June 7, 2017

TO: San Luis & Delta-Mendota Water Authority Board of Directors, Alternates, and Interested Parties

FROM: Jason Peltier, Secretary (by Cheri Worthy)

RE: **Thursday, June 8, 2017, 9:30 a.m.**
Board of Directors' Regular Meeting

Additional Pre-Packet Documents attached for your review in preparation of the **June 8, 2017,** Board of Directors' regular meeting are:

1) Memorandum of Understanding between the United States of America, Department of Interior, Bureau of Reclamation, and the San Luis & Delta-Mendota Water Authority for Cooperation Development of the San Joaquin River Restoration Program Long-Term Recapture and Recirculation of Restoration Flows Environmental Impact Statement/Environmental Impact Report.

2) Water Policy Administrator Report with attachments.

Thank you, and please give us a call if you have any questions or concerns regarding this information.

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:

MP-170
ENV-6.00

APR 10 2017

Mr. Jason Peltier
Executive Director
San Luis and Delta Mendota Water Authority
P.O. Box 2157
Los Banos, CA 93635

Subject: Request to Participate as a Cooperating Agency for the San Joaquin River Restoration Program (SJRRP) Long-term Recapture and Recirculation of Restoration Flows Environmental Impact Statement/Environmental Impact Report

Dear Mr. Peltier:

The Bureau of Reclamation, in compliance with the National Environmental Policy Act (NEPA), is serving as the Federal lead agency in preparation of the SJRRP Long-term Recapture and Recirculation of Restoration Flows Environmental Impact Statement/Environmental Impact Report (Recapture and Recirculation EIS/EIR). As the Federal lead agency, Reclamation is soliciting cooperation from your agency to ensure that issues relating to your jurisdiction and special expertise are properly addressed in the Recapture and Recirculation EIS/EIR. Friant Water Authority (Friant) is the lead agency in accordance with the California Environmental Quality Act (CEQA) in preparing the Recapture and Recirculation EIS/EIR.

This planning effort aims to help achieve the SJRRP Water Management Goal to reduce or avoid water supply impacts to the long-term Friant contractors (Friant Contractors) that may result from releasing Restoration Flows in accordance with the Settlement in *NRDC, et. al., v. Rodgers, et. al.* (Settlement). Specifically, long-term recapture and recirculation actions are needed to satisfy the requirements of Paragraph 16(a) of the Settlement, which directs the Secretary of the Interior to develop and implement a plan for recirculation, recapture, reuse, exchange, or transfer of the Restoration Flows for the purpose of reducing or avoiding impacts to water deliveries to all the Friant Division long-term contractors, caused by the Restoration Flows (Plan). The Recapture and Recirculation EIS/EIR will support the development of the Plan in accordance with the criteria identified in Paragraph 16(a) of the Settlement.

The Recapture and Recirculation EIS/EIR will serve as the site-specific environmental documentation for actions required to implement a long-term plan to recapture up to the full amount of Restoration Flows and recirculate them to the Friant Division. The Recapture and Recirculation EIS/EIR will analyze a range of alternatives, including the potential construction

of expanded or new infrastructure to increase recapture pumping capacity along the San Joaquin River below the Merced River confluence and to convey recaptured Restoration Flows to the Delta-Mendota Canal or California Aqueduct.

The study area for recapture and recirculation activities includes water district service areas, their associated infrastructure, and other areas that may be affected directly or indirectly by implementing recapture, recirculation, and storage actions. The study area also includes Central Valley Project (CVP) and State Water Project (SWP) service areas that may be affected by the transfer of recirculated water from Friant Contractors to CVP or SWP contractors.

On July 27, 2015, Reclamation issued a Notice of Intent to conduct public scoping meetings and prepare the Recapture and Recirculation EIS. Reclamation held four public scoping meetings in August 2015 for the purposes of initiating the NEPA process and collecting input from stakeholders and the public on options for consideration in the EIS along with potential environmental effects to be considered. The public scoping comment period ended on August 27, 2015. In March 2017, Friant was identified as the CEQA lead agency for this planning effort. Reclamation and Friant are now beginning to prepare the Recapture and Recirculation Draft EIS/EIR.

As the Federal lead agency for the Recapture and Recirculation EIS/EIR, Reclamation has requested that the U.S. Fish and Wildlife Service, National Marine Fisheries Service, the Environmental Protection Agency, and the U.S. Army Corps of Engineers participate in this planning effort as cooperating agencies in accordance with NEPA. Reclamation is also providing non-Federal agencies with the opportunity to participate in the NEPA process for the Recapture and Recirculation EIS/EIR as cooperating agencies. Eligible governmental entities include state and local agencies and Federally-recognized tribes that are qualified to participate in preparation of an EIS by virtue of jurisdiction by law or by virtue of special expertise in regard to any environmental impact associated with the action being considered.

Cooperating agencies must meet the following criteria, which are based on NEPA regulations and Council on Environmental Quality guidance:

- Be a governmental entity (tribal, state or local)
- Be qualified to participate in the development of the Recapture and Recirculation EIS/EIR by virtue of:
    - Jurisdiction by law, such as: agency authority to approve, veto, or finance all or a part of the proposal, or
    - Special expertise with respect to any environmental impact associated with the action being considered.

Entities that have met the specified criteria for cooperating agencies will be required to enter into a Memorandum of Understanding (MOU) (enclosed) with Reclamation to document their participation as a cooperating agency. If your agency is interested in being a cooperating agency, and has met the criteria listed above, please complete the enclosed MOU. The purpose of the MOU is to define the needs of Reclamation in regards to coordination with cooperating agencies, the scope of participation by the cooperating agencies, and roles and responsibilities of

the cooperating agencies and Reclamation. Reclamation and Friant retain all decision making authority for preparation of the Recapture and Recirculation EIS/EIR.

Please submit your executed MOU to:

Becky Victorine
Bureau of Reclamation
San Joaquin River Restoration Program
2800 Cottage Way, W-1727
Sacramento, CA 95825

If you have any further questions regarding this process, please contact Becky Victorine at rvictorine@usbr.gov or (916) 978-4624.

Sincerely,

Alicia Forsythe

Alicia Forsythe
Program Manager

Enclosure

cc: Jason Phillips
Chief Executive Officer
Friant Water Authority
854 N. Harvard Avenue
Lindsay, CA 93247

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE UNITED STATES OF AMERICA
DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

AND
THE SAN LUIS AND DELTA MENDOTA WATER AUTHORITY

FOR
COOPERATIVE DEVELOPMENT OF THE SAN JOAQUIN RIVER RESTORATION PROGRAM LONG-TERM RECAPTURE AND RECIRCULATION OF RESTORATION FLOWS ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

I. Preface

This Memorandum of Understanding (MOU) is entered into this ____ day of _____, 2017, by and between the United States Bureau of Reclamation (Reclamation) and the San Luis and Delta Mendota Water Authority for the purpose of coordination in preparing the San Joaquin River Restoration Program Long-Term Recapture and Recirculation of Restoration Flows Environmental Impact Statement/Environmental Impact Report (EIS/EIR). This MOU is specific to the role of the San Luis and Delta Mendota Water Authority as a cooperating agency in accordance with the National Environmental Policy Act (NEPA).

Reclamation is a party to the 2006 Stipulation of Settlement in *Natural Resources Defense Council, et al. v. Kirk Rodgers, et al.* (Settlement), which involves restoration of flows and fisheries in the main stem of the San Joaquin River between Friant Dam and the confluence of the Merced River, and a series of water management actions. The Settlement includes a Restoration Goal and a Water Management Goal. The San Joaquin River Restoration Settlement Act (Public Law 111-11) authorizes and directs the Secretary of the Interior (Secretary) to implement the Settlement. Reclamation is implementing the Settlement on behalf of the Secretary.

To contribute to achieving the Water Management Goal, the Settlement calls for a plan for recirculation, recapture, reuse, exchange, or transfer of Restoration Flows for the purpose of reducing or avoiding impacts to water deliveries to Friant Contractors caused by the release of Restoration Flows. The EIS/EIR will analyze alternatives that would implement Section 16(a) of the Settlement, which requires the Secretary of the Interior and Settling Parties to develop a plan for recirculation, recapture, reuse, exchange, or transfer of Restoration Flows. The EIS/EIR will consider alternatives to recapture Restoration Flows, primarily downstream of the Restoration Area (downstream of the confluence with the Merced River), and recirculate these flows to Friant Contractors. These actions would reduce the water supply impact on Friant Contractors associated with the Settlement and help achieve the Water Management Goal.

In accordance with Code of Federal Regulations 40 CFR 1501.6, Reclamation, as the NEPA lead agency in preparing the EIS/EIR, is requesting participation in development of the EIS/EIR from qualified agencies with specialized expertise. Friant Water Authority is the lead agency in accordance with CEQA in preparing the EIS/EIR. Potential cooperating agencies include Federal, State, tribal, or local agencies with specialized expertise relevant to the analysis to be described in the EIS/EIR.

II. Purpose of this MOU

The purpose of this MOU is to formalize the commitment among the parties to work collaboratively in preparation of the EIS/EIR. This MOU is intended to clarify and define the roles and responsibility of Reclamation as the lead agency and the San Luis and Delta Mendota Water Authority as a cooperating agency in preparation of the EIS/EIR.

III. Statutory and Regulatory Authority

This MOU is being entered into pursuant to NEPA, 42 U.S.C. § 4331, *et seq.;* the Council of Environmental Quality's NEPA regulation regarding Cooperating Agencies, 40 CFR § 1501.6; and the U.S. Department of Interior's NEPA regulations, 43 CFR § 46.225 and 43 CFR § 46.230.

IV. Responsibilities

The parties to this MOU herein commit as follows:

a. Reclamation

Reclamation, as the lead agency, is responsible for the preparation, quality, and content of the alternatives and impact analysis and selection and implementation of alternatives analyzed in the Draft and Final EIS/EIR. Other Reclamation responsibilities include:

1. Preparing or overseeing the preparation of all aspects of the EIS/EIR in compliance with NEPA and the NEPA implementing regulations;
2. Providing direction to and reviewing the work products of the consultants preparing the EIS/EIR and related documents;
3. Clearly identifying and acknowledging the roles and responsibilities of all cooperating agencies in the EIS/EIR;
4. Informing the public and decision makers of the potential direct, indirect, and cumulative impacts of the alternatives that are analyzed in the EIS/EIR, and potential means to mitigate those impacts, including measures to avoid, minimize or compensate for potentially significant adverse impacts;
5. Providing invitations and adequate notice for meetings to cooperating agencies;
6. Providing preliminary EIS/EIR deliverables, as appropriate, to the cooperating agencies for review and comment;

7. Providing technical analyses and information to the cooperating agencies and soliciting their review and comment, particularly with respect to key subject areas pertaining to issues within their jurisdiction by law or special expertise as appropriate;
8. Taking those actions necessary to permit cooperating agencies to accomplish their responsibilities, including the provision of those documents to be reviewed by the cooperating agency, as determined to be appropriate by Reclamation, as the NEPA lead agency;
9. Making all final decisions on the content of public documents;
10. Informing the cooperating agencies of schedule changes that could affect their input to the EIS/EIR or ability to provide timely review of the document; and
11. Making all decisions in the Record of Decision (ROD).

b. Cooperating Agency

As a cooperating agency pursuant to NEPA for the EIS, to the extent that its fiscal, staff and other resources permit, the responsibilities of the San Luis and Delta Mendota Water Authority include taking the following actions in a timely manner consistent with the schedule for developing and completing the EIS/EIR and with direction provided by Reclamation:

1. Identifying their special expertise or jurisdiction related to the analysis in the EIS/EIR;
2. Devoting staff resources sufficient to provide technical assistance to fulfill its role as a cooperating agency;
3. Attending meetings as appropriate and identified in advance by Reclamation;
4. Providing review and comment on preliminary EIS/EIR deliverables as appropriate;
5. Providing responses to data requests pertaining to issues within their jurisdiction by law or special expertise;
6. Providing technical information and expertise directly associated with their statutory responsibilities or related experience, including review of technical analyses of key subject areas, as requested by Reclamation;
7. Raising potential issues as early in the process as reasonably feasible to avoid delay and inefficiency;
8. Identifying data and analysis in the EIS/EIR that may be needed to fulfill their role as potential regulatory agencies and any other requirements regarding jurisdictional permits and/or other approvals required for implementation of the project;
9. Providing review and comment on an Administrative Draft EIS/EIR prior to public review of the Public Draft EIS/EIR, as requested by Reclamation;
10. Providing review of an Administrative Final EIS/EIR, as requested by Reclamation, prior to public release of the Final EIS/EIR;
11. Complying with the confidentiality requirements and procedures specified below for all documents received as part of this MOU; and

12. Funding their own expenses associated with their participation in the environmental compliance documentation process, including development of information, reviewing, and providing comments on the EIS/EIR and related documents pertaining to the cooperating agency's jurisdiction and special expertise.

V. Representation

Reclamation and the San Luis and Delta Mendota Water Authority shall designate their representatives for purposes of this MOU. The representatives shall be responsible for ensuring that the information sharing, collaboration, and document review procedures established by this MOU are implemented: (1) by the employees and consultants of Reclamation directly responsible for the technical analyses and preparation of the environmental documents, and (2) by the employees and consultants of the San Luis and Delta Mendota Water Authority. The San Luis and Delta Mendota Water Authority shall designate one representative and one alternate responsible for attendance at all meetings requested by Reclamation. Changes to the identified representative and/or alternate should be provided in writing to Reclamation.

VI. Confidentiality

The cooperating agency will not release any pre-decisional information (including meeting notes, data, draft documents, and working discussions) obtained from Reclamation or from other cooperating agencies unless the information is deemed a public record pursuant to the Freedom of Information Act or the applicable state public records act. This information may be shared with pertinent cooperating agency staff for purposes of review. Any questions concerning the release of information and all media contacts will be referred to the Reclamation project manager.

The San Luis and Delta Mendota Water Authority agrees to keep all documents, including drafts, provided by Reclamation in accordance with its cooperating agency status and pursuant to this MOU confidential to the extent allowable by law. The San Luis and Delta Mendota Water Authority will provide notice to Reclamation before disclosing any document required by law to be disclosed to outside parties that has been shared with the San Luis and Delta Mendota Water Authority in accordance with their cooperating agency status and pursuant to this MOU.

Notwithstanding the foregoing, the San Luis and Delta Mendota Water Authority may disclose such materials to its officers, members of its staff and its contractors, who are also subject to the confidentiality requirements of this MOU.

VII. Additional Provisions

1. **Effect of MOU.** This MOU shall take effect when signed by the San Luis and Delta Mendota Water Authority and Reclamation. This MOU shall terminate upon issuance of the ROD by Reclamation, or upon written agreement of the parties.
2. **Modification of or Withdrawal from the MOU.** Any party to this MOU wishing to modify or withdraw from this MOU must provide a written notice to the other party hereto specifying the reason. The parties shall promptly meet and confer in a good faith effort to address and resolve, if possible, the issue(s) causing the notifying party

to wish to modify or withdraw from this MOU. This MOU may be modified by written agreement of the parties. If, following such meeting, the notifying party still wishes to withdraw, such party may withdraw 30 days after the date of the written notice. If the San Luis and Delta Mendota Water Authority withdraws from this MOU it will no longer be considered a cooperating agency for the purposes of the EIS/EIR.

3. **Reservation of Rights.** The San Luis and Delta Mendota Water Authority waives no rights under NEPA or other law to comment upon, dispute, or otherwise challenge the EIS/EIR.

4. **Counterparts.** This MOU may be signed in counterparts.

5. **Anti-Deficiency Act.** The expenditure or advance of any money or the performance of any obligation of the United States under this MOU shall be contingent on the appropriation or allotment of funds. No liability shall accrue to the United States for failure to perform any obligation under this MOU in the event that funds are not appropriated or allotted.

6. **Management of information.** The cooperating agency acknowledges that all data and information provided by them will become part of Reclamation's official record and will be available for public review, except as otherwise determined not to be released pursuant to the Freedom of Information Act or restricted by the Privacy Act. The cooperating agency will comply with all aspects of the Privacy Act (43 C.F.R. Part 2; DOI's 383 DM 7), including safeguarding individual's names and addresses. All questions concerning the release of information will be referred to the Reclamation project manager.

   If information is requested through the Freedom of Information Act (43 C.F.R. Part 2) or other public disclosure legislation, the following guidelines will be followed: if the originator of the document(s) being requested is the cooperating agency, the cooperating agency will respond to the disclosure request pursuant to applicable law and the cooperating agency will keep Reclamation informed by sending copies of the request and relevant supplemental documents. If the originator of the document(s) being requested is Reclamation, the cooperating agency will refer the disclosure request to Reclamation and a letter will be sent by the cooperating agency to the requester that the request has been referred. If the originator of the document(s) is another cooperating agency, the cooperating agency will refer the disclosure request to the originating agency and a letter will be sent by the cooperating agency to the requester explaining that the request has been referred. The cooperating agency will keep Reclamation informed by sending copies of the request and the letter to the requester.

7. **Conflict of interest.** The parties agree not to utilize any individual for purposes of EIS/EIR development, environmental analyses, or representation, including officials, employees, or third party contractors having a financial interest in the outcome of the EIS/EIR.

8. **Authorities not altered.** Nothing in this MOU alters, limits, or supersedes the authorities or responsibilities of any party on any matter within their respective

jurisdictions. Nothing in this MOU shall require any of the parties to perform beyond their respective authorities.

9. **Immunity and defenses retained.** Each party retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this MOU and cooperative work on the EIS/EIR.

VIII. Conclusion

In signing this MOU, the undersigned recognize and accept the roles and responsibilities assigned to each party. Each of the parties agrees to pursue maximum cooperation and communication to ensure that the EIS/EIR fully complies with all applicable requirements and minimizes duplication of effort and project delays.

BUREAU OF RECLAMATION

By: _____ Date: _____

Alicia Forsythe
Program Manager

THE SAN LUIS AND DELTA MENDOTA WATER AUTHORITY

By: _____ Date: _____

MEMORANDUM

TO: JASON PELTIER, EXECUTIVE DIRECTOR

FROM: ARA AZHDERIAN, WATER POLICY ADMINISTRATOR

SUBJECT: WATER POLICY ADMINISTRATOR REPORT

DATE: 6/7/2017

2017 CVP-SWP REGULATED OPERATIONS:

On June 1, regulatory requirements shifted from the calendar based NMFS San Joaquin River inflow-to-export ratio to the OMR restriction under both the NMFS and FWS BiOps. Fortunately, high San Joaquin River flows continue to produce positive OMR. This, in conjunction with low salvage, suggests that pumping will continue to operate without regulatory constraint for the foreseeable future. The NMFS BiOp OMR requirement will terminate mid-June and the FWS OMR when Delta temperatures exceed 25 degrees Celsius, which usually occurs between mid-June and certainly by the end of June.

DELTA STEWARDSHIP COUNCIL:

The Council is continuing work on their Delta Plan update. The update focuses on two areas: 1) Storage, conveyance, and the operation of both, and 2) performance measures. Authority staff is reviewing the Council's draft documents and considering submittal of comments.

DISCUSSION DRAFT
NOT APPROVED BY THE DELTA STEWARDSHIP COUNCIL
SUBJECT TO CHANGE

DELTA PLAN AMENDMENTS FOR CONVEYANCE, STORAGE SYSTEMS, AND THE OPERATION OF BOTH

The Delta Stewardship Council (Council) is amending the Delta Plan to promote options for water conveyance, storage systems, and the operation of both as required by Water Code Section 85304. The draft Delta Plan amendment includes a suite of recommendations for Delta water management system operations and supporting infrastructure improvements that, together and in combination with existing Delta Plan policies and recommendations, will further the coequal goals. The draft Delta Plan amendment does not include any new regulations, and therefore it does not apply to a project's consistency with the Delta Plan under Water Code section 85225, or any appeal to the Council of a certification under Water Code sections 85225.5 et seq.

