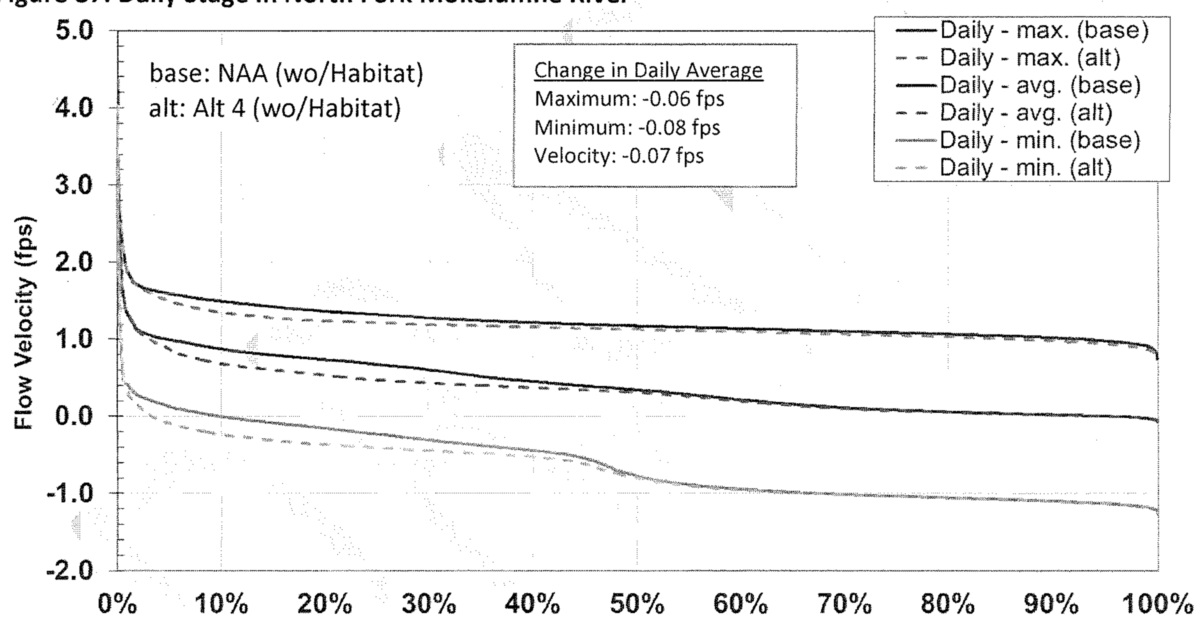


Figure 88. Daily Velocities in North Fork Mokelumne River

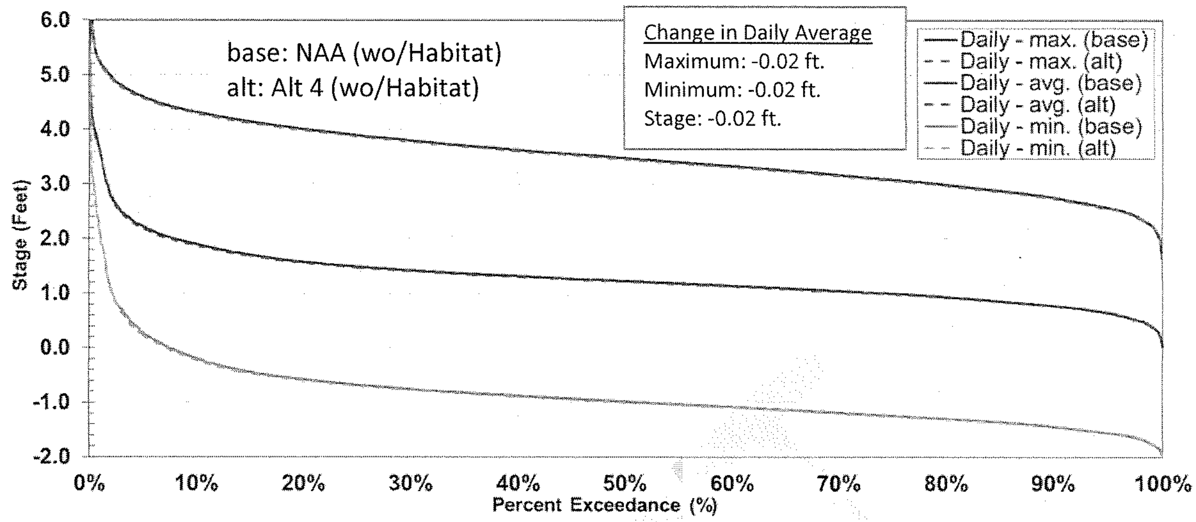


Figure 89. Daily Stage in Cache Slough at Ryer Island

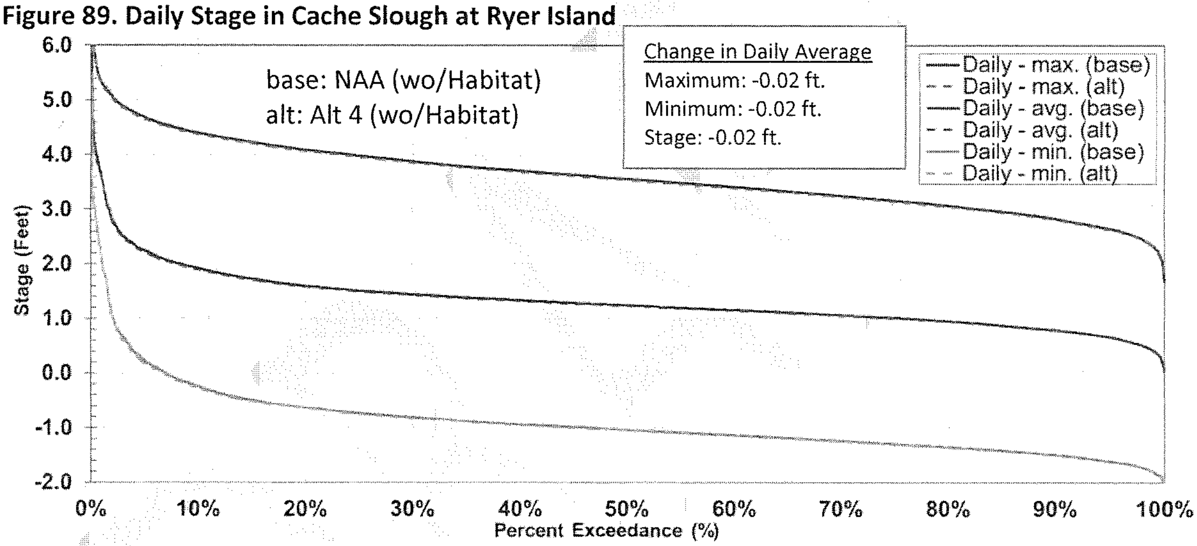


Figure 90. Daily Stage in Barker Slough at NBA Intakes

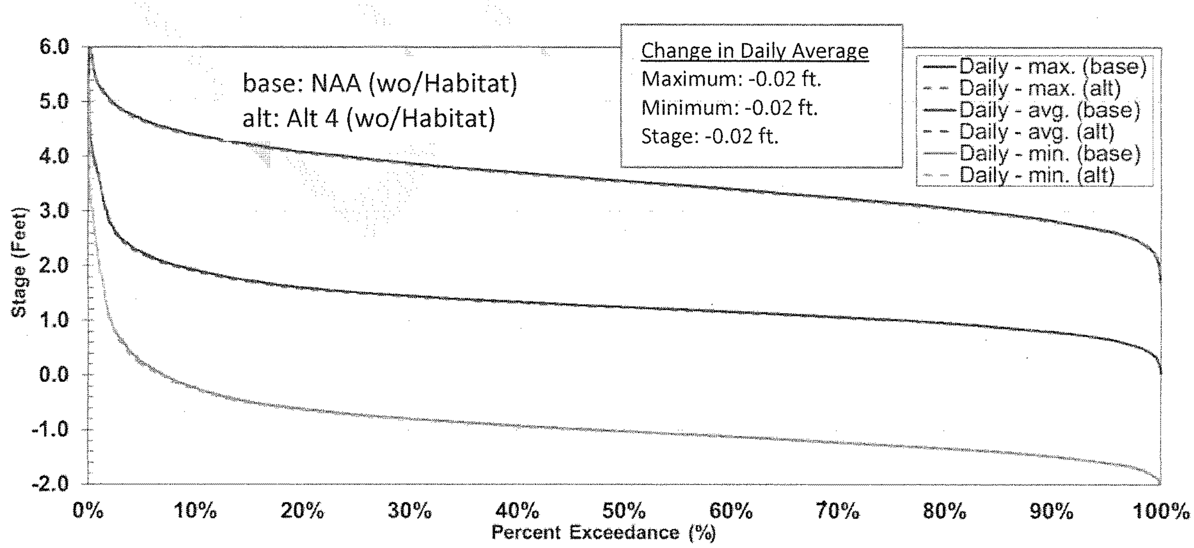


Figure 91. Daily Stage in Shag Slough at RD 2068 Intakes

MBK ENGINEERS

Water Resources • Flood Control • Water Rights

TECHNICAL MEMORANDUM

DATE: October 28, 2015

TO: David Aladjem

FROM: Walter Bourez, Lee Bergfeld, and Dan Easton

SUBJECT: Technical Comments on the Bay Delta Conservation Plan/California Water Fix Partially Recirculated Draft EIR/Supplemental Draft EIS

1. Overview

This technical memorandum is a summary of MBK Engineers' (MBK) findings and opinions concerning the Bay Delta Conservation Plan (BDCP)/California Water Fix Partially Recirculated Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS). These findings and opinions include comments specific to the RDEIR/SDEIS document and analysis, and also concern numerous comments previously submitted regarding the BDCP Draft Environmental Impact Report/Draft Environmental Impact Statement (BDCP Draft EIR/EIS). The key findings of MBK's review of the RDEIR/SDEIS are: (a) the description of the proposed project is insufficient for analysis; (b) the project description is inconsistent with the RDEIR/SDEIS's analysis; and (c) issues regarding the analysis that MBK previously identified remain unaddressed. Assumptions, errors, and outdated tools used in the analysis for the BDCP Draft EIR/EIS remain in the RDEIR/SDEIS and result in impractical or unrealistic CVP and SWP operations. The use of the analyses from the BDCP Draft EIR/EIS therefore provides limited useful information about the effects of the proposed California Water Fix project.

