Attachment 1

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
CALIFORNIA ENDANGERED SPECIES ACT

INCIDENTAL TAKE PERMIT NO. 2081-2019-066-00

PERMITTEE: **California Department of Water Resources**

PROJECT: **Long-term Operation of the State Water Project in the Sacramento-San Joaquin Delta**

PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the Department of Fish and Wildlife (CDFW) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by CDFW is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to CDFW on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

VERIFICATION OF COMPLIANCE, EFFECTIVENESS

CDFW may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

TABLE OF MITIGATION MEASURES

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
GENERAL PROVISIONS					
1	Designated Representative. Within one month of the effective date of this ITP, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing within one month the effective date of this ITP of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP.	ITP Condition # 6.1	Within one month of effective date of the ITP	Permittee	
2	Designated Biologist. Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of a biological monitor (Designated Biologist) within 30 days of the effective date of this ITP. Permittee shall ensure that the Designated Biologist is knowledgeable and experienced in the biology and the natural history of the Covered Species. The Designated Biologist shall be responsible for monitoring Covered Activities described in Condition of Approval 7.7 to help minimize or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist in writing, and shall also obtain approval in advance in writing if the Designated Biologist must be changed.	ITP Condition # 6.2	Within one month of effective date of the ITP	Permittee	
3	Designated Biologist Authority. To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall have authority to immediately stop any activity that does not comply with this ITP, and to order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species.	ITP Condition # 6.3	Throughout the term of the ITP	Permittee	
4	CDFW Access. Permittee shall provide CDFW staff with reasonable access to the Project facilities and mitigation lands under Permittee control, and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP.	ITP Condition # 6.4	Throughout the term of the ITP	Permittee	
MONITORING, NOTIFICATION, SCIENCE AND REPORTING PROVISIONS					
5	Notification of Non-Compliance. The Designated Representative shall immediately notify CDFW in writing if it determines that the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and the MMRP. The	ITP Condition # 7.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Designated Representative shall report any non-compliance with this ITP to CDFW within 24 hours.				
6	Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than December 1 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. The ASR shall summarize information from the prior water year October 1 through September 30. Each ASR shall include, at a minimum: (1) a copy of the table in the MMRP with notes showing the current implementation status of each Condition of Approval and mitigation measure; (2) a copy of all SWP and CVP salvage data collected from the prior water year; (3) reports of inspections and maintenance of fish protective equipment; and (4) an assessment of the effectiveness of each completed or partially completed Condition of Approval mitigation measure in avoiding, minimizing, and mitigating Project impacts.	ITP Condition # 7.2	Throughout the term of the ITP	Permittee	
7	Final Mitigation Report. No later than 45 days after completion of all mitigation measures or 90 days prior to the expiration of this ITP (whichever is sooner), Permittee shall provide CDFW with a Final Mitigation Report. The Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (6) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (7) any other pertinent information.	ITP Condition # 7.3	No later than 90 days prior to the expiration date of the ITP	Permittee	
8	Skinner Fish Facility Operations. Permittee shall work in collaboration with CDFW to ensure essential information on salvage at the Skinner Fish Facility continues to be collected, verified for accuracy and quality, and reported to CDFW. CDFW will provide routine and regular oversight on operations as related to fish identification, handling, care, and transport to maintain appropriate compliance with ITP requirements (see Condition of Approval 8.15). This is both an essential data source for Conditions of Approval 8.1.5, 8.1.5.1, 8.5.1.2, 8.3.3, 8.4.1, 8.4.2, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7 as well as an important performance measure of their effectiveness. In addition, information on daily OMR flows and daily salvage are essential to ensure that the Conditions of Approval in this ITP are implemented effectively. Permittee shall continue to provide daily data sheets with preliminary salvage data from the SWP and CVP fish salvage facilities to CDFW no later than noon the following day, and final data shall be included in each ASR submitted to CDFW (Condition of Approval 7.2).	ITP Condition # 7.4	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