INTRODUCTION

The Sacramento-San Joaquin Delta (Delta) and California's water supply systems are in crisis,[1] and existing Delta water management practices are not sustainable.[2] The recent drought followed by record precipitation underscores this crisis.[3] For decades, human-produced alterations to the Delta's landscape and the operations of water management projects in the Delta and throughout the watershed have combined with multiple other factors to create stressors that imperil the Delta ecosystem and state-wide water supply reliability.[4]

During the mid-1900s when major conveyance and storage facilities of the State Water Project (SWP) and the Central Valley Project (CVP) were authorized and constructed, the State of California (State) was focused on expanding water supplies for economic growth to improve the quality of life throughout California. These projects achieved their purposes of increasing water supplies for agriculture and urban centers, but in doing so they markedly added to the changed physical and ecological conditions in the Delta and its watershed. Subsequently, during the 1970s and 1980s the values informing how we manage water and other natural resources have changed, and the mission of these and other major water storage and conveyance facilities expanded to address native species protection and the maintenance of water quality for human uses in the Delta.[5]

The prolonged drought of 1987-1992 highlighted more than any previous experience the sensitivity of the Delta ecosystem to environmental stressors and the linkage to long-term stability of delta exports. The 1994 Bay-Delta Accord was an historic milestone that brought the State and federal governments together to develop and implement a vision to reverse the

[1] Nichols et al. 1986; Service 2007; Moyle et al. 2013, 2016; Moyle 2014; Luoma et al. 2015
[2] Lund, 2016
[3] Medellín-Azuara et al. 2015; Lund 2016
[4] Hanak et al. 2013; Mount et al. 2012
[5] Lund et al. 2007

declining health of the Delta ecosystem. Subsequent years of study and stakeholder involvement during the CALFED Bay Delta Program resulted in a clearer vision for the future and presaged the need for integrated conveyance and storage and the need to achieve the coequal goals that became the foundation of the 2009 Delta Reform Act and the ~~2013~~ Delta Plan. Despite changes in water system operations and management, ecosystem health has continued to decline in the Delta.[6] An overview of water conveyance and storage project development and operations related to Delta water management is provided as background information in Attachment A.

Today, our existing and planned conveyance and storage projects must meet multiple objectives. The 2009 Delta Reform Act signaled a resolve by the ~~State of California (~~State~~)~~ to implement solutions that would achieve the coequal goals.

> *Coequal goals means the two goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The coequal goals shall be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.* –Water Code section 85054

The Delta Plan includes policies and recommendations intended to build regional water supply reliability, reduce reliance on the Delta, and improve the Delta's ability to support viable populations of native resident and migratory species and to protect and restore habitats for these species. The Plan also seeks to protect and enhance the unique characteristics of the Delta as a place.

However, our current water management system, as constructed and operated today, is not capable of achieving the Delta Plan's coequal goals.[7] In particular, the use of existing south Delta intake facilities as the sole point of diversion for two large conveyance systems – the State Water Project ~~(SWP)~~ and the Central Valley Project ~~(CVP)~~ – continues to result in entrainment of native fish and changes to water quality and Delta food webs, posing fundamental challenges to improving ecosystem health and providing better water management.[8]

Continuation of the status quo in the Delta is not sustainable with respect to ecosystem health or water supply reliability. The state's most recent drought resulted in severe impacts to listed fish species and a precipitous decline in the delta smelt population. Concurrently, historically low contract allocations and water exports via SWP and CVP facilities caused severe water shortages to some urban and agricultural areas. The drought also triggered the first ever imposition of state-wide emergency water conservation regulations. The experience and impacts of this recent five-year drought, the second multiyear near state-wide drought in less

[6] Cloern et al. 2012
[7] The Delta Plan, Delta Stewardship Council, 2013, as amended, Chapter 3.
[8] Mount et al. 2012

than ten years, underscores the state's and the Delta's vulnerability if we simply maintain the status quo. It also illustrates the pressing need to implement solutions to achieve the coequal goals.

The current decline of aquatic resources in the Delta and the erosion of water supply reliability will continue as the state's changing climate places additional stressors on ecosystem and water management. Extended, intense droughts and more extreme floods are expected to occur more frequently in the future due to climate change.[9] Since 2007, California has experienced nine years of below average runoff and only two years out of eleven ~~where precipitation has been~~have had precipitation amounts above the long-term average. As noted above, California's recent five-year drought has reinforced our understanding of the harmful effects of sustained dry periods on ecosystem health and the correlation between Delta exports and overall State water supply reliability.[10] In stark contrast, historically high combined rainfall and snowpack in late 2016 and early 2017 has called to question the capacity of flood management systems to accommodate future precipitation extremes. Water management and ecosystem sustainability strategies must recognize these climatic trends and work to improve system resiliency.[11]

The experience of two prolonged droughts in the last ten years has also reinforced the need to implement a comprehensive strategy that increases the diversity of regional water supply portfolios, creates more sustainably managed local water sources, and achieves greater water use efficiency.[12] The benefits of water storage during an extended drought were also demonstrated, as were the detriments to water supply reliability, ecosystem health, and groundwater levels when storage is not adequate or is ineffectively managed.[13] Further, the Sustainable Groundwater Management Act (SGMA) has prioritized the need to address severe overdraft of groundwater basins in many areas of California. There is an urgent need to conjunctively manage surface water and groundwater supplies as part of a comprehensive approach to statewide water management, and support the recovery of critically overdrafted basins.[14]

Conveyance, system storage, and operations are part of a broad and integrated portfolio of actions described in the Delta Plan. They are water management tools that are inextricably linked to the management of habitat conditions given the variable nature of the state's water supplies. Deploying one tool independent of the others is ineffective. It is only through the combination of new and improved Delta conveyance, the effective management of existing and

[9] Mann et al. 2017; Das et al. 2013; Pierce et al. 2013; Berg and Hall 2015; Cook et al. 2015; Differbaugh et al. 2015; Savtchenko et al. 2015; Stewart et al. 2015; Williams et al. 2015; Jepsen et al. 2016; Udall and Overpeck 2017
[10] Hanak et al. 2015; Medellín-Azuara et al. 2015; Chang and Bonnette 2016; Lund 2016; Moyle et al. 2016
[11] Jenkins et al. 2004; Opperman et al. 2009; Cahill and Lund 2013; Kiparsky et al. 2014; Null et al. 2014; Lund 2015; Dettinger et al. 2015; Dettinger et al. 2016b
[12] Aghakouchak et al. 2014; Ayars 2013; Cahill and Lund 2013; Null et al. 2014; Bachand et al. 2016; Elias et al. 2016; Fournier et al. 2016; Hanak et al. 2017
[13] U.S. Department of Interior, Bureau of Reclamation (Reclamation) 2015
[14] Jenkins et al. 2004; Castle et al. 2014; Lund 2016; Pulido-Velazquez et al. 2016

expanded surface water and groundwater storage, and the balanced operations of both – combined with other actions and recommendations contained in the Delta Plan – that we can achieve the coequal goals.

The California Water Action Plan[15] lays out decisive actions needed to meet three broad objectives: developing more reliable water supplies, restoring important species and habitats, and providing a more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can withstand anticipated and unforeseen pressures in the coming decades. The plan further highlights the need for adaptive management in operating water facilities and in implementing conservation actions, particularly during drought. Action is required throughout California, but the Delta's central role in water management for many regions and citizens of the State makes success in Delta foundational to overall success. The comprehensive actions in the California Water Action Plan include:

- Make conservation a California way of life
- Increase regional self-reliance and integrated water management across all levels of government
- Achieve the coequal goals for the Delta
- Protect and restore important ecosystems
- Manage and prepare for dry periods
- Expand water storage capacity and improve groundwater management
- Provide safe water for all communities
- Increase flood protection
- Increase operational and regulatory efficiency
- Identify sustainable and integrated financing opportunities.

Fortunately, California has taken several steps to implement these actions, as described in the California Water Action Plan 2016 Update.[16]

AMENDING THE DELTA PLAN

To achieve the coequal goals, there is a need to change the way water is managed and water systems are operated in the Delta. Maintaining the status quo will make achieving the coequal goals impossible in the future, and poses a significant risk of continued habitat and species decline and uncertainty in water supplies exported from the Delta. The magnitude of operational changes needed to achieve the coequal goals will not be possible without new investments in

[15] California Natural Resources Agency et al., 2014; http://resources.ca.gov/california_water_action_plan/
[16] California Natural Resources Agency et al. 2016; http://resources.ca.gov/california_water_action_plan/

water infrastructure, namely improvements to water conveyance and storage facilities. Further, operational and infrastructure improvements need to progress together and in coordination with other actions identified in the Delta Plan, such as those related to restoring and enhancing the Delta ecosystem, improving water quality, achieving greater regional self-reliance and reduced reliance on the Delta, and reducing risks to people and property.

There is no single solution to water management in the state, as a whole, and in the Delta in particular.[17] Rather, a combination of near-term and long-term improvements to water conveyance, system storage, and operations are needed.[18] These improvements should seek to balance what can often be competing operational objectives (e.g., protecting threatened fish species and providing reliable water supplies) while minimizing conflicts and protecting the Delta's unique values. Further, as our knowledge of the Delta ecosystem continues to grow there remains significant uncertainty over the effectiveness of planned actions to protect, restore, and enhance the Delta. Consequently, ~~an~~ adaptive management ~~approach~~consistent with the framework outlined in the Delta Plan is critical for all actions that seek to further the coequal goals.

Conveyance improvements in the Delta are needed so that water supplies can be safely moved when they are available and conflicts between water supply deliveries and species protection can be avoided. This will allow exports to be reduced in dry periods when aquatic ecosystem needs are magnified, and promote more effective use of surface and groundwater storage to carry over supplies from wet to dry periods. Conveyance improvements outside the Delta are also needed to better leverage periods when conflicts between water exports and species protection are reduced, such that exported supplies can be managed conjunctively with local surface and groundwater supplies and storage facilities.[19]

Improved water storage in both surface reservoirs and groundwater is needed to accommodate changing hydrology throughout the Delta watershed, to better achieve the beneficial functions of more natural and variable flows, to maintain better temperature conditions in ~~major rivers and~~ the Delta and its tributaries, to allow the storage of water supplies for later use during dry periods, and to sustainably manage the state's aquifers. Moreover, improvements to conveyance and storage must be operated in an integrated manner[20] that furthers achievement of the coequal goals while protecting and enhancing the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place. Throughout the state water managers are actively pursuing opportunities to implement integrated strategies and improvements to water conveyance, system storage, and the operations of both to achieve local and regional goals.

[17] Luoma et al. 2015
[18] Hanak et al. 2017
[19] Hanak et al. 2017
[20] Null et al. 2014

At this juncture, the ~~Delta Stewardship~~ Council, based on historical information and the best currently available science, is proposing to ~~amending~~ amend the Delta Plan to promote options for water conveyance, ~~water~~ storage systems, and the operation~~s~~ of both as required by Water Code Section 85304. Many options have been discussed, proposed, and evaluated by various parties over the past decades, and many options have been implemented (see Attachment A). The ~~proposed~~ recommendations in this draft are an initial proposal for amending the Delta Plan, and ~~these recommendations~~ are based upon the *19 Principles for Water Conveyance in the Delta, Storage Systems, and for the Operation of Both to Achieve the Coequal Goals* adopted by the Delta Stewardship Council in November 2015.[21] ~~These recommendations promote options for conveyance, system storage, and the operation of both in order to contribute to the coequal goals, and describe the outcomes that those options should achieve.~~ The draft amendment describes the types and characteristics of infrastructure that would contribute to the achievement of ~~the achievement of~~ the coequal goals, and also identifies recommended criteria for project proponents to use in evaluating and developing new conveyance and storage projects. The amendment does not prescribe ~~the construction or implementation of specific projects or project proposals, nor does it describe~~ the specific size~~,~~ or location~~, or configuration~~ of ~~such~~ projects.

This amendment is proposed to be included as part of the Delta Plan that was originally adopted by the Council in May 2013. It is intended to work together with existing Delta Plan recommendations and regulatory policies that reduce risk and protect water quality, high-priority habitat areas, Delta as a Place values, and more. This draft amendment should be read in tandem with the Delta Plan, including Delta Plan requirements to reduce reliance on the Delta and increase regional self-reliance, and with the Delta Plan's guidance regarding more natural, functional flows for the ecosystem.

Many agencies, boards, districts, commissions, and other entities are engaged in managing the Delta at federal, state, regional and local levels. Consequently, the recommendations in this draft interact with the planning, implementation, and/or regulatory activities of many entities. Their roles, responsibilities, and missions vary significantly, and none bear sole responsibility for taking action to achieve the coequal goals. Some of the recommendations included in this draft amendment pertain to project proponents who are implementing projects related to conveyance, storage, and their operations, while others pertain to agencies with planning or regulatory review responsibilities. The Council appreciates that agencies with regulatory responsibilities, such as the State Water Resources Control Board and local governments, will have an important role in the review and approval of the actions recommended in this draft amendment. An important function of the Council is to foster collaboration and coordination among the many entities

[21] http://deltacouncil.ca.gov/docs/19-principles-water-conveyance-delta-storage-systems-and-operation-both-achieve-coequal-goals

engaged in projects or planning in the Delta to support decision making that will further the coequal goals.

PROBLEM STATEMENT

Californians have long adapted to the state's highly variable hydrology, characterized by sustained long-term droughts and occasional massive floods.[22] In fact, the state has the most variable annual precipitation patterns of any state within the United States.[23] The existing State and federal water systems were designed principally to address the state's geographic imbalance between abundant, seasonal water supplies north of the Delta, and emerging agricultural, municipal and industrial water demands to the south.[24] In these systems, Delta channels work in combination with water management infrastructure both inside and outside the Delta, including reservoirs, water intakes, pumping facilities, pipelines, and canals. However, much of this infrastructure is aging and vulnerable to natural hazards, and planned components of the State and federal systems were never completed.[25] Recent events have also highlighted the need to inspect and adequately maintain water infrastructure, and ensure adequate long-term funding for ongoing inspections and maintenance.

Today, demands on water infrastructure have fundamentally changed[26] as California's population and diversified economy has grown, societal values informing how we manage water and other natural resources have evolved, our climate ~~has changed~~is changing, and water needs have increased. In addition, populations of several endangered and threatened fish species have declined drastically since the construction of the State and federal water systems and other infrastructure in the Delta watershed. The declines are due to multiple factors, including: entrainment, ~~flow alteration~~changes to natural flow regimes[27] and flow direction, water exports (particularly in dry years), disconnection of rivers and streams from adjacent lands resulting from levee construction and channelization, habitat loss and alteration, urbanization, a warming climate, food availability, predation, and invasive species.[28] Among these many factors, CVP and SWP diversions represent one of the most directly observable sources of fish mortality.[29] Consequently, our water management systems are now called upon to meet

[22] Dettinger and Ingram 2013; Dettinger 2016a
[23] Dettinger et al. 2011
[24] Barnes and Chung 1986; Reclamation 2008
[25] Lund et al. 2007
[26] Lund 2016
[27] Flow regime refers to the regulation of ecological processes in river ecosystems, including the magnitude, frequency, duration, timing, and rate of change of hydrologic conditions (see Glossary, Delta Plan, Delta Stewardship Council, 2013, as amended). In the Delta, seasonal and diurnal flow patterns (flow hydrograph) have been altered by upstream water diversions and reservoir operations, Delta water exports (especially during dry periods), and physical changes to the Delta (channelization, sedimentation, and land use changes). Changes to flow regime have directly affected habitat conditions – including habitat diversity, quality, and extent – and proven harmful to native species. Sources: Bunn and Arthington (2002), Petts (2009), SWRCB (2010).
[28] Healey et al. 2016; Mount et al. 2012
[29] Grimaldo et al. 2009

ecosystem needs not envisioned when they were originally built in an increasingly complex regulatory environment.[30]

This conflict came to a crisis point in 2007 when a federal court significantly curtailed water deliveries south of the delta to protect delta smelt. This launched a seven-year process in the federal courts examining the balance between fish protection requirements under the Endangered Species Act and water operations. Differing federal court orders ensued, some of which protected native fish and restricted water exports, while others recognized urban and agricultural water needs and ordered increased water exports. This period of litigation and court ordered operations of the water projects highlighted the difficulty in resolving this conflict under the status quo system of water conveyance. Reviews by federal and state wildlife agencies have shown that maintaining the status quo conditions will likely result in further deterioration of threatened and endangered fish populations, which will necessitate additional restrictions on water supply exports.[31] If not addressed, this trend may be irreversible and make the achievement of the coequal goals infeasible.

Delta Water Quality and Ecosystem Decline

Human activities and their associated effects on land and water management over the last century and a half have irrevocably changed California's aquatic ecosystems. This is profoundly evident in the Delta, where natural flow patterns have been altered and water has been confined to canalized channels where shallow wetlands once existed.[32] Under the existing configuration for water export, which features single, adjacent points of diversion in the south Delta for both the SWP and CVP, operations result in direct fish losses at the pumps, change the way water and fish move through the Delta, create harmful reverse flow conditions, and place fish at greater risk of predation.[33] These effects have been compounded by the influx of invasive non-native species and changes to habitat quality and quantity upstream from the Delta. The result has been a dramatic decline in native species, including some aquatic species now on the brink of extinction. Despite recent restoration efforts and investments, aquatic species continue to decline.[34] These species also remain highly vulnerable to changing hydrologic conditions such as warmer water temperatures, longer water residence time, increased water clarity, and reduced flow. Further, significant uncertainty exists regarding the effects of projected climate on the hydrology of the Delta watershed and its ecological health.

Water temperatures have warmed and water quality in the Delta has changed over time, as was particularly evident during California's recent drought. Water quality degradation affects not only the Delta ecosystem, but also the ability of waterways to support sustainable agriculture,

[30] Reclamation 1992
[31] National Marine Fisheries Service (NMFS) 2009; NMFS 2014; U.S, Fish and Wildlife Service 2009
[32] Whipple et al. 2012
[33] NMFS 2014; Castillo et al. 2012; Gingras 1997
[34] Moyle et al. 2010, NMFS 2014

recreation, and other quality of life amenities for residents and local communities. Water dedicated to the environment, including storage reserved for water temperature and flow management in the Delta and its tributaries, will become increasingly important over the coming century.[35]

Conflicting Operational Priorities

A fundamental conflict exists today between water operations for ecosystem management (temperature and flow), water quality (both in-Delta and for water exported from the Delta), and water supply reliability. This conflict is magnified during critically dry periods and periods of lower flow when the ecosystem is under increased stress and water suppliers are most vulnerable to shortages. Conflicts in the use and timing of water movement through the Delta for multiple purposes could be more easily addressed by improved water conveyance and storage infrastructure with greater capacity and operational flexibility, combined with investments in regional self-reliance as cited throughout the Delta Plan. This includes increased capacity to safely convey water through the Delta during wetter periods such that exports can be curtailed when fish are at risk, and expanded water storage capacity throughout the state to manage Delta flows and water temperature, and carry over water supplies from wet periods for use in dry periods. Additional storage and conveyance capacity would provide the flexibility needed to adapt to dynamic future conditions and our revolving understanding of ecosystem needs.

An example of this conflict relates to degraded water quality in the Delta during periods of lower flow, which impacts the treatability of water for municipal and industrial uses and creates public health concerns that often must be addressed through higher-cost water treatment processes. Water quality for exports can be improved by moving diversion locations, but doing so also has the potential to degrade water quality for in-Delta uses. These impacts must be carefully monitored and mitigated. Improving, monitoring, and adaptively managing the operation of water systems in the Delta would augment our capacity to balance these priorities and further achievement of the coequal goals.