2. Project Description Is Insufficient for Analysis

The California Water Fix RDEIR/SDEIS project description in Section 4.1 is insufficient to perform the necessary technical analyses to identify the proposed project's potential environmental effects. There are several specific aspects of the proposed project that require additional description before modeling and technical analyses can be performed to identify potential environmental effects. The following sections describe the key aspects of the project description that require more definition.

2.1 North Delta Diversion Operations Plan/Point of Diversion Prioritization

The RDEIR/SDEIS does not include an operations plan for use of the North Delta Diversion (NDD). An operations plan is necessary to understand and describe the conditions under which the NDD would be used in the context of State Water Project (SWP) and Central Valley Project (CVP) operations, and how SWP and CVP diversions would be prioritized between the existing points of diversion in the South Delta and the NDD. Without describing how the CVP and SWP would be operated with a NDD, it is not possible to analyze the changes in CVP and SWP operations that may occur with the NDD; therefore it is not possible to determine the environmental effects that would be caused by changes in CVP and SWP operations.

The RDEIR/SDEIS describes the operation of the NDD as follows: "The proposed project operations include a preference for south Delta pumping in July through September to provide limited flushing for improving general water quality conditions and reduced residence times" (p. 4.1-6). These appear to be the only guidelines provided in the RDEIR/SDEIS that describe how the CVP and SWP operators would decide to either export water through-Delta at the existing South Delta diversions or at the NDD facility. This statement is insufficient to analyze NDD facility operations in conjunction with existing South Delta facilities. The following example illustrates this point.

Inflows from upstream reservoir releases and Delta exports are frequently governed by water quality standards in State Water Resources Control Board (SWRCB) Decision 1641 (D-1641) from July through September. Compliance with water quality standards is achieved through the combination of Delta inflows and exports. When water quality standards govern Delta operations, increases in Delta inflows generally allow for increases in Delta exports from the South Delta facilities at less than a one-for-one ratio because Delta outflows must increase to maintain water quality as South Delta exports increase. This additional outflow is commonly referred to as the "carriage water cost" for any additional exports from the South Delta. However, if water quality standards are being met with specific Delta inflow and South Delta export amounts, and if either the CVP or SWP wants to increase Delta exports, there would be no carriage water cost if the water were exported at the NDD. Therefore, 100 percent of any additional Delta inflow could be exported from the NDD, creating a water supply benefit to using the NDD during this period. However, operating the NDD to create this water supply benefit would not be consistent with the RDEIR/SDEIS's stated operational guideline, which is to "improve general water quality conditions and reduce residence times." The RDEIR/SDEIS does not provide an adequate description of how the NDD facilities would be operated under this, or any other, condition. Nor does the RDEIR/SDEIS offer any description of how diversions would be prioritized between the NDD and South Delta facilities outside the July through September period. An operations plan for the NDD must be defined before technical analyses of environmental effects can be performed.

2.2 Definition and Source of Additional Spring Outflow

The RDEIR/SDEIS identifies Alternative 4A (ALT 4A) as the preferred alternative (p. 2-20). A component of ALT 4A is a requirement for additional Delta outflow in the spring (P. 4.1-9). However, the project description does not adequately describe the expected quantity, timing, or source of the additional spring outflow. It is not possible to analyze the potential environmental effects associated with providing additional spring outflow without more definition as to the source, quantity, and timing of the flow.

According to the spring outflow section in RDEIR/SDEIS Table 4.1-2,

> initial operations will provide a March–May average Delta outflow bounded by the requirements of Scenario H3, which are consistent with D-1641 standards, and Scenario H4, which would be scaled to Table 3-24 in Chapter 3, Section 3.6.4.2 of the Draft EIR/EIS . . . (p. 4.1-9)

This description implies that, when meeting the existing outflow requirements in D-1641, the additional spring outflow would be bounded between zero and 9,200 to 44,500 cubic feet per second (cfs), as defined in Table 3-24 of the BDCP Draft EIR/EIS. While the existing outflow requirements in D-1641 are well-defined and understood in terms of source, quantity, and timing, the upper bound on this additional required spring outflow is not.

Regarding the source of the additional spring outflow, the RDEIR/SDEIS states:

> the proposed project includes spring outflow criteria, which are intended to be provided through acquisition of water from willing sellers. If sufficient water cannot be acquired for this purpose, the spring outflow criteria will be accomplished through operations of the SWP and CVP to the extent an obligation is imposed on either the SWP or CVP under federal or applicable state law. (p. 4.1-6)

The ALT 4A project description does not adequately describe the source of additional spring outflow, a necessary component for analyzing the environmental effects and, particularly, for determining what effects implementing California Water Fix would have on non-participating CVP and SWP contractors and other Sacramento Valley water users. Additional detail is required to identify willing sellers, to describe where sellers would be located, how sellers would provide the additional water, when sellers would be able to provide water, and to provide other similar information. This information must be provided before the potential environmental effects of providing additional spring outflow can be determined. These details must be provided because the environmental effects of making water available through land retirement, groundwater pumping, temporary crop idling, non-CVP/SWP reservoir releases, or water transfers are significantly different, may have different environmental effects and, possibly require different forms of mitigation. Where these environmental effects occur should also be described to ensure that the effects on local ecosystems and economies are disclosed.