9	Maintenance and Inspection Reporting. Permittee shall submit annual reports that describe regular inspections and maintenance of fish protective equipment at the Skinner Fish Facility that may affect screening and salvage efficiencies to CDFW each year as a part of the ASR (see Condition of Approval 7.2). Additionally, each time Permittee inspects or conducts maintenance on fish protective equipment they shall report the activities to CDFW staff assigned to support salvage facility operations (see Condition of Approval 8.15) verbally or via email as soon as feasible, but no later than 24 hours after each instance.	ITP Condition # 7.4.1	Throughout the term of the ITP	Permittee	
10	Skinner Fish Facility Operations Manual. Permittee shall ensure the existing salvage monitoring and reporting program samples no less than 30 minutes every two hours from November 1 through June 30. If the presence of large number of fish or debris may result in the loss of Covered Species in the salvage monitoring process, Permittee may operate to the existing reduced sampling time protocols for such circumstances (see Skinner Fish Facility Operations Manual v 2.0 October 19, 2005) and consult with CDFW immediately, or no later than 12 hours after, to discuss options available in real-time to maintain adequate detection of Covered Species when reduced sampling time protocols are being implemented. The salvage process at the Skinner Fish Facility generates one of the largest data sources characterizing entrainment and take of Covered Species with a high amount of sampling effort. Reducing count times greatly reduces the ability to detect fish in the salvage facility sampling process, and often these outages occur concurrent with conditions which may be conducive to entrainment events. The intent of this Condition is to ensure a clear understanding exists between Permittee and CDFW regarding the circumstances in which reduced sampling times are necessary and appropriate, as the data collected from the facilities informs real-time operations such as OMR Management (Conditions of Approval 8.3 through 8.8). Permittee shall work with CDFW to update the Skinner Fish Facility Operations Manual and submit a draft updated manual to CDFW by June 30, 2021 for review. The updated draft operations manual shall include a new protocol for the Skinner Fish Facility which describes the decision-making process prior to reducing sampling times and the protocol used to determine whether Covered Species are present during debris removal efforts. Permittee shall work with CDFW to address comments on the draft manual and submit the final revised Skinner Fish Facility Operations Manual to CDFW for approval before September 30, 2021. Permittee shall operate the Skinner Fish Facility as described in the final CDFW-approved Skinner Fish Facility Operations Manual no more than 15 days after it is approved by CDFW.	ITP Condition # 7.4.2	Throughout the term of the ITP	Permittee	
11	Continue to Refine Loss Equation. Permittee shall continue to refine the loss equation through annual performance evaluation studies for each component of the loss equation, including but not limited to salvage at the Skinner Fish Facility, pre-screen loss, louver (screen) efficiency, and handling and trucking loss. Performance evaluation studies shall	ITP Condition # 7.4.3	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	also include post release survival studies on salvaged fish to evaluate loss associated with predation and reduced fitness as a result of the salvage and release process. Permittee shall work with Reclamation, CDFW, NMFS, and USFWS to develop refined protocols for daily estimation of salvage and loss for CHNWR and CHNSR, including relevant calculations, data, and information sources necessary to perform the relevant calculations used to estimate salvage and loss. Permittee shall update the loss equation with refinement to the loss equation components as approved by CDFW.				