Changing Conditions

Conflicting priorities in water and ecosystem management will be intensified by climate change, which will alter the magnitude, timing, duration, frequency, and rate of change of stream flows in the Delta watershed.[36] Climate change will result in higher ambient temperatures, reduced Sierra Nevada snowpack, more precipitation falling as rain rather than snow, snow melting earlier and more rapidly, warmer stream temperatures, and higher amounts of water loss

[35] Hanak et al. 2012
[36] Anderson et al. 2008; Huang et al. 2012; Berghuijs et al. 2014; Goulden and Bales 2014; Van Lienden et al. 2014; Savtchenko et al. 2015; Jepsen et al. 2016; Udall and Overpeck 2017

through evapotranspiration.[37] Climate change is also expected to trend toward more frequent and extended periods of drought as well as more frequent and intense floods.[38]

Climate change will also contribute to rising sea levels along California's coast and within its estuaries.[39] Rising sea levels will place additional burdens on the water management system in the Delta in the years to come.[40] Through-Delta conveyance is very likely to experience salinity increases with sea level rise, which will ultimately rise above appropriate concentrations for drinking water and irrigation in some areas of the western Delta if freshwater outflows are not increased.[41] It is projected that salinity at Jersey Point could increase by 23% in the early 21st century (2012-2040) and 88% by the end of the century, assuming an estimated mean sea level rise of 36 inches (92 centimeters (cm)).[42] For the SWP and CVP, a projected 11.8 inches (30 cm) rise in sea level by the mid-21st century would raise salinity enough to reduce by 10% the amount of time that the projects can operate.[43] Reservoir releases to repel salinity are expected to reduce Delta water exports by ~about 10% by 2050 and by about 25% by 2100.[44] In other words, a 1-foot ~~SLR~~ (30 cm) rise in sea level would require almost 500,000 ~~AF~~ acre-feet of additional Delta outflow to meet current Delta salinity requirements.[37] With sea level rise and increasing temperatures, new and expanded water storage will play a critical role in providing adequate flows in the Delta to manage water ~~temperature~~ flow and water quality (salinity) for all uses.

In addition, California's population is expected to increase from about 39 million in 2016 to more than 44 million by 2030.[45] Population growth and increased economic activity, in combination with land-use changes, economically-driven grower choices that favor permanent crops, and demand hardening from advances in conservation and water use efficiency, will alter water demand patterns.[46] Continued progress in urban conservation is likely to substantially offset demand increases due to population growth, and agricultural water demand is expected to decrease over time. Environmental water demands, however, are expected to increase in the coming years.[47] All of these factors will place stress on the existing system of conveyance and storage in the State. This creates a much more difficult situation in which to maintain a healthy Delta ecosystem while providing reliable water supplies.

[37] Anderson et al. 2008; Huang et al. 2012; Berghuijs et al. 2014; Goulden and Bales 2014; Van Lienden et al. 2014; Savtchenko et al. 2015; Jepsen et al. 2016; Udall and Overpeck 2017; Ficklin et al. 2013
[38] Das et al. 2013; Pierce and Cayan 2013; Pierce et al. 2013; Seager et al. 2013; Berg and Hall 2015; Cook et al. 2015; Differbaugh et al. 2015; Stewart et al. 2015; Walton et al. 2017
[39] Griggs et al. 2017
[40] Cayan et al. 2008; National Research Council 2012; Van Lienden et al. 2014
[41] Fleenor and Bombardelli 2013
[42] Van Lienden et al. 2014
[43] Anderson et al. 2008
[44] Dettinger. 2016a
[45] California Department of Finance 2016
[46] Kiparsky et al. 2014; Bauer et al. 2015; Dettinger et al. 2015; Wilson et al. 2016
[47] Hanak et al. 2012

Sustainable Groundwater Management

Many areas of the state rely on groundwater for all or a portion of their water supplies.[48] As demonstrated during California's recent drought, heavy reliance on groundwater can lead to groundwater overdraft, subsidence due to falling groundwater levels, and loss of access to groundwater in some communities. Extraction of groundwater in the Central Valley region, in particular, has reduced both the groundwater level and underground storage capacity due to subsidence.[49] Groundwater pumping in the Central Valley during the drought was estimated to be about five million acre-feet ~~(MAF)~~ in 2014 and about six million acre-feet ~~MAF~~ in 2015.[50]

~~Further, many communities rely on impaired or contaminated groundwater for their water supplies.~~ Disadvantaged communities are disproportionately affected by water resource challenges related to groundwater, as many small and rural communities rely on groundwater for all or a large portion of their supplies.[51] Further, many small and rural communities rely on impaired or contaminated groundwater for their water supplies, and struggle with the cost of providing safe drinking water. During the recent 2012 to 2016 drought, about two-thirds of drought-impacted public water systems and household water outages were in disadvantaged communities, and nearly one-third of drought-impacted systems served cumulatively burdened communities. These impacted communities are concentrated outside the Delta, in the San Joaquin Valley, the North Coast, and the Central Coast.[52] Similar geographic trends were also reported for drought-impacted household water systems (systems with fewer than 15 household connections, including individual household wells or water supplies).[53] Conjunctive management of surface and groundwater supplies, including passive and active groundwater recharge and in-lieu recharge[54], is an important tool for sustainable groundwater management.[55] Improvements to conveyance, system storage, and the operations of both can support conjunctive management and contribute to sustainable groundwater management in many areas of the state, especially disadvantaged communities, and help assure the right to safe, clean, affordable and accessible water for human consumption and domestic use.

Reduced Reliance on the Delta

Many regions of the state rely on the Delta, to varying degrees, to meet their water supply needs. Reducing reliance on the Delta for water supply is essential to providing more flexibility

[48] State Water Resources Control Board (SWRCB) 2015
[49] Famiglietti et al. 2011; Weiler 2014
[50] Howitt et al. 2015
[51] SWRCB 2013
[52] Disadvantaged communities have a median household income of less than 80 percent of the State median. Cumulatively Burdened Communities are those that rank in the top quarter of census tracts in the State for environmental burdens and socioeconomic vulnerability. Source: Feinstein et al. 2017. An interactive map of disadvantaged communities within California can be found at https://gis.water.ca.gov/app/dacs/.
[53] https://mydrywatersupply.water.ca.gov/report/publicpage
[54] In-lieu recharge is the process of temporarily decreasing the amount of groundwater pumped from an aquifer in combination with a proportional increase in surface water deliveries. Decreased groundwater pumping typically occurs in wet years, allowing the aquifer to naturally recharge and be available for use during dry years.
[55] Fournier et al. 2016

in both meeting water supply reliability goals and protecting the ecosystem, especially in times of lower flow when there is maximum stress on both goals. Reducing reliance on the Delta is State policy, along with an associated mandate for improving regional self-reliance (Water Code section 85021), and reducing reliance is a prominent component of the Delta Plan (reflected in regulatory policy WR P1, Appendix G, and performance measures). Many agencies have made significant investments in developing their local and regional supplies, including groundwater banking, on- and off-stream surface water storage, recycled water, and desalinated supplies, while also achieving significant decreases in imported water demand through conservation and water use efficiency efforts. Reduced reliance on the Delta can be achieved through diversification of water supply portfolios at the regional and local levels, which will provide greater overall supply reliability during periods when water exports from the Delta are reduced.

Not all areas of the state have the same opportunities and resources to uniformly reduce reliance on Delta exports. Inland agricultural regions may not produce enough wastewater to replace agricultural irrigation with recycled water, although opportunities to use recycled water for groundwater recharge may be available. Other areas may be challenged by limited ability to dispose of brine, a byproduct of brackish and recycled water desalination, or geology and geography may limit the ability to store significant amounts of water during wetter periods. The cost effectiveness of any local supply strategy is of major importance and a valid criterion for any decision to implement a new local supply, as is avoiding or mitigating significant environmental impacts in the local area. Although new supply development opportunities may vary throughout the State, all regions reliant on Delta exports can reduce their reliance by increased water efficiency and aggressive water conservation.

New and improved conveyance, system storage, and the operations of both can complement water conservation and local supply development activities by providing a more stable and reliable source of supply. Combined with existing Delta Plan regulatory policies and recommendations for reduced reliance, conveyance and storage can provide the flexibility local water managers need to sustainably manage their local supplies and reduce reliance on the Delta, especially during dry periods when the ecosystem is most vulnerable, water quality is degraded, and exports are limited.

Need for New and Improved Conveyance, Water Storage, and the Operations of Both

New and improved conveyance, water storage, and the operations of both—alongside other actions and policies identified in the Delta Plan—are integral to managing the Delta and achieving the coequal goals. They are part of an integrated approach that uses all available water management tools to provide operational flexibility, while striving to achieve a balance among Delta uses recognized by the State. The risk of taking no action is unacceptably high and will lead to additional, irreparable damage to the ecosystem and insufficient water supplies to support a healthy State economy.[56] Maintaining the status quo will make achieving the

[56] Hanak et al. 2017

coequal goals impossible in the future. To address the challenges and to meet the coequal goals, water managers operating California's water supply systems need to integrate their operation to take advantage of regional supply sources and leverage the use of new and existing facilities for conveyance, system storage, and the optimal operations of both.[57]

New and Improved Water Conveyance

The current system of natural and engineered conveyance infrastructure in the Delta lacks sufficient capacity and flexibility to manage water operations to benefit the ecosystem and enhance water supply reliability. System capacity and operational flexibility are needed to create more natural, variable flows and improve temperature conditions to support ecosystem health, maintain water quality for in-Delta uses, and move more water during wetter periods when supplies are available for both environmental and consumptive uses such that we can export less water from the Delta in dryer periods when native fish are more vulnerable.

Current water conveyance infrastructure is also aging and Delta channels are vulnerable to earthquakes, floods, and other hazards. Failure of this infrastructure poses significant risks for environmental harm and water supply disruption.[58] Climate change also is altering precipitation patterns in the Delta watershed and changing the timing and amount of stream flow, affecting water available for both ecosystem management and supply reliability. Sea level rise will increase salinity intrusion into the Delta, degrade water quality for agricultural and municipal uses in and outside the Delta, and alter ecosystem conditions.[59]

For well over 50 years, State, local, and federal entities have worked to identify long-term solutions to protect the beneficial uses of the Delta, including new and improved water conveyance in the Delta. Conveyance options considered over time have taken many different routes, forms, sizes, and configurations.[60] They have included isolated conveyance (moving water across or around the Delta via tunnels, pipelines, and aqueducts); improvements to existing Delta channels and new Delta channels; and combinations of both isolated conveyance and through-Delta channels (also known as dual conveyance). Numerous operational scenarios have also been considered and evaluated that incorporate a range of upstream and in-Delta flow objectives, changed reservoir operations, changes to the timing of water conveyance and exports (seasonally and by year type), and many other regimes. A great body of work exists describing the potential positive and negative effects, risks, and uncertainties associated with different Delta conveyance options:

- If managed for conservation objectives, an isolated conveyance facility (one that moves water over, under, or around the Delta via artificial means) could facilitate more variable

[57] Lund 2016; Gray et al. 2015; Lund et al. 2014; Null 2016
[58] Working Group on California Earthquake Probabilities 2003; Mount and Twiss 2005; Sneed et al. 2013; Farr et al. 2015; Robinson and Vahedifard 2016; Vahedifard et al. 2016
[59] Anderson et al. 2008; Fleenor and Bombardelli 2013; Van Lienden et al. 2014
[60] California Department of Water Resources (DWR) et al. 2016

flow patterns, operating in a way that more closely mimics the natural flows that existed before the CVP and SWP export facilities were constructed and reducing entrainment—two actions scientists consider quite promising.[61] Construction of screened diversion and intake facilities in multiple locations in the Delta would also reduce reliance on the State and federal export facilities in the south Delta. Operation of the existing CVP and SWP export facilities draws water toward the south Delta, which can reverse the natural direction of flow in Old River, Middle River, and other Delta channels. These flow reversals disorient and reposition vulnerable fish populations, resulting in fish losses from entrainment, predation, and capture and release practices. Access to one or more intakes in the northern Delta ~~This~~ would provide operational flexibility to reduce south Delta exports and limit harmful reverse flow conditions, particularly ~~and reduce fish entrainment and associated fish mortality~~ during periods of lower flow, while at the same time managing water quality. Needed improvements to Delta hydrodynamic conditions and aquatic habitat will be more difficult without some suitably operated form of isolated water conveyance.[62]

- Improvements to through-Delta conveyance alone are insufficient to provide effective protection for native fish, and to mitigate current water operation conflicts with listed species that result in export curtailments. Operational history and scientific studies indicate that exclusive dependence on south Delta pumping facilities will continue to cause reverse flow conditions in Old and Middle rivers, drawing salmon and smelt into the interior channels of the Delta where they are vulnerable to predation and entrainment. Further, anticipated changes associated with sea-level rise, land subsidence, invasive species, climate change, and earthquakes will make it impossible to preserve the Delta in its current state.[63] Significant cost is associated with maintaining existing through-Delta conveyance and export operations. In addition to costs associated with improving levees and channels, increased salinity will impose higher water treatment cots on Delta water users on the order of hundreds of millions of dollars per year. The cost of a large-scale levee failure from an earthquake, though difficult to estimate, would also be very high - both in terms of repair and restoration of affected levees and in terms of habitat loss and environmental harm.[64] Although physical improvements to through-Delta conveyance can complement isolated conveyance by providing additional fish protection measures, sole reliance on improved through-Delta conveyance is unlikely to result in achievement of the coequal goals.

- Even with the construction of some form of new isolated conveyance, through-Delta conveyance will remain an important component of the State's water supply system. The implementation of isolated conveyance without consideration of flow needs within

[61] Hanak et al. 2013; Moyle and Bennett 2008; Fleenor et al. 2010
[62] Lund et al. 2008; Hanak et al. 2011; Moyle et al. 2012
[63] Moyle et al. 2012
[64] Lund et al. 2008

existing Delta channels and waterways has the potential for detrimental effects on water quality and associated resources (such as aquatic habitat and species, recreation, and in-Delta water uses). Depending on the location of new intakes, dual conveyance may decrease the salinity of exported water but additional flow releases from upstream reservoirs may be required to meet in-Delta salinity standards. Analyses of different options for dual conveyance indicate that some in-Delta agricultural water users may encounter more frequent periods of high salinity while others may experience the opposite.[65] With sea level rise, crop revenue losses in the Delta are estimated to be similar (less than 0.5%) with either through-Delta conveyance or dual conveyance of Delta exports.[66] To provide flexibility to adapt to changing conditions, conveyance solutions (both through-Delta and isolated conveyance) should be integrated and operated in tandem with ~~through-Delta conveyance and~~ enhanced water storage in the Delta watershed to optimally achieve the coequal goals while protecting and enhancing the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

- California's hydrology is highly variable, requiring flexibility in water management operations to adjust to changing conditions. Adaptive management of new conveyance infrastructure in the Delta and its watershed can provide a framework for adjusting operations to changing conditions and our evolving understanding of ecosystem needs.[67] Adaptive management is a central component of the Delta Plan, and a requirement for covered actions under the plan's regulatory policy G P1.

- Large infrastructure projects ultimately have effects on the local environment and communities where the facilities are located. Above-ground isolated conveyance, in either a canal or above-ground pipeline, would permanently impact the landscape of the Delta—including native habitat, agriculture, transportation, recreation, and local communities. In comparison, below-ground conveyance reduces these impacts over the long-term.[68] However, below-ground conveyance – depending on its location, size, design, and associated physical details – still has the potential for impacts to Delta communities during construction, which would span years. Several existing Delta Plan policies (which are regulatory) and recommendations (which are not regulatory) promote protection of Delta communities, land uses, and restoration opportunity areas that may be affected by new infrastructure.

[65] Fleenor and Bombardelli 2013
[66] Medellín-Azuara et al. 2014
[67] Georgakakos et al. 2012
[68] DWR et al. 2016

- ~~For example,~~ Delta Plan regulatory policy DP P2 requires water management infrastructure be sited to avoid or reduce conflicts with existing land uses and those uses described in general plans.

- Delta Plan recommendation DP R5 addresses the need to plan for the provision of adequate infrastructure, including streets and roads. A large-scale infrastructure project – taking place in multiple locations, on land and on waterways, over a decade or more – will impact existing and future planned infrastructure. Plans should be made to accommodate the goals of transportation planning in the affected area, as well as to mitigate those impacts.

- Delta Plan recommendation DP R14 is aimed at enhancing nature-based recreation within the Delta, and recommendation DP 17 promotes enhancing opportunities for visitor-serving businesses. Construction of new conveyance and future maintenance activities can negatively affect visitor-serving recreation and businesses, and thoughtful and collaborative planning is needed to minimize these impacts such that the intent of these recommendations can be achieved, even during an extended construction period.

- ~~Further,~~ Delta Plan regulatory policy G P1 requires covered actions not exempt from CEQA to include applicable feasible mitigation measures identified in the Delta Plan's Program Environmental Impact Report, including those related to impacts to Delta communities.

Advice from the Delta Protection Commission, ~~and~~ affected local communities and local governments, and agencies responsible for protecting and restoring the Delta environment must be considered in selecting conveyance alternatives and mitigation measures. ~~Further, Delta Plan regulatory policy G P1 requires covered actions not exempt from CEQA to include applicable feasible mitigation measures identified in the Delta Plan's Program Environmental Impact Report, including those related to impacts to Delta communities.~~ Minimizing impacts during construction to the normal, daily course of business in the affected communities and minimizing disruptions during normal operations and maintenance activities should be a priority for facility planners. A phased construction schedule, developed in coordination with local governments and communities in the Delta, could help minimize disruptions from large-scale infrastructure construction activities. Mitigation measures appropriate to the physical scale of new conveyance facilities, the length of the construction period, and anticipated maintenance needs should be planned in collaboration with the affected communities to minimize disruptions to residents and businesses. Further, collaboration, communication, and public engagement should continue throughout design, construction and, ultimately, operation and maintenance of new facilities.

- There is a need to address impacts to terrestrial and aquatic species from new infrastructure development in the Delta. Delta Plan regulatory policy ER P3 requires avoidance of or mitigation for significant adverse impacts to high priority habitat restoration areas, including designing projects such that they will not preclude or interfere with future habitat restoration projects in these areas. Habitat mitigation projects should be implemented in advance of construction activities, such that replacement habitat is establish and functioning prior to the start of construction. Furthermore, project proponents should design new or improved Delta conveyance infrastructure ~~should consider and seek~~ to enhance ecosystem restoration opportunities, flood risk reduction, recreation, and quality of life for Delta communities. New flow patterns linked with habitat restoration areas can create opportunities to re-establish important ecological processes associated with interactions between land and water that more closely resemble~~s~~ historical conditions within the Delta.[69] Conveyance infrastructure can and should be designed to enhance the connectivity of surrounding riparian and floodplain habitats, as well as in-Delta habitats, to better support native ecosystems.[70]

- It will take many years to implement large-scale improvements to conveyance infrastructure in the Delta and, even with the construction of such facilities, the CVP and SWP pumping facilities in the south Delta ~~are likely to~~will continue to operate ~~well into the future~~. Various studies have examined the feasibility of installing fish screens at Clifton Court Forebay or the entrance channels to the CVP and SWP pumping facilities. Most fish screens rely on sweeping flows moving past (parallel to) the screen to prevent impingement and entrainment; additionally, the terminal location and large pumping capacity of the CVP and SWP export facilities make it difficult to design a facility with sufficient sweeping flows to safely screen delta smelt and salmon. Further, fish screens would not address the effect that pumping operations have in reversing flows in some Delta channels and drawing fish toward the south Delta, where they would remain subject to predation and other harmful conditions. Given this, there is a need to identify and implement near-term actions to protect native fish and reduce fish losses associated with existing water export facilities, particularly in the south Delta.[71] This includes evaluating structural changes to the export facilities, improving salvage and release operations, and identifying, monitoring, and adaptively managing actions to address predation.[72]

Based on the findings and considerations identified above, new conveyance in the Delta should:

[69] Whipple et al. 2012
[70] Opperman et al. 2009; Hanak et al. 2013; DiFrancesco and Tullos 2014, 2015
[71] California Natural Resources Agency 2016
[72] Grossman 2016; NMFS 2014; Gingras 1997

- Be a combination of new isolated conveyance and improved through-Delta conveyance facilities (dual conveyance) with access to multiple points of diversion, including one or more screened diversions in the north Delta;

- Be resilient to current and future hazards;

- Be adaptively managed and operated to adjust to changing conditions and scientific understanding, providing flexibility in operations to help achieve the coequal goals today and into the future;

- Be designed to avoid or minimize adverse effects while preserving and enhancing opportunities for ecosystem restoration, recreation, sustainable agriculture, and resilient local economies and communities;

- Be constructed and operated to minimize disruptions to the normal, daily course of business in affected communities, including minimizing disruptions during routine operations and maintenance; this includes ~~developing~~ implementing formal, collaborative processes with local governmental representatives to develop detailed construction implementation plans and policies that are responsive to the needs of affected communities, their economic activities, and quality of life during construction and beyond; and

- Be paired with near-term actions to address native fish losses at Delta export facilities.