Additionally, agricultural water users are typically not irrigating during the entire March through May period. Therefore, there may not be sufficient water available from willing sellers to directly meet increased spring Delta outflow requirements through reductions in agricultural diversions. This may require additional releases of stored water from CVP and SWP reservoirs. This potential is partially acknowledged in the statement that Delta outflow would be provided from a combination of SWP and CVP operations if or when outflow is not available from willing sellers. However, this statement lacks the detail necessary to describe potential environmental effects within the CVP/SWP system. The proposed project should describe under what conditions additional spring outflow would be provided from the CVP, the SWP, or a combination of both projects. These details must be provided before potential environmental effects can be determined, because providing additional water from Shasta Reservoir would have different environmental effects than providing it from Trinity, Oroville or Folsom Reservoir, or through reductions in exports. Providing additional Delta outflow from either the CVP or SWP through any combination of additional reservoir releases or changes in Delta exports would affect the operations of both projects through the Coordinated Operations Agreement (COA). These factors must be considered, defined, and then analyzed before the potential environmental effects can be determined.

How California Water Fix would implement the increased spring outflow component of the preferred alternative must be better described to allow for analyses of environmental effects. The RDEIR/SDEIS's reliance on the effects being bounded by analyses of the BDCP ALT 4 H3 and H4 simulations leaves too much uncertainty concerning the breadth of operational and environmental effects and, likely omits numerous potential environmental impacts.

2.3 Definition and Description of Adaptive Management Process

The RDEIR/SDEIS describes an Adaptive Management Process that may be used to adjust certain operational criteria, including spring Delta outflow requirements, NDD bypass flows, South Delta export operations including Old and Middle River (OMR) flow requirements, and Head of Old River Barrier (HORB) operations. The potential for adjustment in the operational criteria is contained in Table 4.1-2: "Adjustments to the criteria above [NDD bypass, South Delta exports, OMR, and HORB] and these outflow targets [spring Delta outflow] may be made using the Adaptive Management Process . . . " (p. 4.1-9).

These potential adjustments and the environmental effects are not analyzed in the RDEIR/SDEIS. The RDEIR/SDEIS suggests that the range of the spring Delta outflow requirements would be bounded by two different scenarios, H3 and H4, which are evaluated in Table 4.1-1 of the BDCP Draft EIR/EIS (p. 4.1-5). However, no attempt to quantify the range of effects associated with any of the other criteria is provided in the RDEIR/SDEIS.

Evaluating a range of additional spring outflows without identifying their source, quantity, and timing does not adequately disclose the potential environmental effects associated with the Adaptive Management Process. Providing no description of the likely range of changes in the other criteria that may occur under the Adaptive Management Process is another area where the project description lacks sufficient detail for analysis of potential environmental effects.

3. Project Description is Inconsistent with Analysis

As described above, the project description does not contain the specificity necessary to identify, analyze, and disclose the environmental effects of implementing the preferred alternative. Furthermore, the RDEIR/SDEIS's analyses performed to assess the environmental effects are inconsistent with the description of the project alternatives in the RDEIR/SDEIS. This inconsistency between the project description for the proposed, and ultimately the preferred, alternative and the analysis chosen for that alternative occurs because of reliance on model results and technical analyses conducted for the BDCP Draft EIR/EIS alternatives, notably BDCP Alternative 4 (BDCP ALT 4) Scenarios H3 and H4. The RDEIR/SDEIS states that "the Lead Agencies have determined that they may reasonably rely on the modeling conducted for Alternative 4 to accurately predict the environmental effects of Alternative 4A" (p. 4.1-43, line 17-19).

BDCP Draft EIR/EIS alternatives, however, are fundamentally different in several key areas from the alternatives described in the RDEIR/SDEIS. These key areas are described in the following sections. To support their conclusion that model results for a project analyzed in the BDCP Draft EIR/EIS may be relied upon to "accurately predict" environmental effects for a different proposed project in the RDEIR/SDEIS, the Lead Agencies conducted a sensitivity analysis for the RDEIR/SDEIS. The sensitivity analysis and conclusions are described at the end of this section.

3.1 Tidal Wetland Restoration

The BDCP Draft EIR/EIS's ALT 4 assumed that 25,000 acres of tidal wetland restoration would be in place as part of the project in the Early Long Term (ELT), at approximately 2025, and that 65,000 acres of tidal wetland restoration would be in place in the Late Long Term (LLT), at approximately 2060. There was no tidal wetland restoration in the No Action Alternative (NAA). In the BDCP Draft EIR/EIS, it was assumed the restored tidal wetlands would influence Delta tidal fluctuations, salinity, and operations. Generally, when the Delta contained more fresh water and lower salinity, it was expected that less Delta outflow would be necessary to keep it fresh with the wetlands in place because the wetlands served as a bulwark against tidal intrusion. On the other hand, when the Delta contained more salt water, the opposite would be true. More Delta outflow would be necessary to flush salts out because of the retention capacity of the wetlands. In either case, the effect was expected to be significant enough that tidal wetland restoration needed to be represented in the CalSim II simulations of the BDCP project alternatives. Operationally, additional wetlands could result in a different balance of Sacramento River inflows and exports to meet D-1641 standards, which could result in changes in CVP and SWP reservoir releases, allocations, and deliveries.