New and Expanded Water Storage

Improvements to conveyance alone are not sufficient to eliminate conflicts between water exports and species protection, or to optimize water system operations. Those conflicts are at their height during hydrologic extremes, such as droughts and floods. Water storage is an effective water management tool available to even out the variability of the state's hydrology across time and space, and to optimize the benefits of improved conveyance for both the environment and water supply reliability. For this reason, improvements to conveyance must be considered along with increased water storage to ensure that flow, temperature, and water quality needs can be managed in the Delta, now and into the future.

The state's interconnected network of surface water and groundwater storage lacks the capacity and conveyance flexibility to manage ecosystem, water reliability, and public safety needs under the state's highly variable climate. New and expanded surface water reservoirs, improved groundwater storage, and the conjunctive management of both are critical to provide reliable water supplies for all uses, including flow and temperature management to benefit the Delta ecosystem in the face of increasingly intense drought and a changing climate.[73] With climate

[73] Reclamation 2016; Ho et al. 2017

change, reservoirs in the Delta watershed will need to adjust their operations to accommodate warmer and more intense winter storms, more precipitation occurring as rainfall, and earlier spring snowmelt.[74] These changes will make it increasingly difficult to meet water temperature and flow objectives for native fish and water supply reliability for municipal, industrial, and agricultural uses. With current facilities and management practices, shifts in precipitation and runoff will directly affect deliveries and reservoir storage levels for the SWP and CVP. Lower carryover storage is projected for both the SWP and CVP, presenting risks for water supply reliability, hydropower production, and cold water pool storage for fish protection. The warmer climate and significant shift in seasonal runoff will result in consistently lower water delivery capability.[75] Further, warmer and more intense winter storms will require adjustments to reservoir operations to provide adequate space for floods and protect public safety, which may come at the risk of environmental and water supply needs if reservoirs cannot be refilled later in the season. Without new or expanded storage, current conflicts between the use of water for ecosystem management (flow and temperature), water quality (for in-Delta use and exporters), and supply reliability will only intensify.

New or expanded surface water and groundwater storage across the state can contribute in different ways to achieving the coequal goals. Improved water storage in the Delta watershed – both seasonal and permanent – can help manage flow and water quality conditions to support a healthier Delta ecosystem, while maintaining water quality for agricultural and municipal users, recreation, and fisheries. Native fish species may benefit from improved water storage in the Delta watershed, including storage space dedicated to ecosystem benefits such as flow management, water temperature management, other water quality benefits, or providing water supplies to wildlife refuges. However, it is recognized that opportunities for increased surface water storage may be limited by water availability and that onstream reservoirs may be limited by potential ecological impacts.

More water storage – within the Delta watershed, and within the Delta water export area – is also needed to allow water to be moved through the Delta when there are sufficient flows to support ecosystem needs and water can be more safely exported. These water supplies can be used for storage and later delivery when exports must be reduced to protect water quality and native fish. The value of new and/or expanded storage infrastructure should be assessed along with its connectivity to other surface storage, conveyance systems, and groundwater systems to maximize water supply and ecosystem benefits. Given the State's variable hydrology, the ability to operate conveyance in the Delta in a "big gulp, little sip" manner that balances ecosystem and water supply reliability needs is dependent on the availability of water stored in reservoirs and aquifers.

[74] Anderson et al. 2008; Huang et al. 2012; Berghuijs et al. 2014; Goulden and Bales 2014; Van Lienden et al. 2014; Savtchenko et al. 2015; Jepsen et al. 2016; Udall and Overpeck 2017
[75] Anderson et al 2008

Improved Operations of Storage and Conveyance

The operation of water management projects in and tributary to the Delta are subject to laws and regulations administered and enforced by a variety of agencies, including water flow and quality standards as defined by the State Water Resources Control Board. These laws and regulations effect the operation of upstream reservoirs to meet flow and quality standards, and govern the timing and volume of water that may be conveyed through and exported from the Delta. Water operations are also subject to the conditions associated with individual water rights. ~~The~~ Within this regulatory environment, a complex system of State, federal, and local water management infrastructure in the Delta and its watershed is operated to meet diverse and increasingly competing needs.[76]

Many of the state's conveyance and storage systems are inextricably linked by the Delta and surrounding environments, and conveyance and storage must be operated in an integrated manner to realize their full and combined potential. This includes operations to take better advantage of periods of ample supply such that less water is exported during critical dry periods. Operational flexibility is particularly important when considering climate change and uncertainties associated with future water demands.[77] Further, sustained drought conditions are expected to intensify in the future, putting additional stress on the operation of Delta conveyance and water storage infrastructure to meet both ecosystem and water supply needs.

Given these challenges and uncertainties, adaptive management is critical to successfully operating water management facilities in the Delta to achieve the coequal goals, as described in the Delta Plan. The operation of water storage facilities and Delta conveyance systems must be adaptively managed to address specific and measurable operating objectives for ecosystem and water quality requirements, changing climate conditions, and changing water demands.[78] Systems in the Delta must be operated to reduce hydrodynamic and biological impacts of exporting water through Jones and Banks pumping plants and minimize the frequency, magnitude, and duration of reverse flows in Old River and Middle River in order to reduce the likelihood that fish will be diverted from the San Joaquin or Sacramento rivers into the southern or central Delta.[79] Studies suggest that SWP and CVP water diversion impacts on fish can be mitigated by altering the timing of exports, and that fish losses can by minimizing reverse flows during periods when delta smelt and other fish are migrating into the Delta.[80] Conveyance operations must be coordinated with storage operations to provide adequate flows in the Delta to meet the needs of fish and other native species. Integrated or coordinated operation of conveyance and storage, within and outside of the Delta, can also contribute to sustainable

[76] Lund 2016
[77] Georgakakos et al. 2012
[78] Georgakakos et al. 2012; Null et al. 2014; Kistenmacher and Georgakakos 2015; Null and Prudencio 2016; Rheinheimer et al. 2016
[79] NMFS 2016, NMFS 2009
[80] Grimaldo et al. 2009

management of the State's aquifers, promote conjunctive use, leverage local supplies, and reduce reliance on the Delta during dry periods and droughts.

By taking into account effects on the Delta, conveyance outside of the Delta can be operated to complement Delta conveyance and expanded storage. Local conveyance improvements and sustainable water management actions taken outside the Delta can contribute to the coequal goals through a comprehensive, integrated water management approach that considers multiple water supply sources, including but not limited to surface water storage, groundwater, stream flow, imported water, water transfers, stormwater, desalinated water, and recycled water, as applicable.[81]

CONCLUSION

With regard to new and improved infrastructure—relating to water conveyance in the Delta, water storage systems, and the operation of both to achieve the coequal goals—the Delta Plan promotes the design, implementation, and operation of new and improved water conveyance infrastructure and new or expanded water storage that are consistent with the criteria in Sections I, II, and III, below. All promoted options should be managed so Delta water supplies further the coequal goals and incorporate the best currently available science and adaptive management. Performance measures relevant to Delta Plan amendments for conveyance, system storage, and the operation of both are included in Attachment B.

These provisions are recommendations; they are not regulations.

They are intended to provide guidance to agencies implementing projects but do not ~~control~~ apply to a project's consistency with the Delta Plan under Water Code section 85225, or any appeal to the Council of a certification under Water Code sections 85225.5 et seq.

I. NEW AND IMPROVED WATER CONVEYANCE

A. Promote Options for New and Improved Infrastructure Related to Water Conveyance

Subject to completion of environmental review and approval by the lead agency, and applicable regulatory approvals from other public agencies, the following infrastructure options are hereby promoted.

1. The California Department of Water Resources (DWR) and the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) should pursue a dual-conveyance option for the Delta. Dual conveyance is a combination of through-Delta conveyance and isolated conveyance to allow operational flexibility. Dual conveyance alternatives should be

[81] Howitt et al. 2010; Hanak et al. 2012; Howitt et al. 2015

evaluated, and a selected plan designed and implemented, consistent with Section I.B., below. Dual conveyance should incorporate ~~multiple~~ existing and new intakes and facility improvements for both isolated, below-ground conveyance and through-Delta conveyance of State Water Project (SWP) and Central Valley Project (CVP) water supplies from the Sacramento River to the south Delta, as follows:

(a) The isolated conveyance should incorporate one or more new screened intakes that protect native fish and that are operated to minimize harmful reverse flow conditions in Old and Middle rivers while maintaining water quality for in-Delta uses. Isolated conveyance should complement existing and improved through-Delta conveyance to promote operational flexibility, protect water quality, and support ecosystem restoration.

(b) ~~Operational criteria for new and improved conveyance facilities should be consistent with updated State Water Resources Control Board flow criteria adopted pursuant to Water Code 85086(c)(2).~~ To protect the Delta ecosystem, the State Water Resources Control Board should ensure that operational criteria for new and improved conveyance facilities comply with applicable State Water Resources Control Board requirements, including any flow criteria adopted pursuant to Water Code 85086(c)(2).[82]

(c) Dual conveyance requires continued maintenance and further improvement of through-Delta conveyance. Through-Delta conveyance improvements may include channel improvements consistent with the Delta Plan and additional facilities that could provide for improved operations for native fish protection.

2. DWR and local agencies should pursue new intake and conveyance facilities for conveying SWP supplies from the Sacramento River to SWP contractors in Solano and Napa Counties. This is both to protect native fish and improve the quality and reliability of water supplies delivered via the North Bay Aqueduct.

3. Local agencies, in coordination with DWR and Reclamation, should pursue new conveyance facilities or conveyance facility improvements that allow use of multiple Delta intakes associated with the Los Vaqueros Project. This would increase operational flexibility for local, SWP, and

[82] Water Code section 85086(c)(2) provides, "Any order approving a change in the point of diversion of the State Water Project or the federal Central Valley Project from the southern Delta to a point on the Sacramento River shall include appropriate Delta flow criteria and shall be informed by the analysis conducted pursuant to this section. The flow criteria shall be subject to modification over time based on a science-based adaptive management program that integrates scientific and monitoring results, including the contribution of habitat and other conservation measures, into ongoing Delta water management."

CVP municipal and environmental water supplies conveyed from the south Delta.

4. DWR and Reclamation, in coordination with the California Department of Fish and Wildlife, National Marine Fisheries Service and U.S. Fish and Wildlife Service, should evaluate and identify for near-term implementation feasible actions to contribute to reducing fish losses associated with existing pumping operations at the Banks Pumping Plant and Jones Pumping Plant, consistent with the 2009 *Biological Opinion and Conference Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan;* the 2009 *Biological Opinion on the Coordinated Operations of the Central Valley Project and State Water Project in California;* and the 2014 *Recovery Plan for Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead*. These actions may include, but are not limited to:

   (a) Implementing changes to the operations and physical infrastructure of the facilities where such changes can improve fish screening and salvage operations and reduce mortality from entrainment and salvage.

   (b) Evaluating and implementing effective predator control actions, such as fishery management or directed removal programs, for minimizing predation on juvenile salmon and steelhead in Clifton Court Forebay and in the primary channel at the Tracy Fish Collection Facility.

   (c) Evaluating and implementing effective predation reduction actions associated with salvage operations, such as transporting and releasing fish in multiple locations in the Delta.

   (d) Installing equipment to monitor for the presence of predators and to monitor flows at the fish collection facilities.

   (e) Modifying Delta Cross Channel gate operations and evaluating methods to control access to Georgiana Slough and other migration routes into the interior Delta to reduce diversion of listed juvenile fish from the Sacramento River and the San Joaquin River into the southern or central Delta.

B. Evaluate, Design, and Implement New or Improved Conveyance or Diversion Facilities in the Delta

1. In selecting new and improved Delta infrastructure for conveying SWP and CVP water supplies from the Sacramento River to the south Delta, project proponents ~~should be based on an evaluation of~~should analyze

and evaluate a range of alternatives that includes all of the following ~~analyses~~:

(a) A reasonable range of flow criteria, rates of diversion, and other operational criteria required to satisfy applicable requirements of State ~~or~~ and federal ~~fishery~~ fisheries agencies~~,~~ and the State Water Resources Control Board, and other operational requirements and flows necessary for protecting, restoring, and enhancing the Delta ecosystem under a reasonable range of hydrologic conditions (as described under Section III.B, below). This includes identifying water available for export and other beneficial uses, consistent with water quality requirements of the State Water Resources Control Board.

(b) A reasonable range of dual-conveyance alternatives, including options for the number and location of new intakes, a range of isolated conveyance capacities, through-Delta conveyance improvements, and other facilities that could improve operations for native fish and in-Delta water quality, as applicable.

(c) The potential effects of climate change on the conveyance alternatives under consideration, including possible precipitation and runoff pattern changes and sea level rise estimates consistent with guidance provided by the California Natural Resources Agency, National Research Council, or other appropriate projections.

(d) The potential effects on migratory fish and aquatic resources.

(e) The potential effects on Sacramento River and San Joaquin River flood management.

(f) The resilience and recovery of Delta conveyance alternatives in the event of catastrophic loss caused by earthquake, flood or other natural disaster.

(g) The potential effects of each Delta conveyance alternative on Delta water quality, flows, and water levels, including the effects of these changes on in-Delta water users.

(h) The operational benefits and/or detriments of providing multiple intake locations.

(i) The potential short-term and long-term effects of each Delta conveyance alternative on terrestrial species.

(j) The potential effects of each Delta conveyance alternative on the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

(k) The cost-effectiveness of the alternatives in furthering the coequal goals. Cost-effectiveness means the degree to which a project or action is effective in achieving desired outcomes in relation to its cost.[83]

2. Project proponents should design and implement new or improved conveyance infrastructure in the Delta ~~should be designed and implemented~~ consistent with the following parameters:

(a) Located in areas with seasonally favorable freshwater conditions, and areas that are less vulnerable to degradation during sustained droughts and under anticipated future climate change and sea level rise conditions.

(b) Located to avoid impacts to and, where possible, improve conditions for habitat restoration opportunities in priority restoration areas identified in the Delta Plan, and other important restoration opportunity areas identified by the California Department of Fish and Wildlife.

(c) Located, designed, and operated to minimize adverse conditions for native aquatic and terrestrial species, including but not limited to those conditions related to flow direction and water quality.

(d) Designed to avoid or minimize native fish entrainment and impingement.

(e) Designed to balance adverse project impacts against the project's long- and short-term benefits.

(f) Designed to minimize disruptions to transportation and business activities during routine maintenance activities, with consideration given to scheduling planned maintenance activities in consultation with local governments to minimize impacts to residents and businesses, and establishing communication protocols to notify residents of planned and unplanned maintenance activities.

[83] A cost effectiveness analysis assess the degree to which a project or action is effective in achieving desired outcomes in relation to its cost. A cost-effectiveness analysis differs from a cost–benefit analysis, which assigns a monetary value to the outcomes or effects and compares that monetary value to the cost. Cost effectiveness is often applied where it may be inappropriate or difficult to assign monetary value to the outcomes or effects, such as ecosystem benefits or public health outcomes. In the context of evaluating alternatives, a cost effectiveness analysis can help identify the least costly way of achieving a desired benefit.

~~(f)~~(g) Designed to complement the Delta landscape and minimize aesthetic impacts.

(h) Implemented in accordance with detailed project implementation plans ~~that are~~ developed in cooperation with affected communities, local governments, the Delta Protection Commission, and stakeholders to minimize and/or mitigate adverse environmental effects consistent with Delta Plan Policy GP 1, and avoid or reduce conflicts with existing or planned land uses consistent with Delta Plan Policy DP P2~~.~~, and in consideration of Delta Plan recommendations DP R14, DP R16 and DP R17. Project implementation plans should incorporate good neighbor policies to avoid negative impacts on agricultural lands, residents, and business. Items that should be addressed in the plans include, but are not limited to, the following:

(i) Construction sequencing or phasing;

(ii) Temporary and long-term spoils placement;

(iii) Plans for temporary traffic routing that are consistent with local transportation plans, including consideration of permanent improvements to transportation and alternative transportation routes to avoid the most severe impacts to levels of service during construction;

(iv) Effects of construction activities on recreation and other visitor-related activities and businesses, including disruptions to transportation, temporary waterway closures, aesthetic and noise effects, and access to marinas, parks, and other recreation facilities;

(v) Mechanisms for communicating with landowners, communities, and local governments before and during construction;

(vi) Mechanisms by which community members and stakeholders can raise concerns during construction and in association with ongoing facility operations and maintenance; and

~~(i)~~(vii) Legally-permissible project delivery methods which are cost effective and provide for an expedited design and construction timeline that minimizes disruption to affected communities.

C. Improve or Modify Through-Delta Conveyance

1. Project proponents should design, implement, and adaptively manage improved or modified through-Delta conveyance and appurtenant facilities (such as gates or permanent barriers) ~~should be designed, implemented, and adaptively managed~~ to:

   (a) Substantially lessen or avoid impacts and provide net improvements to riparian habitat and channel margin habitat along anadromous fish migratory corridors and, where feasible, enhance conditions for native fish.

   (b) Substantially lessen or avoid impediments and provide net improvements to anadromous fish migration.

   (c) Substantially lessen or avoid impacts to public safety and include or contribute to levee improvements along Old and Middle Rivers consistent with Chapter 7 of the Delta Plan.

   (d) Modify the conveyance capacity or hydraulic characteristics of existing Delta waterways (e.g., improving levees and/or dredging) in a manner that provides multiple benefits, including: taking advantage of periods when water flow and quality conditions are favorable for improving water supply delivery reliability and flexibility and for protecting, restoring, and enhancing the Delta ecosystem; improving floodplain values and functions; improving habitat conditions during fish migration; and reducing flood risks.

II. NEW AND IMPROVED WATER STORAGE

A. Promote Options for New or Expanded Water Storage

Subject to completion of environmental review and approval by the lead agency, and applicable regulatory approvals from other public agencies, options for new or expanded water storage are hereby promoted as follows:

1. Within the Delta watershed, project proponents should design and operate new or expanded offstream or onstream surface water storage projects ~~should be designed and operated to~~consistent with the criteria in Section III.B. to:

   (a) Provide water supply reliability, water quality, operational flexibility to adapt to changing conditions, and ecosystem benefits under variable hydrologic conditions, and, where possible, flood risk management benefits.

   (b) Improve resilience to the effects of climate change, sea level rise, long-term drought conditions, and emergency supply disruptions.

(c) Allow greater flexibility in storing ~~exported Delta~~water supplies during periods when more water is available ~~for export~~, for carryover into periods when Delta exports are reduced.

(d) Take advantage of periods when the water flow, ~~and~~ quality, and environmental ~~conditions are favorable~~requirements of State and federal agencies are being met, for improving water supply delivery reliability and flexibility and protecting, restoring, and enhancing the Delta ecosystem.

(e) Contribute to improved conjunctive management[84] of both surface and groundwater resources to maximize efficient water use and contribute to sustainable management of groundwater basins, consistent with the Sustainable Groundwater Management Act.

2. Within the Delta water export area, project proponents should implement new or expanded surface water storage projects ~~should~~ that improve resilience to the effects of climate change and drought and ~~be~~ are operated to allow storage of exported and local surface water supplied during wetter periods for use during dryer periods when exports from the Delta are reduced. Opportunities to store stormwater and recycled water supplies of suitable quality should also be promoted as a strategy for improved regional water management and reduced reliance on the Delta. This includes projects in the San Francisco Bay Area, San Joaquin Valley, Central Coast region, and Southern California.

3. Within the Delta watershed and Delta water export area, project proponents should implement groundwater storage and extraction projects, including facilities for groundwater withdrawal, recharge, injection, and monitoring~~, should be~~that are consistent with the criteria in Sections II.C below.

4. The State Water Resources Control Board should review and consider revisions to existing regulations to ~~increase~~ facilitate the safe use of recycled water, stormwater, and other local water supplies for groundwater replenishment.

B. Design, Construct and Implement New or Expanded Surface Water Storage

1. Project proponents should design, implement, and adaptively manage new or expanded surface storage projects in the Delta, its watershed, and Delta water export areas ~~should be designed, implemented, and adaptively managed~~ to:

[84] Conjunctive management is the coordinated and planned management of both surface water and groundwater resources to maximize efficient water use. Water is stored in groundwater basis for future use by intentionally recharging the basin during year of above-average surface water supply. See Glossary, Delta Plan, Delta Stewardship Council, 2013, as amended.

(a) Improve resilience of the State's water supply system through demonstration of benefits under current and anticipated future conditions, including climate change, changing water demands, and regulatory conditions.

(b) Contribute to regional self-reliance and reduced reliance on the Delta.

(c) Demonstrate contributions to the goals of the Sustainable Groundwater Management Act ~~(SGMA)~~ by promoting conjunctive use to achieve long-term groundwater basin sustainability.

(d) Enable participation in water exchanges and transfers that benefit the Delta ecosystem and improve regional water supply reliability.

(e) Demonstrate cost-effectiveness, where cost-effectiveness means the degree to which a project or action is effective in achieving desired outcomes in relation to its cost.

~~(e)~~(f) Minimize and mitigate the impacts of storage on stream flows and water quality, including impacts during construction.

2. Project proponents should design and implement new or expanded surface water storage projects in the Delta and Delta watershed, ~~should be designed and implemented~~ where feasible, to further achievement of the coequal goals by:

(a) Providing ~~the ability to store~~for the dedicated storage of water during wet periods for carry over and later use during dry periods, while balancing the benefits of providing more natural, functional flows[85] to the Delta and its tributaries, meeting other ecosystem needs and providing flood risk management benefits.

(b) Enhancing water temperature management on Delta tributaries either directly or through coordinated operations with other facilities.

(c) Incorporating storage space dedicated to ecosystem benefits, such as flow management, water temperature, other water quality benefits, or providing water supplies to wildlife refuges.

(d) Integrating new and/or expanded storage with other existing or planned storage and conveyance systems to provide increased ecosystem and water supply benefits. This includes developing and/or updating coordinated operations plans, and/or agreements with other storage and conveyance systems.

[85] Defined in Chapter 4 of the Delta Plan, Delta Stewardship Council, 2013, as amended.

(e) Contributing to the protection of water quality in the Delta and its watershed for all beneficial uses consistent with the State Water Resources Control Board's Bay-Delta Plan.

(f) Contributing to more natural, functional flows that support ecosystem health.[86]

3. Project proponents should design and implement, where feasible, new or expanded surface water storage projects outside the Delta watershed, but within the Delta water export area, such as projects within the San Joaquin Valley, Central Coast, or Southern California regions, ~~should be designed and implemented, where feasible, consistent with the following parameters~~to:

(a) Contribute to reduced reliance on the Delta and regional self-reliance and, particularly during dry periods, through storage of available water supplies during wet periods for use during dry periods.

(b) Promote conjunctive management of surface and groundwater resources, and contribute to achieving groundwater sustainability goals established pursuant to the Sustainable Groundwater Management Act or applicable local plans, as appropriate.

(c) Contribute to a comprehensive, integrated water management approach that considers multiple water supply sources including, but not limited to, stream flow, groundwater, imported water, stormwater, and recycled water, as applicable.

C. Implement New or Expanded Groundwater Storage

1. Funding, planning, and technical support provided by the State for groundwater projects should:

(a) Promote multiple benefits, minimize harmful effects to the ecosystem, help achieve Bay-Delta Plan objectives, as applicable, and be consistent with guidance from the State Water Resources Control Board and DWR for implementing the Sustainable Groundwater Management Act.

~~(a)~~(b) Promote increased groundwater recharge using locally available water, such as recharge via stream-aquifer interactions, floodwater or stormwater capture, recharge using recycled water, or others~~.~~, provided such actions do not result in harmful impacts to functional flows in local streams.

[86] Defined in the Delta Plan, Delta Stewardship Council, 2013, as amended.

(c) Promote conjunctive management of surface water and groundwater ~~supplies~~resources, including in-lieu recharge.

(d) Promote new or expanded groundwater banking and exchange projects.

(e) Promote the construction of new or improved local conveyance infrastructure to convey water to and from groundwater recharge and recovery facilities.

~~(b)~~(f) Promote the construction of new or improved conveyance infrastructure that interconnects Delta export conveyance facilities with local conveyance facilities.

~~(c)~~(g) Promote implementation of the Central Valley Salt and Nitrate Management Plan and achievement of management goals and priorities for protection of water quality, where appropriate.

~~(d)~~(h) Support wellhead treatment, especially in disadvantaged communities relying on impaired groundwater.

~~(e)~~(i) Demonstrate consistency with applicable Groundwater Sustainability Plans under the Sustainable Groundwater Management Act.

~~(f)~~(j) Include new infrastructure that is consistent with Sections II.C(a)-(c), above.

~~(g)~~(k) Assess the ecosystem and water supply impacts and benefits to the Delta, including providing mitigation, as appropriate.

~~(h)~~(l) Promote opportunities for storage of flood waters (e.g., floodplain storage) or stormwater that can be managed for groundwater recharge.

2. DWR should develop a model ordinance for groundwater recharge that urges cities and counties to incorporate groundwater recharge and storage into land-use planning and zoning, and to protect areas with the highest potential for groundwater recharge from incompatible uses. (Note: A representative map showing the soil suitability index for groundwater banking projects on agricultural lands is shown in Attachment C [Figure C-1].)

3. DWR or the State Water Resources Control Board should prepare a proposal for an incentive program, in coordination with the Department of Conservation or the U.S. Department of Agriculture's conservation programs, for landowners to protect lands with high groundwater recharge potential for the purpose of contributing to sustainable groundwater management.

III. IMPROVE OPERATIONS OF STORAGE AND CONVEYANCE

A. Promote Options for Operations of Storage and Conveyance Facilities

Subject to completion of environmental review and approval by the lead agency, the following options for the operation of conveyance and storage are hereby promoted:

1. DWR and Reclamation should develop a coordinated operation plan for the SWP and CVP to meet State Water Resources Control Board-specified flow and water quality criteria during extended drought conditions lasting up to six years, describing anticipated changes in routine operations to adapt to drought conditions. In developing the plan, DWR and Reclamation should develop criteria for defining appropriate levels or stages of drought affecting the SWP and CVP, in coordination with water contractors and the public. The plan should consider the operation of other storage projects that are not part of the CVP or SWP, which could further achievement of the coequal goals. This plan should be submitted to the Delta Stewardship Council in 2020 and be updated every five years thereafter, or when physical or regulatory changes necessitate an update.

2. DWR and Reclamation should develop an adaptive management plan consistent with the Delta Plan's adaptive management framework[87] for the coordinated operation of SWP and CVP through-Delta conveyance for the purposes of protecting, enhancing, and restoring the ecosystem and maintaining adequate flows, flow direction, water levels, and water quality for Delta agriculture, recreation, and communities ~~in the Delta~~.

3. Lead agencies for new or modified conveyance facilities, and new and expanded storage facilities—including those options identified in I.A. and II.A., above—should develop operational plans consistent with Section III.B., below.

4. To improve water management flexibility and to support coordinated operations with new storage facilities, local agencies—in coordination with DWR and Reclamation, as appropriate—should pursue the following new or improved conveyance facilities outside of the Delta, to reduce reliance on the Delta and promote regional self-reliance:

   (a) Facilities that promote the movement or exchange of SWP, CVP, and local water supplies between the east and west sides of the San Joaquin Valley.

[87] See page 38 of the Delta Plan, Delta Stewardship Council, 2013, as amended.

(b) Facilities that improve groundwater recharge and/or conjunctive use in overdrafted aquifers of the San Joaquin Valley, Tulare Lake Basin, and other Delta water export areas.

(c) Facilities that increase groundwater banking or exchange, or that promote increased use of stormwater, recycled water, desalinated water, or other local water supplies in regions tributary to, or that rely on, Delta water supplies.

B. Operate Delta Water Management Facilities ~~to Specified Targets and Objectives~~Using Adaptive Management Principles

1. Plans for the operation or reoperation of water conveyance and control facilities in the Delta, or new or modified storage facilities in the Delta and its watershed, should incorporate adaptive management consistent with the Delta Plan's adaptive management framework[88] and further achievement of the coequal goals by:

(a) Including specific and measurable operating objectives (consistent with State Water Resources Control Board's Bay-Delta Plan objectives), that address:

(i) Protection for and enhancements to the Delta ecosystem, including improved water temperature management, while reliably delivering water.

(ii) Avoidance or mitigation of adverse effects on in-Delta recreation ~~or~~ and in-Delta water quality, including identifying salinity targets for the south Delta that are designed to prevent severe water quality degradation and toxic events in dry and critically dry years.

~~(ii)~~(iii) Avoidance or mitigation of adverse effects on stream flows and water quality.

(b) Enabling diversions during periods when Delta water flow, quality, and environmental requirements are being met~~water flow and quality conditions are favorable~~ for improving water supply delivery reliability and flexibility to changing conditions, and for protecting, restoring, and enhancing the Delta ecosystem.

(c) Incorporating adaptive management plans, consistent with the Delta Plan's adaptive management framework[89] and developed in coordination with operators and applicable regulatory agency staff, for modifying operations to meet State Water Resources Control

[88] See page 38 of the Delta Plan, Delta Stewardship Council, 2013, as amended.
[89] See page 38 of the Delta Plan, Delta Stewardship Council, 2013, as amended.

Board flow ~~or~~ and water quality ~~objectives~~ requirements, and California Department of Fish and Wildlife conservation and recovery goals, under the following:

(i) Extended drought conditions (more than three years in duration).

(ii) Changed climate conditions including sea level rise and changed hydrologic conditions over the anticipated project life.

(iii) Extreme wet years and flood events.

(d) Demonstrating that projects can contribute to a more reliable water supply, and can protect, restore, and enhance the Delta ecosystem under a range of future conditions, including changing climate and sea level rise projections from the California Natural Resources Agency or National Research Council, or other appropriate projections.

(e) Evaluating the applicability of forecast-informed reservoir operations.

(f) Considering coordination and integration of operations with existing and/or planned conveyance and water storage facilities to maximize their potential to contribute to the goals of the Sustainable Groundwater Management Act~~SGMA~~, and the goals of other applicable programs and plans related to sustainable groundwater, stormwater, and floodwater management.

(g) Reviewing and updating, as needed, the flood space reservation guidelines for upstream reservoirs in coordination with the U.S. Army Corps of Engineers and reservoir owners or operators.

2. Operation plans for new water conveyance facilities in the Delta, and new or expanded storage facilities in the Delta watershed, should:

(a) Ensure that operations are adequately monitored, evaluated, and revised using adaptive management to make progress towards achieving defined performance measures.

(b) Be based upon accurate, timely, and transparent water accounting and budgeting.

~~(b)~~(c) Ensure that operations provide water levels, water flow, and water quality suitable for in-Delta agricultural and recreational uses.

C. Update the Bay-Delta Plan and Consider Drought

1. In developing and implementing updates to the Bay-Delta Plan, and flow ~~objectives~~ requirements for priority tributaries to the Delta to protect beneficial uses in the Bay-Delta watershed, the State Water Resources Control Board should:

   (a) Consider and contribute to achievement of applicable Delta Plan performance measures.

   (b) Require water diverters in the Delta and its watershed that are responsible for meeting Bay-Delta Plan requirements, including but not limited to DWR and Reclamation, to develop a process and plan for meeting applicable ~~Sacramento River~~ flow and water quality ~~objectives during~~ requirements during extended drought conditions (characterized by multiple, successive dry years)~~, for the purposes of furthering~~to further the coequal goals and ~~minimizing DWR and Reclamation's use of~~minimize reliance on temporary urgency change ~~orders~~petitions and related requests.

D. Operate New or Improved Conveyance and Diversion Facilities Outside of the Delta

1. Conveyance facilities outside the Delta should be operated in a manner that takes into account effects on Delta water quality, the timing and magnitude of flows in the Delta, water supplies available for export from the Delta, and effects on opportunities to protect, restore, and enhance the Delta ecosystem.

2. In allocating funding for new water conveyance and conveyance improvement projects outside the Delta that support regional self-reliance, the State should give preference to projects that:

   (a) Reduce reliance on the Delta for water supply during dry and critically dry years by the specific designation, in operational agreements or plans, of carryover storage for beneficial use during these periods.

   (b) Improve conjunctive management of surface and groundwater resources and contribute to achieving groundwater sustainability goals established pursuant to the Sustainable Groundwater Management Act or local plans, as appropriate.

   (c) Support ecosystem enhancement and/or provide more natural, functional flows[90] in the Delta and its tributaries.

[90] Delta Plan, Delta Stewardship Council, 2013, as amended.

(d) Improve the ability of regions that rely on the Delta, for all or a portion of their water supplies, to withstand and adapt to changing current and future hydrologic conditions.

(e) Contribute to a comprehensive, integrated water management approach that considers multiple water supply sources including, but not limited to, stream flow, groundwater, imported water, stormwater, desalinated water, water saved through increased efficiency, and recycled water, as applicable.

E. Promote Water Operations Monitoring Data Management, and Data Transparency

In meeting the requirements of the 2016 Open and Transparent Water Data Act, DWR should coordinate with the Council to incorporate information related to Delta Plan performance measures and links to the Council's online tracking and reporting tools, as appropriate, in an effort to promote transparency and accessibility of data in tracking progress toward achieving the coequal goals.

ATTACHMENT A.

TIMELINE OF MAJOR CONVEYANCE, STORAGE, AND OPERATIONS

Year	Event	Applicability to:		
		Conveyance	Storage	Operations
1923	O'Shaughnessy Dam (Hetch Hetchy Reservoir) completed		✓	
1929	Pardee Dam completed		✓	
	Mokelumne aqueduct completed	✓		
1931	State Engineer Edward Hyatt created the California State Water Plan. The Plan called for construction of 420 foot dam at the town of Kennett (now in the middle of Shasta Lake) and addressed conveyance from Sacramento River Basin to supplement water supplies in the San Joaquin River Basin	✓	✓	✓
1933	State Authorized $170 million to construct the Central Valley Project	✓	✓	✓
1935	Bureau of Reclamation authorized the Central Valley Project which included Kennett (Shasta), Friant, and Contra Costa (Delta) divisions.	✓		
1942	Friant Dam completed		✓	
1945	Shasta Dam completed		✓	
	Madera Canal completed	✓		
1948	Contra Costa Canal completed	✓		
1950	Sacramento Canals unit of the Central Valley Project authorized	✓		
1951	Delta Cross Channel, Delta-Mendota Canal and Friant-Kern Canal completed	✓		
1956	Folsom Dam completed		✓	
1957	California State Water Plan proposed a West Canal on the west side of Sacramento Valley, through the North Delta	✓		
1959	Corning Canal (east canal system) construction completed	✓		
1960	Burns-Porter Act passed creating the State Water Project; the Act authorized Delta facilities for water conservation, water supply in the Delta, transfer water across the Delta, flood and salinity control	✓	✓	✓
1962	South Bay Aqueduct completed	✓		
1964	Red Bluff Diversion Dam completed		✓	
1965	The Interagency Delta Commission recommended the Peripheral Canal	✓		
1969	Department of the Interior adopted Reclamation's Peripheral Canal Feasibility Report	✓		
1973	Delta Environmental Advisory Committee concluded that the Peripheral Canal, properly designed and operated, was necessary to protect the Delta	✓		
1975	California Department of Water Resources considered alternative water transfer facilities in Bulletin 76	✓		✓

DISCUSSION DRAFT
NOT APPROVED BY THE DELTA STEWARDSHIP COUNCIL
SUBJECT TO CHANGE

Year	Event	Applicability to:		
		Conveyance	Storage	Operations
1978 ~~1978~~	Water Rights Decision 1485 adopted by the State Water Resources Control Board - the Decision ordered the Central Valley Project and State Water Project to guarantee certain conditions for water quality protection for multiple beneficial uses			✓
	Water Quality Control Plan for Sacramento-San Joaquin Delta and Suisun Marsh released			✓
	~~New Melones Dam completed~~		~~✓~~	
1979	New Melones Dam completed		✓	
1980	Legislature / Governor signed Senate Bill 200 authorizing the Peripheral Canal	✓		
	Tehama Colusa Canal (west canal system) construction completed	✓		
1982	Proposition 9, which would have authorized Senate Bill 200, defeated	✓		
1983	Alternatives for Delta Water Transfer published by the California Department of Water Resources			✓
1984	The Deukmejian Administration proposed a new, shorter canal to take Sacramento water to existing channels in the central and south Delta. The Legislature never approved the proposal, commonly called "Duke's Ditch."	✓		
1986	Coordinated Operations Agreement of the State Water Project and Central Valley Project signed which formalized 1970's annual agreements between the two projects for integrated operations as well as developed a common allocation model – the California Water Resources Simulation Model, CALSIM	✓	✓	✓
1991	Central Valley Project Improvement Act Passed – Protects Salmon and Striped Bass	✓	✓	✓
1993	Delta smelt are listed as a threatened species under the Endangered Species Act by both state and federal agencies			✓
1994	Delta Accord signed – CALFED began			✓
1995	Bay-Delta Water Quality Control Plan adopted by the SWRCB and becomes the basis for Decision 1641			✓
1997	Los Vaqueros Project completed		✓	
	The Kern Water Bank began operating under a Habitat Conservation Plan/Natural Community Conservation Plan executed by the Kern Water Bank Authority.	✓	✓	✓
1998	The CALFED Bay Delta Program developed three alternatives for moving water through or around the Delta as well as plans for ecosystem restoration, a multi-species habitat conservation plan, a levee repair strategy, and reservoir planning	✓	✓	✓

DISCUSSION DRAFT
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SUBJECT TO CHANGE