Depending on the location of the restored tidal wetlands, they could also buffer and reduce the tidal energy that carries salt water into the Delta. This is important when considering that operation of the NDD may reduce the volume of fresh water in the lower Sacramento River used to repel tidal energy and salt water intrusion. In this way, restoring tidal wetlands as part of BDCP ALT 4 reduced the additional salinity intrusion that would otherwise result from an NDD.

The ALT 4A project description in the RDEIR/SDEIS includes 59 acres of tidal wetland restoration (p. 4.1-5), or 0.2 percent of the area included at the ELT in the BDCP Draft EIR/EIS. This area would likely be too small to have a significant effect on Delta water quality, tidal energy, or CVP/SWP operations. However, CalSim II modeling performed for the BDCP Draft EIR/EIS was assumed to represent the operation of the ALT 4A for the RDEIR/SDEIS and was compared to an NAA that did not include any tidal wetland restoration. It is inappropriate to assume that ALT 4A in the RDEIR/SDEIS would have the same effects on Delta water quality, tidal energy, and CVP/SWP operations as the BDCP alternative that would have included nearly 25,000 acres more tidal wetland restoration. The RDEIR/SDEIS's modeling for ALT 4A does not reflect the reality of ALT 4A's significantly reduced amount of restored wetlands.

3.2 Relaxation of the Sacramento River Agricultural Water Quality Compliance Point

BDCP ALT 4 would have relaxed the Sacramento River agricultural water quality compliance point contained in D-1641 from Emmaton to Threemile Slough, a location approximately 3 miles upstream of Emmaton. The project description of ALT 4A in the RDEIR/SDEIS removes the relaxation of this water quality compliance point and leaves compliance at Emmaton, as specified in D-1641 (p. 4.3.4-23). Changing the water quality compliance location to Threemile Slough would require less fresh water flow from the Sacramento River to comply with the water quality standard because Threemile Slough is located further from Suisun Bay and the Pacific Ocean. The change in location for the water quality standard would likely affect the balance between exports and Sacramento River inflow necessary for compliance. Additionally, because meeting a water quality standard at Threemile Slough can be done with less Sacramento River flow, it could allow higher diversions at the NDD facility, or lower releases from upstream reservoirs. Therefore, it is inconsistent and inappropriate for the RDEIR/SDEIS to state that the operational effects in the modeling results for BDCP ALT 4 which includes moving the water quality compliance point, are the same as ALT 4A in the RDEIR/SDEIS, which does not include moving the compliance point.

3.3 Fremont Weir Gates

BDCP ALT 4 included habitat restoration in the Yolo Bypass. One component of the restoration was installation of operable gates on Fremont Weir at the northern end of the Yolo Bypass to allow for more frequent flooding of the bypass. The operable gates would be opened when Sacramento River flows at Freeport exceed 25,000 cfs, and would divert as much as 6,000 cfs of Sacramento River flow into the

Yolo Bypass, depending on the stage of the river. Therefore, opening the Fremont Weir gates would result in up to 6,000 cfs less flow at Freeport.

The ALT 4A project description in the RDEIR/SDEIS removes the Fremont Weir gates from the alternative because they are now considered to be included in the NAA (p. 4.1-23). However, the CalSim II modeling performed for the BDCP Draft EIR/EIS, which included the Fremont Weir gates, is assumed to represent the operation of ALT 4A for the RDEIR/SDEIS and is compared to an NAA that did not include the Fremont Weir gates. It is inconsistent and inappropriate for the RDEIR/SDEIS to attempt to determine the operational impacts of ALT 4A by comparing BDCP ALT 4, which includes the operable gates, to an NAA that does not include the gates. However, unlike the first two inconsistencies described above, this change will likely have lesser impacts on key operational parameters such as reservoir storage, exports and Delta outflow, since the gates would be opened during high-flow events when the system would likely be in a surplus condition.

3.4 RDEIR/SDEIS Sensitivity Analysis

The RDEIR/SDEIS attempts to address the inconsistencies identified above with a sensitivity analysis as described in the RDEIR/SDEIS's Appendix B. In this sensitivity analysis, BDCP ALT 4 is modified to remove the tidal wetland restoration, water quality compliance point relaxation, and Fremont Weir operable gates. No additional modifications were made to the BDCP ALT 4 CalSim II model, including any updates to the model since the analysis was done for the BDCP Draft EIR/EIS (p. B-3).

Appendix B is comprised of three pages of text and 613 pages of figures and tables of results from CalSim II. The conclusions from the sensitivity analysis are summarized in a single paragraph on page B-3.

> As shown in the figures Alt4A (H3) and Alt4A (H4) CALSIM II results are generally similar to A4_H3 and A4_H4, respectively. The results indicate that the incremental changes for Alt4A (H3) and Alt4A (H4) when compared to the No Action Alternative are trending similar to A4_H3 and A4_H4, at both ELT and LLT.

It is not reasonable or defensible to rely upon the results of modeling performed for the BDCP Draft EIS/EIR, which considered a project with different physical and operational effects, to accurately predict the environmental effects of a different project compared to a different no project/no action alternative as defined in the RDEIR/SDEIS because CalSim II model results are "generally similar" and "trending similar." Environmental effects should be determined through a project-specific analysis of the potential effects on species and resources. These non-specific conclusions do not provide sufficient information for the public to understand the basis for the RDEIR/SDEIS's conclusions about the significance of project effects. Project-related changes in flows and hydrodynamics can have a significant effect to aquatic species, water quality and beneficial uses of water, and it should not be assumed that environmental effects are the same because model results are "generally" or "trending" similar.