Year	Event	Applicability to:		
		Conveyance	Storage	Operations
1999	State Water Resources Control Board Water Right Decision 1641 amended water right licenses and permits for the Central Valley Project and State Water Project to assure protection of beneficial uses in the Delta and grants the California Department of Water Resources and the Bureau of Reclamation Joint Point of Diversion capabilities	✓		✓
	Diamond Valley Lake dams (West Dam, East Dam and Saddle Dam) completed		✓	
2000	CALFED approved and began to consider Alternative Conveyance (Peripheral Canal) if alternate measures fall through	✓		
2000	CALFED Bay-Delta Program Final Programmatic Environmental Impact Report/Environmental Impact Statement and Record of Decision released established a preferred program alternative for a through-Delta approach to conveyance			✓
2001	Joint California Department of Water Resources and Bay Delta Authority planning study to evaluate in-Delta storage options released		✓	
2002	The Integrated Storage Investigation developed *North of the Delta Offstream Storage Investigation* report which outlined the development of a new reservoir (Sites reservoir)		✓	
	California Department of Water Resources issued the CALFED Surface Storage Investigations Progress Report to provide information on the status of ongoing CALFED surface storage investigations		✓	
2004	Long-Term Central Valley Project Operations Criteria and Plan released by the Bureau of Reclamation			✓
	In-Delta Storage Program State Feasibility Study released by the California Department of Water Resources and California Bay-Delta Authority (Supplemental Report released in 2006)		✓	
2005	Final Revised Water Quality Control Plan from the California Department of Water Resources and Bureau of Reclamation released			✓
2006	A steering committee was formed to prepare an approach for developing the Bay Delta Conservation Plan which developed a habitat conservation plan as well as a series of conveyance alternatives	✓		
	State Water Resources Control Board Order WR 2006-006 required the Department of Water Resources and the Bureau of Reclamation to meet water quality objectives for salinity in the Southern Delta			✓
	Revised Bay-Delta Plan adopted by the State Water Resources Control Board			✓
	Delta Vision created to “develop a durable vision for sustainable management of the Delta”			✓

DISCUSSION DRAFT
NOT APPROVED BY THE DELTA STEWARDSHIP COUNCIL
SUBJECT TO CHANGE

Year	Event	Applicability to:		
		Conveyance	Storage	Operations
2008	Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment Released by the Bureau of Reclamation			✓
2008	Biological Opinion from the United States Department of Fish and Wildlife on Long-Term Operations of the Central Valley Project and State Water Project concluded that operations jeopardize the continued existence of the delta smelt	✓		✓
	Senate Bill X2 1 (Water Code 83002) passed and provided funding to the California Department of Water Resources to identify potential options for the reoperation of the state's flood protection and water supply systems that will optimize the use of existing facilities and groundwater storage capacity		✓	✓
2009	Biological Opinion from National Oceanic and Atmospheric Administration on Long-Term Operations of the Central Valley Project and State Water Project concluded that operations jeopardize the continued existence of several endangered species	✓		✓
	Delta Reform Act passed; Section 85304 called for "The Delta Plan shall promote options for new and improved infrastructure relating to the water conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals"	✓	✓	✓
2010	Delta smelt listed as endangered under the Endangered Species Act			✓
	The first administrative draft of the Bay Delta Conservation Plan released to the public for review (second draft released in 2012)	✓		✓
	California Department of Water Resources tracked, coordinated, and expanded feasibility studies on the CALFED storage projects through their Surface Storage Program	✓		
2013	Delta Plan adopted by Delta Stewardship Council	✓	✓	✓
	Bay Delta Conservation Plan was modified once again to address comments regarding balance costs, engineering design, and ease of construction while reducing local dislocation and disturbance in the Delta	✓		✓
	California Department of Water Resources released the Bay Delta Conservation Plan Draft Environmental Impact Report/Environmental Impact Statement for public review	✓		✓
	Delta Independent Science Board released review of Bay Delta Conservation Plan Draft Environmental Impact Report/Environmental Impact Statement ~~in 2014~~ and found that the presentation made it difficult to compare alternatives and evaluate the critical underlying assumptions	✓		✓

DISCUSSION DRAFT
NOT APPROVED BY THE DELTA STEWARDSHIP COUNCIL
SUBJECT TO CHANGE

Year	Event	Applicability to:		
		Conveyance	Storage	Operations
2014	*Recovery Plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead* published by the National Oceanic and Atmosphere Administration			✓
	Council Chairman Randy Fiorini authored an issue paper, *Smaller May Be Better at Getting Storage Projects off the Ground*, which included recommendations for storage		✓	
	California voters approved the passage of Proposition 1 provided $2.7 billion dollars for new water storage projects		✓	
2015	Administration indicated that the state will forgo the Bay Delta Conservation Plan and work on two separate plans to address conveyance improvements through the California WaterFix and provide near-term habitat restoration through the California EcoRestore	✓		✓
	Bay Delta Conservation Plan Partially Recirculated Draft Environmental Impact Report/Supplemental Environmental Impact Statement released and reviewed by Delta Independent Science Board	✓		✓
	Council adopted the *19 Principles for Water Conveyance in the Delta, Storage Systems, and for the Operation of Both to Achieve the Coequal Goals*	✓	✓	✓
	Bay Delta Conservation Plan /California WaterFix Final Environmental Impact Report/Environmental Impact Statement released by the California Department of Water Resources and the Bureau of Reclamation	✓		✓
	Reinitiation of consultation on the Coordinated Long Term Operations of the Central Valley Project and State Water Project			✓
	Water Commission developed the Water Storage Investment Program		✓	
2016	Delta Smelt Resiliency Strategy published by the California Natural Resources Agency			✓
2017	Council discussed the Discussion Draft Delta Plan Amendment for Water Conveyance, System Storage, and the Operation of Both	✓	✓	✓

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ATTACHMENT B.

PERFORMANCE MEASURES RELEVANT TO DELTA PLAN AMENDMENTS FOR CONVEYANCE, SYSTEM STORAGE, AND THE OPERATION OF BOTH

The Delta Reform Act of 2009 requires the Delta Plan to include performance measures that enable the Council to track progress in meeting its objectives. These performance measures are to include quantitative or other "measureable assessments of the status and trends" of the health of the Delta, as well as the reliability of the state's water supply exported from the Sacramento and San Joaquin river watersheds (Water Code Sections 85211 and 85308).

The Delta Plan, adopted in 2013, contained a set of performance measures developed to monitor performance of Delta Plan policies and recommendations. The Delta Plan stated that the Council would continue to work with scientific, agency, and stakeholder experts to refine the Delta Plan's performance measures. The Council's first refinement effort involved a rigorous public process culminating in the Council's February 2016 adoption of new and refined performance measures (see Appendix E of the Delta Plan).

Three types of performance measures are identified for the Delta Plan: administrative, output, and outcome. Administrative performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or a group or programs. As the discussion draft amendment for conveyance, system storage, and the operation of both is further developed and refined, new administrative performance measures will be identified to assess progress in achieving the recommendations contained therein.

Outcome performance measures evaluate responses to management actions or natural outputs. Output performance measures evaluate the factors that may be influencing outcomes and include on-the-ground or physical implementation of management actions (such as acres of habitat restored or acre-feet of water released) as well as natural phenomena outside of management control (such as a flood control, earthquake, or ocean conditions. Outcome and output performance measures relevant to the discussion draft Delta Plan amendments for conveyance, system storage, and the operation of both are listed below. Additional performance measures related to flood and seismic risks to facilities are included in Chapter 7 and are currently undergoing revisions through the amendment of the Delta Levee Investment and Risk Reduction Strategy.

OUTCOME PERFORMANCE MEASURES

PM 3.4 *Demonstrate a measureable reduction in reliance on the Delta at the regional level based on individual water supplier reports.*

PM 3.9. *Decrease in Delta exports during critically dry years and an increase in Delta exports during wet years.*

PM 4.2 *Restoring a healthier estuary using more natural functional flows, including in-Delta flows and tributary input flows to support ecological floodplain processes (e.g., spring pulse flows along the Sacramento River, and more gradual recession flows at the end of the wet season).*

PM 4.6 *Achieve the State and federal "doubling goal" for wild Central Valley salmon relative to the period of 1967-1991 levels. Trends will be derived from long-term salmon monitoring surveys conducted by the U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and others.*

OUTPUT PERFORMANCE MEASURES

PM 6.3 *The Department of Water Resources begins constructing the North Bay Aqueduct Alternate Intake Project by the end of 2018 after the environmental impact report is completed.*

ATTACHMENT C.

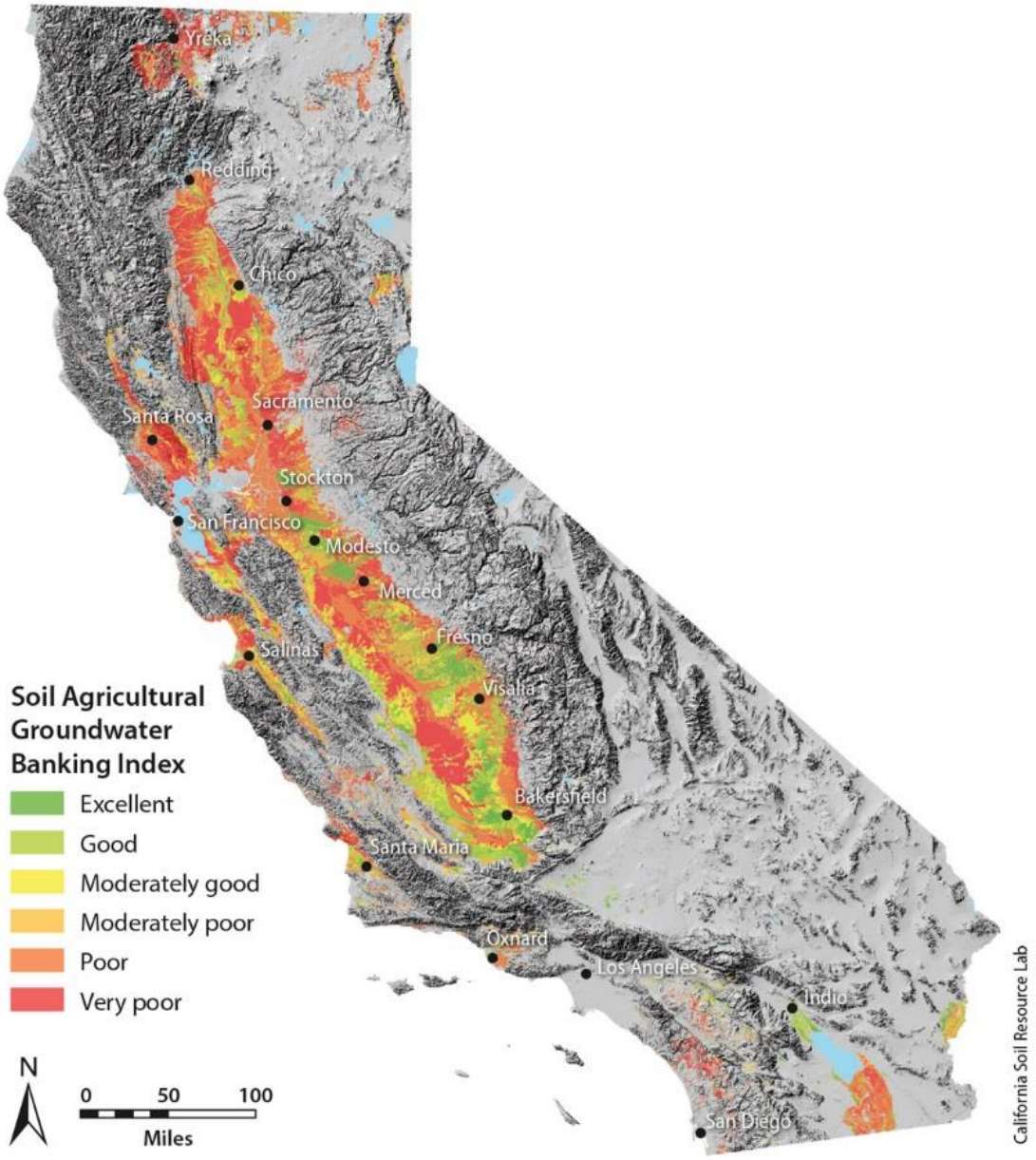

Figure A-1. Soil Agricultural Groundwater Banking Index Identifying Potential Areas for Groundwater Banking on Agricultural Lands

Source: Green, A.T. et al. 2015. California Agriculture. Soil suitability index identifies potential areas for groundwater banking on agricultural lands. Available at: http://ucanr.edu/repositoryfiles/cav6902p75-157818.pdf

ATTACHMENT D.

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Delta Plan Performance Measures for Review – May 2017

Delta Plan Chapter 3: A More Reliable Water Supply for California

- **Administrative** performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- **Output** (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- **Outcome** performance measures evaluate responses to management actions or natural outputs.

Strategies supporting this chapter:

1. Increase water conservation and expand local and regional supplies
2. Improve groundwater management
3. Improve conveyance and expand storage
4. Improve water management information

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
3.1	Output	~~Demonstrate California's urban water suppliers' progress toward meeting California's SB X7-7 conservation goal of achieving a 10% reduction in statewide urban per capita water usage by 2015 and a 20% reduction by 2020.~~ Urban water suppliers that are within the Delta watershed or rely on water from the Delta watershed achieve their individual targets set through the SB X7-7 process or its successor legislation or regulatory targets. (Strategy 3.1) **Metrics:** • Gallons per capita per day of urban water use. This will be evaluated at least every five years as Urban Water Management Plans are updated. • Percentage change in urban per capita water use from SB X7-7 baseline years. This will be evaluated at least every five years as Urban Water Management Plans are updated. **Baseline:** • ~~196 gallons per capita per day (population-weighted average of baselines established in 2010 Urban Water Management Plans).~~ • SB X7-7 baselines established in contractors/diverters 2010/2015 Urban Water Management Plans. **Target:** • ~~10% reduction by 2015 (176 gallons per capita per day).~~ • 2015 targets established in contractors/diverters 2010/2015 Urban Water Management Plans. Interim targets are set by individual suppliers using one of four methods identified in SB X7-7 and are to be achieved by December 31, 2015, and reported in subsequent Urban Water Management Plans. • ~~20% reduction by 2020 (156 gallons per capita per day).~~ • 2020 targets established in contractors/diverters 2010/2015 Urban Water Management Plans. Targets are set by individual suppliers using one of four methods identified in SB X7-7 and are to be achieved by December 31, 2020 and reported in subsequent Urban Water Management Plans.
3.2	Output	~~Demonstrate California's progress toward achieving the State Water Resource's Control Board's Recycled Water Policy goal for the increased use of storm water runoff (e.g. capture and reuse, recharge, redirection to constructed wetlands or landscaping) of at least 500,000 acre-feet /year by 2020 and by at least 1 million acre-feet /year by~~

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		~~2030.~~ Water Contractors or Urban water suppliers that are within the Delta watershed or rely on water from the Delta watershed demonstrate sustained progress towards achieving their individual projections for water recycling, storm water capture, and use of advanced water technologies in their Urban Water Management Plans (UWMPs). (Strategy 3.1) **Metric:** ~~• Acre-feet per year of storm water use (e.g., capture and reuse, recharge, redirection to constructed wetlands or landscaping).~~ • Percent of Water Contractors or urban water suppliers meeting their recycled water projections. This will be evaluated at least every five years as Urban Water Management Plans are updated. • Percent of Water Contractors or urban water suppliers meeting their storm water use projections. This will be evaluated at least every five years as Urban Water Management Plans are updated. • Percent of Water Contractors or urban water suppliers meeting their desalination projections. This will be evaluated at least every five years as Urban Water Management Plans are updated. **Baseline:** ~~• Volume of storm water use reported in 2015 Urban Water Management Plans and Prop 1 Storm Water Resource Plans may be the first widespread reporting of storm water use that could serve as a baseline.~~ • Each five year UWMP update includes projections of future sources of water supply in five year increments. **Target:** ~~• Increased use of storm water runoff of at least 500,000 acre-feet/year by 2020 and by at least 1 million acre-feet/year by 2030.~~ • Suppliers meet at least 75% of their projected beneficial use of recycled water, storm water, and desalinated groundwater or ocean water from their previous UWMP. Achievement of target to be met every five years as set by Urban Water Management Plan updates.
3.4	Outcome	~~Demonstrate a measureable reduction in reliance on the Delta at the regional level based on individual water supplier reports.~~ Water contractors or urban water suppliers that are within the Delta watershed or rely on water from the Delta watershed demonstrate reliability during single and multiple dry years through their Urban Water Management Plans. Single and multiple dry year projections should take into account the decreased availability of supplies from the Delta watershed. Reliability can be achieved through increased use of alternative supplies, demand management, or both. (Strategy 3.1) **Metrics:** ~~• 10-year moving average volume and percent of total water used (percent of total water portfolio) originating in the Delta watershed for all years, and for different water year types.~~ ~~• 10-year moving average volume and percent of total water use met from local and regional sources. For the purposes of reporting progress in reducing reliance on the Delta and improving regional self-reliance, water conservation and efficiency measures are considered new sources of water supply.~~ ~~• Projected volume and percent of total use met by local and regional sources of supply.~~ • Percent of Contractors or urban water suppliers projecting reliability during a single dry year (lowest water supply available to the agency for a single year). This will be evaluated at least every five years as Urban Water Management Plans are updated. • Percent of Contractors or urban water suppliers projecting reliability for multiple dry years (lowest water supply available to the agency for three consecutive years). This will be evaluated at least every five years as Urban Water Management Plans are updated. • **Baseline:** ~~• 10-year average volume and percent of total water use met by water originating in the Delta watershed, by hydrologic region, as of Delta Plan adoption (May 2013) for all years, and for different water year types.~~ ~~• 10-year average volume and percent of total water use met by local and regional supplies, by hydrologic region, as of Delta Plan adoption (May 2013).~~ • Percent of Contractors or urban water suppliers projecting reliability during a single dry year in their 2015 UWMPs.

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• Percent of Contractors or urban water suppliers projecting reliability for multiple dry years in the 2015 UWMPs. **Target:** • ~~Decreasing trend in volume of water used from the Delta watershed or percent of total water use met by water from the Delta watershed.~~ • ~~Increasing trend in volume or percent of total water use met by local and regional supplies.~~ • 100% of Contractors or urban suppliers project shortages no greater than 20% during single and multiple dry years, taking into account the reduced availability of water from the Delta watershed during dry years, by 2020.
3.6	Administrative	~~Demonstrate an increase in efficiency in agricultural water use. (Strategy 3.1)~~ ~~**Metrics:**~~ ~~• Water management fraction (ratio of the amount of water needed to be applied for optimal crop growth and the amount of water in recoverable return flow per the total amount of water applied. As efficiency increases, this ratio approaches one.).~~ ~~This metric was defined by Department of Water Resources in Methodology for Quantifying the Efficiency of Agricultural Water Use, 2012.~~ ~~**Baseline:**~~ ~~• 2012 Agricultural Water Management Plans or earliest available data as they are reported by water suppliers.~~ ~~**Target:**~~ ~~Increase in efficiency.~~ Meet the requirement of Senate Bill SB X7-7, the Water Conservation Act of 2009, requiring agricultural water suppliers to submit an Agricultural Water Management Plan (AWMP) to the Department of Water Resources (DWR). (Strategy 3.1) **Metrics:** • Percentage of AWMPs submitted to DWR on time. This will be evaluated at least every five years as AWMPs are updated. • Percentage of AWMPs submitted to DWR that include a quantification of water use efficiency. This will be evaluated at least every five years as AWMPs are updated. **Baseline:** • 14% of the required AWMPs (8 of the estimated 56) were submitted to DWR on time for the 2012 cycle. 37% of required AWMPs (35 of the estimated 95) were submitted to DWR on time for the 2015 cycle. • 0% of AWMPs (0 of the estimated 56 required) submitted to DWR for the 2012 cycled included a quantification of water use efficiency improvements. **Target:** • 100% of AWMPs are submitted to DWR on time, by 2020. • 100% of AWMPs submitted to DWR include a quantification of water use efficiency, by 2020.
3.8	Administrative	~~Demonstrate progress towards decreasing the overall rate of groundwater depletion in critically overdrafted basins. (Strategy 3.2)~~ ~~**Metrics:**~~ ~~• Change in groundwater in storage.~~ ~~• Groundwater elevations.~~ ~~**Baseline:**~~ ~~• Regional groundwater estimates for California's Central Valley using satellite-based gravimetric sensors are available back to October of 2003. The California Department of Water Resources has a network of long-term monitoring wells in the San Joaquin Valley (3,124 wells) and Sacramento Valley (599 wells) that will be used to assess sub-~~

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		~~basin groundwater trends.~~ ~~**Target:**~~ • ~~Decreasing rate of groundwater depletion in critically overdrafted basins.~~ Responsible State and local agencies complete the mandates of the 2014 Sustainable Groundwater Management Act (SGMA). Upon completion of Groundwater Sustainability Plans (GSPs), this measure will be updated to track achievement of the measurable objectives and five-year interim milestones identified by local agencies in the plan. Ground water levels and ground water storage will be targeted specifically. (Strategy 3.2) Metric: • Completion of actions required by SGMA. This will be evaluated annually until GSPs are completed. **Baseline:** • N/A **Target:** • The actions required by SGMA have various target dates. 100% of actions required by SGMA are completed by their target dates[1].
3.9	Outcome	~~Demonstrate that water available to be exported through the Delta is not disrupted. (Strategy 3.3)~~ ~~**Metric:**~~ ~~• Percent of Central Valley Project/State Water Project final allocations delivered each year.~~ ~~**Baseline:**~~ ~~• Long-term historical average deviation of total deliveries from final allocations.~~ ~~**Target:**~~ ~~Declining trend in the deviation of total deliveries from final allocations.~~ Decrease in Delta exports during critically dry years and an increase in Delta exports during wet years. Overall average decrease in Delta exports[2]. (Strategy 3.3) **Metric:** • Total water exported each critically dry year by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta. This will be evaluated following critically dry years. • Total water exported each wet year by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta. This will be evaluated following wet years. • 15-year average total water exported annually (for all water year types) by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta. This will be evaluated at least every five years. **Baseline:** • Median total water exported during critically dry years by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta for the years 1975 through 2014. • Median total water exported during wet years by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta for the years 1975 through 2014. • Average total water exported annually (for all water year types) by the State Water Project and the Central Valley Project through the Harvey O. Banks and C.W. Bill Jones Pumping Plants in the southern Delta for the years 2000 through 2014.