Lastly, the RDEIR/SDEIS includes an acknowledgement that the project description is inconsistent with the analysis.

> Nevertheless, there is notable uncertainty in the results of all quantitative assessments that refer to modeling results, due to the differing assumptions used in the modeling and the description of Alternative 4A and the No Action Alternative (ELT). (pp. 4.3.4-1 to 4.3.4-2)

In our opinion, this statement may suggest that preparers of the RDEIR/SDEIS recognized the weakness in the assumption that model results of a fundamentally different project could be compared to a different NAA than described in the RDEIR/SDEIS to "accurately predict" the environmental effects of the proposed project.

4. Previous Comments Remain Applicable

Analysis and conclusions in the RDEIR/SDEIS rely on the model runs developed for the BDCP Draft EIR/EIS, so many of the comments submitted based on our review of the BDCP Draft EIR/EIS apply to the RDEIR/SDEIS. These comments are described in the July 11, 2014 report by MBK Engineers and Daniel B. Steiner, Consulting Engineer, *Review of Bay Delta Conservation Program Modeling* (MBK Report). As described in Appendix B of the RDEIR/SDEIS, no updates were made to the CalSim II modeling to address these previous comments or any other issues previously identified.

The following is a summary of key findings in the MBK Report, which is attached to this technical memorandum.

4.1 Incorporation of Climate Change Ignores Reasonably Foreseeable Adaptation Measures

The following conclusion in the MBK Report's Executive Summary is applicable to the RDEIR/SDEIS:

> The BDCP Model uses assumed future climate conditions that obscure the effects of implementing the BDCP. The future conditions assumed in the BDCP model include changes in precipitation, temperature, and sea level rise. The result of this evaluation is that the modeled changes in water project operations and subsequent environmental impacts are caused by three different factors: (1) sea level rise; (2) climate change; and (3) implementation of the alternative that is being studied.
>
> Including climate change, without adaptation measures, results in insufficient water needed to meet all regulatory objectives and user demands. For example, the BDCP Model results that include climate change indicate that during droughts, water in reservoirs is reduced to the minimum capacity possible. Reservoirs have not been operated like this in the past during extreme droughts and the current drought also provides evidence that adaptation measures are called for long in advance to avoid draining the reservoirs. In this aspect, the BDCP Model simply does not reflect a real future condition. Foreseeable adaptations that the CVP and SWP could make in response to climate change include: (1) updating operational rules regarding water releases from reservoirs for flood protection; (2) during severe droughts, emergency drought declarations could call for mandatory conservation and changes in some regulatory criteria similar to what has been experienced in the current and previous droughts; and (3) if droughts become more frequent, the CVP and SWP would likely revisit the rules by which they allocate water during shortages and operate more conservatively in wetter years. The modifications to CVP and SWP operations made during the winter and spring of 2014 in response to the drought supports the likelihood of future adaptations. The BDCP Model is, however, useful in that it reveals that difficult decisions must be made in response to climate change. But, in the absence of making those decisions, the BDCP Model results themselves are not informative, particularly during drought conditions. With future conditions projected to be so dire without the BDCP, the effects of the BDCP appear positive simply because it appears that conditions cannot get any worse (i.e., storage cannot be reduced below its minimum level). However, in reality, the future

> condition will not be as depicted in the BDCP Model. The Reviewers recommend that Reclamation and DWR develop more realistic operating rules for the hydrologic conditions expected over the next half-century and incorporate those operating rules into any CalSim II Model that includes climate change. (p. 4)

The CVP's and SWP's operations during the current drought confirm this comment. Operations have been modified to meet human and environmental needs to the extent possible, and preserve some water in reservoir storage to continue to do so if drought condition persist. Modeling assumptions for the RDEIR/SDEIS and simulated operations with climate change are not consistent with recent operations.

4.2 The BDCP Model Was Built on a Benchmark Study with Numerous Inaccuracies

The following conclusion in the MBK Report is applicable to the RDEIR/SDEIS:

> CalSim II is continuously being improved and refined. As the regulatory environment changes and operational and modeling staff work together to improve the model's capability to simulate actual operations, the model is continually updated. The BDCP Model relied upon a version of CalSim II that dates back to 2009, immediately after the new biological opinions (BiOps) from the NMFS and the United States Fish and Wildlife Service (USFWS) significantly altered the operational criteria of the CVP and SWP. In the last 4 to 5 years, DWR, Reclamation, and outside modeling experts have worked together to improve the model. Changes include better (more realistic) implementation of the new BiOps and numerous fixes to the code. Since CalSim II is undergoing continual improvements, there will always be "vintage" issues in that by the time a project report is released, the model is likely slightly out of date. However, in this case – with the major operational changes that have occurred in the new regulatory environment – many issues have been identified and fixed in the last 4 to 5 years that have a significant effect on model results. CalSim II modeling for the DWR 2013 Delivery Reliability Report contains numerous modeling updates and fixes that significantly alter results of the BDCP Model. A key modeling revision in the 2013 DWR modeling was fixing an error regarding artificial minimum instream flow requirements in the Sacramento River at Hood. An "artificial" minimum instream flow requirement had been specified; the requirement is artificial in that it does not represent a regulatory requirement, but rather is a modeling technique to force upstream releases to satisfy Delta needs. (p. 14)

4.3 BDCP Model Coding and Data Issues Significantly Skew the Analysis and Conflict with Actual Real-Time Operational Objectives and Constraints

The following conclusion in the MBK Report is applicable to the RDEIR/SDEIS:

> Operating rules used in the BDCP Model, specifically regarding Alternative 4, result in impractical or unrealistic CVP and SWP operations. Reservoir balancing rules cause significant drawdown of upstream reservoirs during spring and summer months while targeting dead pool level in San Luis from September through December resulting in artificially low Delta exports and water shortages. CVP allocation rules are set to artificially reduce south of Delta allocations during wetter years resulting in underestimates of diversions at the NDD and the SDD. Operating rules for the Delta Cross Channel Gate do not reflect how the gates may be operated in "With Project" conditions.

> Operational logic is coded into the CalSim II model to simulate how DWR and Reclamation would operate the system under circumstances for which there are no regulatory or other definitive rules. This attempt to specify (i.e., code) the logic sequence and relative weighting so that a computer can simulate "expert judgment" of the human operators is a critical element to the CalSim II model. In the BDCP version of the CalSim II model, some of the operational criteria for water supply allocations and existing facilities such as the Delta Cross Channel and San Luis Reservoir are inconsistent with real-world conditions. (p. 18)

Because the RDEIR/SDEIS evaluates Alternative 4A, which is based on Alternative 4, these conclusions now apply to the RDEIR/SDEIS.

4.4 BDCP's "High Outflow Scenario" is Not Sufficiently Defined for Analysis

MBK and Steiner previously commented on the lack of definition for the additional spring outflow requirement contained in the BDCP Draft EIR/EIS. The following conclusion in the MBK Report Executive Summary is applicable to the RDEIR/SDEIS, which now includes additional spring outflow as an element of Alternative 4A:

> The effects of many critical elements of the BDCP cannot be analyzed because those elements are not well-defined. The Reviewers recommend that the BDCP be better defined and a clear and concise operating plan be developed so that the updated CalSim II model can be used to assess effects of the BDCP.
>
> The High Outflow Scenario (HOS) requires additional water (Delta outflow) during certain periods in the spring. The BDCP Model places most of the responsibility for meeting this new additional outflow requirement on the SWP. However, the SWP may not actually be responsible for meeting this new additional outflow requirement. This is because the Coordinated Operations Agreement ("the COA") would require a water allocation adjustment that would keep the SWP whole. Where one project (CVP or SWP) releases water to meet a regulatory requirement, the COA requires a water balancing to ensure the burden does not fall on only one of the projects. The BDCP Model is misleading because it fails to adjust project operations, as required by the COA, to "pay back" the water "debt" to the SWP due to these additional Delta outflow requirements. Unless there is a significant revision to COA, the BDCP Model overstates the impacts of increased Delta outflow on the SWP and understates the effects on the CVP.
>
> Furthermore, after consulting with DWR and Reclamation project operators and managers, the Reviewers conclude that there is no apparent source of CVP or SWP water to satisfy both the increased Delta outflow requirements and pay back the COA "debt" to the SWP without substantially depleting upstream water storage. It appears, through recent public discussions regarding the HOS, that BDCP anticipates additional water to satisfy the increased Delta outflow requirement and to prevent the depletion of cold water pools will be acquired through water transfers from upstream water users. However, this approach is unrealistic. During most of the spring, when BDCP proposes that Delta outflow be increased, agricultural water users are not irrigating. This means that there is not sufficient transfer water available to meet the increased Delta outflow requirements and therefore, additional release of stored water from the reservoirs would be required. Releasing stored water to meet the increased Delta outflow requirements could potentially impact salmonids on the Sacramento and American River systems due to reductions in the available cold water pool. (p. 5)

4.5 Delta Cross Channel Operational Assumptions Overestimate October Outflow

The following conclusion in the MBK Report is applicable to the RDEIR/SDEIS:

> When south Delta exports are low due to regulatory limits, and upstream reservoirs are making releases to meet the instream flow objectives at Rio Vista, operators have the ability to close the Delta Cross Channel (DCC) in order to reduce the required reservoir releases (by closing the DCC a greater portion of water released from the reservoirs stays in the Sacramento River to meet the Rio Vista requirements). As long as the Delta salinity standards are met, operators have indicated that they would indeed close the DCC in this manner (as was done in October and November 2013). In the BDCP Model, the DCC is not closed in this manner. The net result is that the BDCP Model overestimates outflow under such circumstances typically occurring in October.
>
> The overestimated outflow leads to incorrect conclusions regarding the effects of BDCP. For instance, an actual increase in fall outflow could be beneficial for the endangered fish species delta smelt (USFWS, 2008). Therefore, by overestimating outflow in October, the BDCP studies likely overestimate the benefit to delta smelt (Mount et al., 2013). Similarly, an actual increase in fall outflow would reduce salinity in the western Delta, which could be beneficial for in-Delta diverters; therefore, overestimating outflow in October artificially reduces salinity, incorrectly reducing the net impacts on in-Delta diverters. (p. 17)