[1] Seventeen actions leading to adoption of GSPs have been identified. These actions are to be completed by the Department of Water Resources, the State Water Resources Control Board, and local agencies with target dates ranging from January 31, 2015 to January 31, 2022. All medium and high priority basins must be managed under a GSP by January 31, 2022. Medium and high priority basins subject to critical conditions of overdraft must be managed under a GSP by January 31, 2020. On April 1 following GSP adoption and annually thereafter, local agencies must provide a report on progress towards sustainability to the Department of Water Resources. These reports may form the basis of a future groundwater performance measure.

[2] Following the State Water Resources Control Board's completion of updates to the Bay-Delta Water Quality Control Plan, this performance measure will be reevaluated for consistency with the Board's regulations.

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		Target: • A statistically significant decrease in annual total exports during critically dry years compared to historical deliveries for critically dry years in 1975-2014. This target is to be achieved by 2030. • A statistically significant increase in total exports during wet years compared to historical deliveries for wet years in 1975 -2014. This target is to be achieved by 2030. • 15-year average total exports during all year types decreases by 5% or more from the average historical deliveries for the years 2000-2014 (5.1 MAF). This target is to be achieved by 2030.

Delta Plan Performance Measures

Delta Plan Chapter 4: Protect, Restore, and Enhance the Delta Ecosystem

- **Administrative** performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- **Output** (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- **Outcome** performance measures evaluate responses to management actions or natural outputs.

Strategies supporting this chapter:

1. Create More Natural Functional Flows
2. Restore Habitat
3. Improve Water Quality to Protect the Ecosystem
   *Addressed in Chapter 6, Water Quality
4. Prevent Introduction of and Manage Nonnative Species Impacts
5. Improve Hatcheries and Harvest Management

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
4.2	Outcome	~~Progress toward r~~Restoring a healthier~~y~~ estuary using more natural functional flows, including in-Delta flows[3] and tributary input flows to support ecological floodplain processes~~,~~ (e.g., spring ~~pulse~~ peak flows along the Sacramento River, and more gradual recession flows at the end of the wet season). (Strategy 4.1) **Metrics:** • ~~Frequency of achieving >17,000 acres of inundation for 21~~14 or more consecutive days in the Yolo Bypass.~~**~~**~~ • ~~Flows exceeding base flows. A flow, 5 to 10 times greater than the base flow, during the period of spring flows in the Sacramento River~~. • Area and duration of inundation in the Yolo Bypass, evaluated annually on a five-year rolling basis. • Frequency of 2-year return interval peak flows between November 1 and April 30, evaluated annually on a five-year rolling basis. • Rate of change in the hydrograph on the receding limb as measured from spring high flows to summer low flows, evaluated annually and on a five-year rolling basis[4]. • (1) 10-year rolling average slope of the Delta outflow-inflow ratio, disaggregated by seasonal, annual, and 10-year periods, (2) outflow-inflow ratio in dry and critically dry years, evaluated annually on a five-year rolling basis. **Baseline:**

[3] Please see the Chapter 6 *Water Quality* performance measure on salinity in-Delta flows for X2.
[4] For this performance measure, the focal period is from April 1 to July 31, but the start of spring flows will differ depending on water year type and water management actions. The definition of spring high flows (or start of the spring recession is defined as the third consecutive day of decreasing flow following the last peak flow between March 15 and June 1, and "low flows" is defined as the date when the daily recession rate average over five days is less than 3.5% per day.

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• ~~Between 1984 and 2007 the Yolo Bypass experienced inundation events of at least 14 consecutive days between December and April, 10 out of 24 years.~~ • ~~Long-term, historical hydrograph data retrieved from U.S. Geological Survey stations[5] from below Shasta Dam.~~ • Modeling for the years 1997-2012 estimates that events with 14-day duration inundated 19,704 acres in 30% of years, 16,391 acres in 50% of years, and 27,803 acres in 67% of years. Events with a duration of at least 21 days covered 36,267 acres in 30% of years, 15,823 acres in 50% of years, and 9,976 acres in 67% of years, between November 1 and May 30 (DWR 2015)[6] • Hydrograph data for the Bend Bridge gage station (USGS gage 11377100) indicate that the magnitude of flow for pre-Shasta Dam (1891 to 1948) and post-Shasta dam (1960-2013) events with 14-day duration are similar (approximately 20,000 cubic feet per second, CFS)[7]. However, the pre-Shasta Dam historical 1.5-year recurrence interval peak flow even (approximately 75,000 CFS) now occurs approximately every two years, and the pre-Shasta Dam 10-year recurrence interval flow (206,200 CFS) has been nearly halved (133, 842 CFS)[8]. • Long-term hydrograph data from US Geological Survey gage station at Hamilton City (USGS 11383800). • Long-term ratio of Delta outflow to Delta inflow. The period before construction of the Central Valley Project and State Water Project and select major dams (1931-1954) had a Delta outflow-inflow ratio of 0.88. Post-completion of most components of the State Water Project (1981-2015) the Delta outflow-inflow ratio was 0.75[9]. **Target:** • ~~Allow for >17,000 acres of Yolo Bypass inundation for 14 or more consecutive days between December and March in at least two out of three years.~~ • ~~At least one spring flow event 5 to 10 times winter base flow each year in the Sacramento River.~~ • ~~Not to exceed daily drops in flow >10%.~~ • By 2030, allow for at least 17,000 acres of inundation for at least 14 days in two out of three years and at least 21 days in one out of two years, between November 1 and March 15[10]. • By 2030, at least one peak flow greater than 75,000 CFS and lasting at least 48 hours in duration, every two years[11]. • By 2030, daily decrease in flow will be less than 3.5% per day, as calculated by a five-day rolling average during the period of spring flow recession, in at last 1 out of 5 years[12] • By 2030, (1) 10-year rolling average slope of Delta outflow-inflow ratio is greater than zero (i.e. positive), and (2) Annual average Delta outflow-inflow ratio in dry and critically dry years is greater than 0.5[13].
4.10	Outcome	Prevention and reduction of key nonnative terrestrial and aquatic invasive species in the Delta and Suisun Marsh. ~~Progress toward managing aquatic and terrestrial invasive nonnative species in the Delta over the next decade. Long-term animal and plant monitoring surveys will be conducted by the Interagency Ecological Program agencies, the California Department of Boating and Waterways, the U.S. Department of Agriculture, the San Francisco Estuary Institute, and others.~~ (Strategy 4.4) **Metrics:** Metrics are to be evaluated annually:

[5] Discharge for gage stations below Shasta Dam can be accessed from the USGS: https://waterdata.usgs.gov/nwis/uv/?referred_module=sw
[6] This baseline reflects the existing Fremont Weir configuration as of 2017.
[7] DWR 2016, Central Valley Flood Protection Plan Conservation Strategy, Appendix H, Tables 3-1 and 4-1.
[8] Michalkova et a. 2011, Contantine 2006, and Micheli et al. 2011.
[9] Delta inflow and Net Delta Outflow Index estimates for the period of 1929-1955 can be retrieved from DWR: http://www.water.ca.gov/dayflow/
[10] This performance measure may be refined to ensure consistency with the State Water Resources Control Board update of the Bay-Delta Water Quality Control Plan.
[11] This performance measure may be refined to ensure consistency with the State Water Resource Control Board update of the Bay-Delta Water Quality Control Plan.
[12] Target recession rate informed by research and analyses conducted for the Environmental Flows Tool (Alexander et al. 2014) and Stillwater Sciences (2007).
[13] Following the State Water Resources Control Board's completion of updates to the Bay-Delta Water Quality Control Plan, this performance measure will be reevaluated for consistency with the Board's regulations.

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• Number of key new nonnative invasive species of fish, plants, and invertebrates establishing populations in the Delta (e.g., quagga and zebra Mussels, Hydrilla verticillata, and others as they are identified). • Managing nonnative fish: - Percent of the total biomass of fish that are native fish species based on USFWS beach seine surveys (and other relevant surveys). ~~Number of newly identified nonnative fish species.~~ - Percent of total relative abundance that are native species in the Delta and Suisun Marsh based on USFWS beach seine surveys (and other relevant surveys). ~~- Relative abundance of individual native fish and individual nonnative fish in the Delta.~~ • Managing invasive nonnative vegetation: - Number of acres treated for invasive plants as defined by individual plans and projects (e.g., CVFPP Conservation Strategy, Arundo control project, DBW control program, etc.).~~Number of newly identified invasive nonnative plant species reported in the Delta.~~ - Coverage, in acres, of invasive nonnative plant species (e.g., Eichhornia crassipes, Ludwigia hexapetala, Egeria densa, Arundo donax and Phragmites australis) in the Delta and Suisun Marsh. **Baseline:** • Species reported as established in the Delta prior to 2013 (Delta Plan adoption) will be used to base identification of new invasive species establishing post-2013. • Fish: - Average percent of total fish biomass that are native fish species based on USFWS beach seine surveys from the period of 1995-2015. ~~Number of new invasive nonnative species set at zero.~~ • Vegetation: - Number of acres treated set at zero as of 2013. - Coverage estimates in acres for nuisance nonnative aquatic plant species based on available hyperspectral and Landsat remote sensing surveys conducted in the - Delta during the period of 2003-2016. Arundo surveys conducted for the Delta Conservancy in 2015. Suisun Marsh vegetation surveys conducted between 1999 and 2013.~~Abundance or coverage of existing specific nonnative species set at the adoption of the Delta Plan May 2013.~~ **Target:** Targets to be achieved by 2030: • Fish: - 20% increase in the biomass of the native inshore fish community, relative to total fish biomass. - 20% increase in the relative abundance of the native inshore fish community, relative to total relative abundance. • Vegetation: - Acreage targets for treatment of invasive plants as defined by individual plans and projects: ▪ 680 acres within lower Sacramento[14] ▪ 800 acres within lower San Joaquin[14] ▪ 15 acres in the Cache Slough Complex (Arundo control project) • A 50% reduction in peak nonnative invasive plant species coverage (acres) for the following species: *Eichhornia crassipes, Ludwigia hexapetala, Egeria densa, Arundo donax, Rubis armenicus, Lepidium latifolium,* and *Phragmites australis*. • ~~Trends for:~~ ~~- Decreasing relative abundance of nonnative/introduced fish.~~ ~~- Decreasing the number of newly identified nonnative fish species.~~ ~~- Decreasing the number of newly identified invasive nonnative plant species.~~ ~~- Decreasing coverage of invasive nonnative plant species.~~

[14] See the 2016 Draft Central Valley Flood Protection Plan Conservation Strategy for more details: http://www.water.ca.gov/conservationstrategy/docs/cs_draft.pdf

Delta Plan Performance Measures

Delta Plan Chapter 5: Protect and Enhance the Unique Cultural, Recreational, Natural Resource, and Agricultural Values of the California Delta as an Evolving Place

- **Administrative** performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- **Output** (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- **Outcome** performance measures evaluate responses to management actions or natural outputs.

Strategies supporting this chapter:

1. Designate the Delta as a Special Place
2. Plan to Protect the Delta's Lands and Communities
3. Maintain Delta Agriculture
4. Encourage Recreation and Tourism
5. Sustain a Vital Delta Economy

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
5.2	Outcome	~~The Department of Water Resources and others increase the extent of their subsidence reversal and carbon sequestration projects to 5,000 acres by January 1, 2017. (Strategy 5.2)~~ Increase acres with subsidence reversal or carbon sequestration practices. (Strategy 5.2) **Metrics:** • Acres of subsidence reversal and carbon sequestration projects, evaluated annually. **Baseline:** • Set at zero as of 2008. **Target:** • ~~5~~30,000 acres by January 1, 203017~~~~ (905 acres were converted in 2008-2011 and will be included towards meeting the target).
5.3	Outcome	~~Prevent further Delta rural farmland loss to urban development in areas designated for agricultural use in Delta Plan regulations.~~ No change in agricultural land use due to urban development from 2013 to 2025. ~~Track conversions of farmland to habitat restoration areas.~~ (Strategy 5.2, 5.3) **Metrics:** Metrics to be evaluated annually: • ~~Acres of farmland lost to urban development.~~

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• ~~Acres of farmland lost to urban development within areas designated for agricultural use in the Delta Plan regulations.~~ • ~~Acres of farmland converted to habitat restoration.~~ • Conversion of farmland acres to urban development, evaluated in conjunction with updates to the Farmland Mapping and Monitoring Program[15]. • Conversion of land designated for agricultural use to urban land use under General Plan land designations, evaluated annually. **Baseline:** • Number of acres of Delta ~~rural~~ farmland designated for agriculture in Delta Plan regulations at the time of Delta Plan adoption in May of 2013. **Target:** • ~~Zero acres of farmland lost to urban development within areas designated for agricultural use in the~~ By 2025, no conversion of farmland to urban development as defined by Delta Plan regulations.
~~5.4~~	~~Output~~	~~Water management, ecosystem restoration, and flood management projects minimize conflicts with adjoining uses by avoiding, minimizing, or mitigating adverse effects. (Strategy 5.2)~~ ~~**Metrics:**~~ • ~~Percent of projects that avoid, minimize, or mitigate adverse effects to less than significant levels.~~ ~~**Baseline:**~~ • ~~This performance measure was developed during the adoption of the Delta Plan (May 2013) with the primary purpose of measuring consistency with the Delta Plan, setting the baseline at May 2013.~~ ~~**Target:**~~ • ~~100% consistency with the Delta Plan measured on an annual basis.~~
5.5	Output	~~Progress toward p~~P repar~~e~~~~ing~~ and implement~~ing~~ plans for the vitality and preservation of each Delta legacy community. (Strategy 5.2) **Metrics:** • Number of community action plans ~~projects~~ adopted and initiated to achieve legacy community Delta Plan objectives, evaluated annually. **Baseline:** • Set at zero as of the Delta Plan's adoption date, May 2013. **Target:** • All legacy communities have plans adopted by 2021. • 25% implementation of plan objectives achieved by 2025. • ~~Upward trend in the number of completed projects that improve community vitality.~~

[15] As identified in the Farmland Mapping and Monitoring Program (FMMP), including Prime Farmland, Unique Farmland, Farmland of Statewide Importance, Farmland of Local Importance, and Grazing Land. Department of Conservation (http://www.conservation.ca.gov/dlrp/fmmp)

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
5.6	Outcomeput	~~Track the extent to which~~ Increase in regional recreation opportunities throughout the Delta and Suisun Marsh. ~~recreation facilities are included in new ecosystem restoration projects~~. (Strategy 5.4) **Metrics:** • ~~Percent~~ Number of regional Recreation Proposal recommendations and outcomes implemented within the Delta and Suisun Marsh, evaluated annually[16] ~~of new ecosystem restoration projects that include recreational facilities~~. **Baseline:** • Measured as of the date of the regional Recreation Proposal completion ~~Delta Plan's adoption, May~~ 2011~~3~~. **Target:** • ~~Increasing trend in the percentage of~~ Implementation of the recommendations and outcomes put forward within the Recreation Proposal, to be achieved by 2025.~~of new ecosystem restoration projects that include recreation facilities.~~
~~5.7~~	~~Outcome~~	~~Value-added crop processing trends. (Strategy 5.3)~~ ~~**Metrics:**~~ • ~~Revenues (dollars) associated with value-added crop processing.~~ ~~**Baseline:**~~ • ~~Measured as of the date of the Delta Plan's adoption, May 2013.~~ ~~**Target:**~~ • ~~Upward trend as measured by the metric above.~~
5.8	Outcome	Increase in Delta recreation and tourism trends[17]. (Strategy 5.4) **Metrics:** Metrics evaluated annually: • Acres of accessible state and federal owned land to the public for recreation and tourism. • Length (linear feet) of shoreline accessible for public recreation. • Number of fishing licenses bought per year by county. • Number of first-time visitors. • Number of off-season visitors. • Number of website views and social media traffic. • Number of existing and new visitor engagement.

[16] Recommendations and outcomes proposed by California Department of Parks and Recreation in Recreation Proposal for the Sacramento-San Joaquin Delta and Suisun Marsh per 2009 Delta Reform Act legislative directive (http://www.parks.ca.gov/?page_id=26677).

[17] Data will be tracked as part of the collaboration between the Delta Marketing Task Force, Sacramento-San Joaquin Delta Conservancy, Delta Protection Commission, and Delta Stewardship Council in efforts to implement the objectives of the *Delta Tourism Awareness 5-year Marketing Plan*, released February 2017: http://deltaconservancy.ca.gov/wp-content/uploads/2015/06/AI-12.2-Marketing-Plan-Design_Complete-20170224.pdf

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		Baseline: • Measured as of ~~the date of the Delta Plan's adoption, May 2013.~~ April 2017. **Target** • Increase of 5 percent for each metric from the prior year, over a 5-year period beginning from the performance measure adoption. ~~Upward trend as measured by the metrics above.~~
5.9	Outcome	~~Delta industrial, agricultural, and recreational economic trends~~. Improvement in the Economic Opportunity Index within the Delta[18]. (Strategy 5.3, 5.5) **Metrics:** Metrics to be evaluated every 5 years: • ~~Tonnage of port cargo.~~ • ~~Agriculture revenue (dollars).~~ • ~~Recreation spending (dollars).~~ • Economic Opportunity Index for People and Place in the Primary Zone, and Secondary Zone (score) **Baseline:** • Measured as of 2012. ~~the date of the Delta Plan's adoption, May 2013.~~ **Target:** • Economic Opportunity Index for People and Place (score) within the Delta increases to next opportunity category by 2025. • ~~Upward trend as measured by the metrics above.~~

[18] Developed by Center for Regional Change at UC Davis; this index incorporates 33 indicators that measure relative opportunity or both people and the places in which they live, and focus on six broad domains: education, economy, housing, transportation/mobility, health/environment, and civic engagement.