4.6 San Luis Reservoir Operational Assumptions Produce Results Inconsistent with Real-World Operations

The following conclusion in the MBK Report is applicable to the RDEIR/SDEIS:

> San Luis Reservoir (SLR) is an off-stream reservoir located south of the Delta and jointly owned and operated by CVP and SWP. The reservoir is used to store water that is exported from the Delta when available and used to deliver water to CVP and SWP Contractors when water demands exceed the amount of water that can be pumped from the Delta. The decision of when to move water that is stored in upstream reservoirs, such as Shasta, Folsom, or Oroville, through the Delta for export to fill SLR is based on the experience and expert judgment of the CVP and SWP operators.
>
> CalSim II attempts to simulate the expert judgment of the operators by imposing artificial operating criteria; the criteria are artificial in the sense that they are not imposed by regulatory or operational constraints but rather imposed as a tool to simulate expert judgment. One such artificial operating criteria is the SLR target storage level: CalSim II attempts to balance upstream Sacramento Basin CVP and SWP reservoirs with storage in SLR by setting artificial target storage levels in SLR, such that the CVP and SWP will release water from upstream reservoirs to meet target levels in SLR. The artificial target storage will be met as long as there is ability to convey water (under all regulatory and physical capacity limits) and as long as water is available in upstream reservoirs. SLR target storage criteria are also sometimes described in section 4.2 as the "San Luis rule-curve."
>
> In the BDCP Model, CVP and SWP reservoir operating criteria for Alternative 4 H3 ELT differ from the corresponding without project scenario (e.g. NAA-ELT). The difference in criteria and result is primarily driven by changes to the artificial constraint used to determine when to fill SLR: the

SLR target storage. In Alternative 4 H3 ELT, SLR target storage is set very high in the spring and early summer months, and then reduced in August and set to SLR dead pool from September through December. This change in SLR target storage relative to the no action alternative causes upstream reservoirs to be drawn down from June through August and then recuperate storage by cutting releases in September. This change to the artificial operating criteria SLR target storage causes changes in upstream cold water pool management and affects several resource areas.

In addition to changes in upstream storage conditions, changes in SLR target storage cause SLR storage to drop below a water supply concern level (300,000 acre-feet) in almost 6 out of every 10 years under ELT conditions and more than 7 out of every 10 years under LLT conditions for Alternative 4 H3. When storage in SLR drops below this 300,000 acre-foot level, algal blooms in the reservoir often cause water quality concerns for drinking water at Santa Clara Valley Water District. The change in SLR target storage also causes SLR levels to continue to drop and reach dead pool level for the SWP in 4 out of every 10 years and also dead pool level for the CVP in 1 out of every 10 years under the ELT conditions.

Reaching dead pool level in SLR creates shortages to water users south of the Delta. Although some delivery shortages are due to California Aqueduct capacity constraints, the largest annual delivery shortages are a result of inappropriately low SLR target storage. Average annual Table A shortages due to artificially low SLR storage levels increased from 3 TAF in the NAA-ELT scenario to 35 TAF in the Alt4-ELT scenario. Such shortages occurred in 2% of simulated years in the NAA-ELT scenario and 23% of years in the Alt4-ELT scenario. In addition to the inability to satisfy Table A allocations, low storage levels cause loss of SWP Contractors' Article 56 water stored in SLR. Average annual Article 56 shortages were 43 TAF in the Alt4-ELT scenario because of low San Luis storage and 5 TAF in the NAA-ELT scenario. Low San Luis storage causes Article 56 shortages in 27% of simulated years in the Alt4-ELT scenario as compared to 5% of simulated years in the NAA-ELT. Another consequence of low storage levels in SLR is a shift in water supply benefits from Article 21 to Table A.

In summary, the operational assumptions for SLR are unrealistic in Alternative 4 because they create problems in upstream storage reservoirs and create shortages for south of Delta water users that would not occur in the real world. In reaching this conclusion, the Reviewers met with operators from CVP and SWP to review the BDCP Model results and discussed real-time operations. (p. 16)

From: Melinda Terry <melinda@floodassociation.net>
Sent: Friday, October 30, 2015 5:11 PM
To: BDCPcomments
Cc: 'Melinda Terry'; 'Cindy Tiffany'; 'Mike Hardesty, RD 2068'; 'Gilbert Cosio'; 'Shapiro, Scott @downeybrand.com'; 'Clark, Andrea'
Subject: CCVFCA comment letter - BDCP/CA WaterFix RDEIR/SDEIS
Attachments: MBK BDCP_ModelingReviewAppendix14-5-15.pdf; CCVFCA comments, CA WaterFix, 10-30-2015.pdf; MBK Tech Memo, BDCP_Modeling 07-25-2014_DRAFT (2).pdf; MBK, Tech Memo-FINAL, CA Water Fix, Oct 2015.pdf

Attached is the CCVFCA comment letter and associated Exhibits on BDCP/WaterFix project alternatives and EIR/EIS.

Melinda Terry, Executive Director
California Central Valley Flood Control Association
910 K Street #310
Sacramento, CA 95814
(916) 446-0197
Fax 446-2404
melinda@floodassociation.net