Delta Plan Performance Measures

Delta Plan Chapter 6: Improve Water Quality to Protect Human Health and the Environment

- **Administrative** performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- **Output** (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- **Outcome** performance measures evaluate responses to management actions or natural outputs.

Strategies supporting this chapter:

1. Require Delta-Specific Water Quality Protection
2. Protect Beneficial Uses by Managing Salinity
3. Improve Drinking Water Quality
4. Improve Environmental Water Quality

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
6.1	Outcome	~~Water quality in the Delta and Suisun Marsh meets the San Francisco, Central Valley, and Bay-Delta Water Quality Control Plan objectives. (Strategy 6.1)~~ ~~**Metrics:**~~ • ~~The reduction in the number of impaired water bodies on the 303(d) list.~~ ~~**Baseline:**~~ • ~~Measured as of the date of the Delta Plan's adoption, May 2013.~~ ~~**Target:**~~ • ~~- Water quality objectives in the respective Water Quality Control Plans listed are met.~~ ~~- TMDLs are being developed and Basin Plan amendments are being implemented for those water bodies not meeting water quality objectives (i.e., those listed under the Clean Water Act 303 (d) list).~~ Water quality in the Delta and Suisun Marsh meets the standards of the Clean Water Act. Metrics: • The number of Delta watershed waterbody – pollutant combinations on the 303(d) list, evaluated every 8 years within the State Water Resources Control Board Integrated Report. Baseline:

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• Measured as of the 2010 Integrated Report[19]. Target: Reduction of 40% of the waterbody – contaminant combinations on the 303(d) list by 2034.
6.2	Outcome	~~Monitor salinity in the Delta, utilizing extensive existing electrical conductivity and chloride concentration (D-1641) and X2 measurement data that correspond to~~ Water management agency compliance with State Water Resources Control Board objectives for salinity in the Delta for (D-1641) and X2[20]. (Strategy 6.2) **Metrics:** • ~~Daily~~ Monthly electrical conductivity (and temperature), ~~chloride concentration,~~ and X2 in the Delta, evaluated annually. **Baseline:** • Average ~~annual~~ monthly electrical conductivity (and temperature) and X2 at compliance points ~~salinity levels~~ from 1995 to 2015. **Target:** • Targets are to be achieved upon the adoption of these performance measures[21]: - Water management agencies meet~~ing~~ State Water Resources Control Board salinity objectives for ecosystem purposes at least 99% of the time at compliance points. - Water management agencies meet~~ing~~ all other State Water Resources Control Board salinity objectives for urban and agricultural beneficial use at least 99% of the time at compliance points. - Water management agencies maintain average X2 for September and October at or less than 74 km in the fall following wet years and at or less than 81 km in the fall following above normal years. The monthly average X2 must be maintained at or seaward of these values for each individual month and not averaged over the two-month period.[22]

[19] State Water Resources Control Board, 2010 Integrated Report - Clean Water Act Section 303(d) List/305(b) Report (http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml); to be prepared on a tri-region cycle every 2 years; data available for each region on an 8-year interval.
[20] X2 is the distance from the Golden Gate to the point where daily average salinity is 2 parts per thousand at 1 meter off the bottom. (Jassby et al., 1995). http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/usdoi/spprt_docs/doi_jassby_1994.pdf
[21] The targets are to be met during periods when Temporary Urgency Change Petitions (TUCPs) are not in effect (e.g., TUCPs may be in effect during severe drought).
[22] The standards of 74 km in wet years and 81 km in above normal years are designed to mitigate the effects of X2 encroachment upstream in current and proposed action operations, and provide suitable habitat for organisms using this low salinity region. The target is referenced from the Biological Opinions: https://www.fws.gov/sfbaydelta/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf.

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
6.3	Output	~~The Department of Water Resources~~ Implementation of ~~begins constructing~~ the North Bay Aqueduct Alternate Intake Project to improve water quality and to provide reliable water deliveries ~~as soon as possible after the environmental impact report is completed~~. (Strategy 6.3) **Metrics:** • Project status ~~completed~~. **Baseline**: • The Notice of Preparation for the North Bay Aqueduct Alternate Intake Project Environmental Impact Report was published on November 24, 2009. **Target:** • The Department of Water Resources would begin constructing the North Bay Aqueduct Alternate Intake Project~~'s~~ by the end of 2019. ~~final Environmental Impact Report projected date is September/October 2016.~~
6.4	Output	Protect groundwater beneficial uses. Groundwater meets drinking water quality standards in the Delta ~~Central Valley~~[~~23~~] for levels of nitrate (≤10 ppm NO3-N) and arsenic (≤10 ppb As). (Strategy 6.3) **Metrics:** • Number of groundwater wells used for drinking~~domestic~~ water supply that exceed arsenic and/or nitrate drinking water limits, evaluated every 5 years ~~in the San Joaquin Valley~~. • ~~Percentage of population with access to clean drinking water in the San Joaquin Valley.~~ **Baseline:** • Number of wells within the Delta which exceed 2008 ~~W~~California water quality standards ~~in the Central Valley~~ for levels of nitrate not to exceed (10 ppm NO3-N) and arsenic not to exceed (10 ppb As) between the years of 2001 and 2013. • ~~Baseline of population with access to clean drinking water in the Central Valley will be established once this performance measure is adopted.~~ **Target:** • ~~Maintain or reduce~~ A fifty percent reduction in the number of wells exceeding nitrate and arsenic standards~~levels~~ from baseline levels using historical data (2001-2013), by 2025. • ~~Increase percent of population with access to clean drinking water in the Central Valley from baseline.~~
6.5	Outcome	~~Progress toward c~~ Consistently meeting applicable dissolved oxygen (DO) standards in the Delta by 2020 (i.e., Stockton Deep Water Ship Channel, Suisun Marsh, and Old and Middle River). (Strategy 6.4) **Metrics:** Progress of PM metrics are to be evaluated annually: • Milligrams of DO per liter of water (mg/L). • Continuous, real-time DO measurements made at multiple locations throughout the Delta. **Baseline:** • Measured as of the date of the Delta Plan's adoption, May 2013. **Target:**

[~~23~~] ~~This performance measure refers to the San Joaquin Valley because many residents of this region rely on impaired groundwater for drinking water and have limited access to clean surface water that is exported from the Delta watershed.~~

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• Targets to be proceeded upon the adoption of this performance measure: - Meet water quality objectives for DO in the Stockton Deep Water Ship Channel, Suisun Marsh, and Old and Middle River. - Maintain or exceed the minimum DO concentrations of: • 5 mg/L daily average~~at all times~~ everywhere in the Delta. • 6 mg/L daily average from September through November ~~only~~ in the San Joaquin River between Turner Cut and Stockton.
6.7	Output	Reduction in number of ~~TMDLs for~~ critical pesticides ~~(e.g., diazinon, chlorpyrifos, and pyrethroids)~~ in the waters and sediments of the Delta and Suisun Marsh. ~~are met by 2020~~. (Strategy 6.4) **Metrics:** • The number of Delta watershed waterbody-pesticide combinations on the 303(d) list, as evaluated every 8 years within the State Water Resources Control Board Integrated Report. • ~~Progress in developing and meeting TMDLs.~~ **Baseline:** • Number of waterbody – pesticide combinations on the 303(d) list reported in the 2010 Integrated Report[24] • ~~December 2004 monitoring baseline data to align with USEPA TMDL report.~~ **Target:** • Zero Delta watershed waterbody-pesticide combinations on the 303 (d) list by 2034. • ~~As defined within applicable TMDL and published in the Central Valley Regional Water Quality Control Board amendments to the Water Quality Control Plan for the control of diazinon and chlorpyrifos runoff into the Sacramento-San Joaquin Delta (June 2006). Target date is defined in the Delta Plan as year 2020. Other compliance dates are defined in management plans submitted by dischargers. Following are in micrograms/liter:~~ ~~- Chlorpyrifos:~~ ~~• 0.025 µg/L, acute, 1-hour average~~ ~~• 0.015 µg/L, chronic, 4-day average~~ ~~• Not to be exceeded once in a three-year period~~ ~~- Diazinon:~~ ~~• 0.16 µg/L, acute, 1-hour average~~ ~~• 0.10 µg/L, chronic, 4-day average~~ ~~• Not to be exceeded once in a three-year period.~~ • ~~Pyrethroids: Target pending the adoption of the Pyrethroid Control Program into the Water Quality Control Plan for the Sacramento San Joaquin River Basins by 2017.~~

[24] The State and Regional Water Boards asses water quality data for California's waters every two years to determine if they contain pollutants and if they are exceeding water quality standards. The report is required under the Federal Clean Water Act. For more information please refer here: http://www.waterboards.ca.gov/water_isseus/programs/tmdl/intergrated2010.shtml

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
6.8	Output	~~Progress toward r~~Reducing concentrations and/or loads of bio-stimulatory substances ~~(ammonium, nitrate, and phosphate)~~ in Delta waters ~~over the next decade~~. (Strategy 6.4) **Metrics**: • Concentration and/or loads of bio-stimulatory substances (inorganic nutrients such as ammonium, nitrate, and phosphate) at key Delta water quality monitoring locations, evaluated annually. **Baseline**: • ~~Nutrient~~ Bio-stimulatory substance concentrations, loads, and trends during the period of 2004-2013. **Target:** Meet the limits and targets identified by the Delta Nutrient Science and Research Program[25] by 2027. ~~Water shall not contain biostimulatory substances which promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses~~.
6.9	Outcome	~~Trends in measurable~~Measurable reduction in positive toxicity tests using standard methods ~~toxicity~~ from pesticides~~, including herbicides, insecticides, and fungicides,~~ and other pollutants in Delta water ~~will be downward~~ by 2025~~over the next decade~~. (Strategy 6.4) **Metrics:** • ~~Measurable t~~Toxicity testing using standard methods approved by the USEPA for fish, invertebrates, and ~~the USEPA approved test methods for~~ algae. • Toxicity in sediments and benthic invertebrates as measured by the State Water Resources Control Board. **Baseline:** • Toxicity in fish, invertebrates, and algae using 2017 levels. • ~~Trends associated with~~ Toxicity as measured in sediment and benthic invertebrates using 2008 levels as measured by the State Water Resources Control Board[26]. ~~(The Stream Pollution Trends Monitoring Program monitors trends in toxicity and pollution of California waters and was implemented in 2008.)~~ **Target:** • Zero toxicity in fish, invertebrates, and algae from pesticides and other contaminants as determined by standard methods for Delta waters by 2034. • Zero toxicity in sediment and benthic invertebrates for Delta by 2034. ~~Downward trend of measurable toxicity results for Delta water bodies.~~
6.10	Outcome	~~Trends in the abundance and s~~ Reduced spatial coverage of freshwater harmful algal blooms in select waterbodies in the Delta. (Strategy 6.1 and Strategy 6.4) **Metrics:** Progress of PM metrics are to be evaluated annually: • Spatial coverage (acres) of Microcystis sp. cell concentration equivalents (cells/ml), in select Delta waterbodies (e.g., Discovery Bay, South Delta along Grantline Canal and Old River surrounding Fabian Tract, Big Break Regional Shoreline, and San Joaquin River between Antioch and Stockton) with densities of 100,000 cell/ml[27] or greater. • ~~Aerial distribution estimates of harmful algal blooms (e.g., microcystis), by acres in the Delta.~~ • ~~Abundance of harmful algal blooms (e.g., microcystis) in the Delta.~~

[25] The State and Regional Water Resources Control Board are finalizing research prioritization and scientific work which will provide the foundation for interim targets addressing bio-stimulatory substances (e.g. Delta Nutrient Research Plan, Biological Integrity Assessment Project, and Bio-stimulatory Substances Project to be completed in 2018). Future evaluation of targets may be required in the case of rulemaking processes and resulting regulations by SWRCB. (http://www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/delta_nutrient_research_plan/)
[26] The Stream Pollution Trends Monitoring Program monitors trends in toxicity and pollution of California waters and was implemented in 2008.
[27] The tool for maintaining spatial images and cell count can be found through the SWRCB Cyanobacteria and Harmful Algal Bloom Network page:

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		Baseline: • Spatial coverage (acres) based on satellite images during the period of 2016-2017[28]. • ~~Sighting records with the Department of Water Resources during the period of 1999-2000.~~ **Target:** Target to be achieved by 2023. • Zero acres of waterbodies with densities of 100,000 cells/ml[29]. • ~~Downward trend in abundance and spatial coverage of harmful algal blooms over the next decade.~~
6.11	Outcome	~~Trends in the spatial distribution and coverage of nuisance nonnative aquatic plants Delta. (Strategy 6.1 and Strategy 6.4)~~ ~~• Metrics:~~ ~~• Acreage of invasive aquatic plants in the Delta (e.g., water hyacinth and others as data becomes available).~~ ~~• Baseline:~~ ~~• 2000-2004 University of California Davis hyacinth monitoring surveys.~~ ~~• Target:~~ ~~• Downward trend in water hyacinth acreage over the next decade.~~

http://www.mywaterquality.ca.gov/habs/where/satellite.html. The tool is expected for release November 2017 and baseline satellite images will begin between 2016-2017.

[28] The State Water Resources Control Board is in the process of finalizing an interactive mapping tool used for displaying estimated concentrations of cyanobacteria in large water bodies. The satellite tool will be using data from the new Sentinel3b satellite, which detects the absorption by chlorophyll in phytoplankton and provides an estimate of chlorophyll-a concentration, and can detect the presence of phycocyanin. This data can then be used to calculate the portion of the biomass associated with cyanobacteria and non-cyanobacteria. Estimates for the average baseline reported between 2016-2017 will be calculated upon the tool's release date (expected November 2017).

[29] Cell densities exceeding 100,000 cells/ml threshold constitute a High risk exposure with increased probability of irritative symptoms of exposure and potential health impacts. See the WHO guideline values for relative probability of acute health effects.

Delta Plan Performance Measures

Delta Plan Chapter 7: Reduce Risk to People, Property, and State Interests in the Delta

- **Administrative** performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- **Output** (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- **Outcome** performance measures evaluate responses to management actions or natural outputs.

Strategies supporting this chapter:

1. Continue to Prepare for Delta Emergencies
2. Modernize Levee Information Management
3. Prioritize Investment in Delta Levees
4. Update Flood Management Funding Strategies
5. Manage Rural Floodplains to Avoid Increased Flood Risk
6. Protect and Expand Floodways, Floodplains, and Bypasses
7. Renew Assurances of Federal Assistance for Post-Disaster Levee Reconstruction
8. Limit State Liability

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
7.2	Outcome	~~Trends in loss of life in the Delta as a result of flood emergencies, and economic damages associated with Delta flood emergencies~~ Decrease in expected annual fatalities and expected annual property damages from flood emergencies in the Delta. (Strategy 7.1) **Metrics:** • ~~Number of lives lost in the Delta as a result of flood emergencies.~~ • Expected Annual Fatalities (EAF) in the Delta. This will be evaluated at least every five years. • ~~Dollars of National Flood Insurance Program (NFIP) claims in the Delta.~~ • Expected Annual Damages (EAD) in the Delta. This will be evaluated at least every five years. **Baseline:** • ~~Number of lives lost within the Delta in recent history is zero according to the National Oceanic and Atmospheric Administration's Storm Events Database.~~ • EAF for the Delta using best available data as of 2017, as reported in the Delta Levees Investment Strategy final report. • ~~NFIP claims can date back as far as the initial NFIP Flood Insurance Rate Maps for a given area. Some areas of the Delta have maps dating back as far as 1978.~~ • EAD for the Delta using best available data as of 2017, as reported in the Delta Levees Investment Strategy final report. **Target:** • ~~Zero lives lost from floods.~~

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• 50% decrease in EAF by 2025 • ~~Reduction in dollars of NFIP claims.~~ • 50% decrease in EAD by 2025
7.3	Output	Level of flood risk reduction provided by Delta levees. (Strategy 7.3) **Metrics:** • ~~Percent of urban area in the Delta protected by levees meeting the Federal Emergency Management Agency's (FEMA's) 100-year protection standard.~~ Percent of urban communities in the Delta protected by levees meeting DWR's urban level of flood protection criteria. This will be evaluated at least every five years. • Percent of rural Delta ~~lands~~ islands and tracts protected by levees at or above the Bulletin 192-82/PL 84-99 standard. This will be evaluated at least every five years. **Baseline:** • ~~Percent of urban area in the Delta protected by levees meeting FEMA's 100-year protection standards and percent of Delta land protected by levees at or above the PL 84-99 standard at the time of Delta Plan adoption, May 2013.~~Percent of urban communities in the Delta protected by levees meeting DWR's urban level of flood protection criteria as of completion of the Delta Levees Investment Strategy. • Percent of rural Delta islands and tracts protected by levees at or above the Bulletin 192-82/PL 84-99 standard as of completion of the Delta Levees Investment Strategy. **Target:** • ~~Target pending completion of the Delta Levees Investment Strategy.~~ 100% of urban communities in the Delta are protected by levees meeting DWR's urban level of flood protection criteria by 2025. • 100% of the rural Delta islands and tracts are protected by levees at or above the Bulletin 192-82/PL 84-99 standard by 2050.
7.7	Outcome	~~Trends in eligibility for federal reimbursement of emergency response and recovery costs~~ Increase in community credit points in National Flood Insurance Program (NFIP) Community Rating System. (~~Strategy 7.3 and~~ Strategy 7.~~8~~7) **Metrics:** • ~~Miles of levee active in the U.S. Army Corps of Engineers' Rehabilitation and Inspection Program.~~ • ~~NFIP market penetration in the Delta.~~ • ~~Ratings~~ Community Rating System credit points of Delta communities participating in the NFIP ~~Community Rating System~~. This will be evaluated at least every five years. **Baseline:** • ~~Miles of levee active in the Rehabilitation and Inspection Program, NFIP market penetration, and c~~Community Rrating System credit points at the time of Delta Plan adoption, May 2013 or nearest available date. **Target:** • ~~Increasing trend.~~ 1% increase in Community Rating System credit points by 2025.
7.1	Output	Responsible local, State, and federal agencies with emergency response authority implement the recommendations of the Sacramento-San Joaquin Delta Multi-Hazard Coordination Task Force (Water Code section 12994.5) by end of 2018. ~~January 1, 2014~~. (Strategy 7.1) **Metric:** • Percent of recommendations implemented. This will be evaluated annually. **Baseline:** • 0% (0/11) of recommendations implemented. **Target:**

Ref. #	Type	Proposed PM Track Changes Since February 2016 Adoption
		• 100% (11/11) of recommendations implemented by the end of 2018.
7.5	Outcome	Water delivery interruptions by floods or earthquakes in the Delta. (Strategy 7.3) **Metrics:** • Number of water delivery interruptions caused by floods or earthquakes in the Delta. This performance measure will be assessed following any major floods or earthquakes in the Delta. • Acre-feet of water not delivered due to disruptions caused by floods or earthquakes in the Delta. This performance measure will be evaluated following any major floods or earthquakes in the Delta. **Baseline:** • N/A because this measure has a prescribed target and is not showing a change from a baseline. **Target:** • No water delivery interruptions. This target is to be achieved upon the adoption of this performance measure.
7.6	Output	Consideration of sea level rise in flood protection planning for new residential development in the Delta. (Strategy 7.5 ~~7.4~~) **Metric:** • Number of proposed actions covered by the Delta Plan policy to require flood protection for residential development in rural areas (RR P2). This performance measure will be evaluated as covered actions are submitted. **Baseline:** • N/A because this measure has a prescribed target and is not showing a change from a baseline. **Target**: • 100% of proposed actions to which RR P2 are applicable meet the requirements of RR P2. This target is to be achieved upon the adoption of this performance measure.

Delta CSO Amendment