12	Winter- and Spring-run Chinook Salmon Monitoring and Science Requirements. To improve understanding of CHNWR and CHNSR population size, life history diversity, migration patterns, survival rates, habitat use, and impacts from water-operations related stressors, Permittee as part of the AMP shall initiate, fund, and implement new monitoring and science. This new monitoring and science shall include the elements identified in Conditions of Approval 7.5.1, 7.5.2, and 7.5.3, and shall be combined with existing surveys and data to: 1) continue to build knowledge regarding the biology and life history of CHNSR and CHNWR; 2) better understand potential impacts of Project operations on CHNWR and CHNSR; 3) continue to refine the CHNWR juvenile production estimate (JPE); and 4) develop a CHNSR JPE and associated operational criteria that may be proposed to replace Condition of Approval 8.6.4 as a part of the AMP (described in Attachment 2) and a subsequent amendment to this ITP.	ITP Condition # 7.5	Throughout the term of the ITP	Permittee	
13	Upstream Monitoring During Water Transfer Window. CHNSR are vulnerable to redd dewatering and juvenile stranding when flows in tributaries are increased rapidly to initiate a water transfer, then decreased rapidly following the end of a water transfer. Permittee as part of the AMP shall develop a plan to monitor relevant flow rates prior to, during, and after all water transfers and redd distribution, redd dewatering, and juvenile stranding during the Project water transfer window and submit the draft Water Transfer Monitoring Plan to CDFW for approval within six months of the effective date of this ITP. Permittee shall work collaboratively with CDFW to address comments on the draft plan before it is finalized and submitted to CDFW for approval. Permittee shall implement the final Water Transfer Monitoring Plan no more than 30 days after CDFW approval and provide data to CDFW annually thereafter within 30 days of the end of the water transfer window. Additionally, Permittee shall notify the Designated Representative as soon as possible, and no more than 24 hours, after each redd dewatering or juvenile stranding event observed as a part of this monitoring program.	ITP Condition # 7.5.1	Throughout the term of the ITP	Permittee	
14	New and Ongoing Monitoring Required to Develop and Establish a Spring-run Chinook Salmon JPE. Within 30 days of the effective date of this ITP, Permittee as part of the AMP shall convene a Spring-run JPE Team including experts from CDFW, DWR, NMFS, USFWS, and Reclamation. To further advance collaboration, upon convening, the Spring-run JPE team may invite other experts in fish biology, hydrology, or operations of the SWP and CVP to meetings of the Spring-run JPE Team to assist with discussion and analyses.	ITP Condition # 7.5.2	Within thirty days of the effective date of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Permittee shall prepare a draft Spring-run JPE Monitoring Plan in collaboration with the Spring-run JPE Team that describes monitoring required to inform the development of the JPE prior to December 1, 2020. The plan shall include, but not be limited to: • Feather River adult passage monitoring and escapement surveys: Monitoring needed to develop adult spawner abundance estimates from which to derive production estimates. Monitoring includes continuing redd surveys and carcass surveys for CHNSR and collecting genetic samples from all carcasses. • Lower Yuba River adult passage monitoring and escapement surveys: Monitoring needed to develop adult spawner abundance estimates from which to derive production estimates. Monitoring includes continuing adult salmonid passage surveys via the Vaki Riverwatcher at Daguerre Point Dam, redd surveys for CHNSR, upstream of Daguerre Point Dam, and carcass surveys for CHNSR upstream of Daguerre Point Dam. Collect genetic samples from all carcasses. • Deer, Mill, and Butte Creek adult passage monitoring and escapement surveys: Monitoring needed to develop adult spawner abundance estimates from which to derive production estimates. Monitoring includes passage surveys via video monitoring stations on Deer, Mill and Butte creeks, carcass surveys, and redd surveys. • Feather River rotary screw trap monitoring at RM 61 and 45.8: Monitoring to provide estimates of the number of CHNSR emigrating through the upper limits of the Feather River via two existing rotary screw traps located at RM 45.8 (High Flow Channel RST) and RM 61 (Low Flow Channel RST). • Feather River rotary screw trap monitoring near Beer Can Beach: New monitoring near Beer Can Beach (river mile seven) to provide estimates of the number of CHNSR entering the Delta from the Feather River Basin. Data obtained would be used to integrate all Feather River Basin-origin fish into the JPE. The data obtained can also be used as a point of comparison for reach-specific loss estimates from upstream sites when used in conjunction with acoustic telemetry data. • Lower Yuba River rotary screw trap monitoring: Monitoring to provide estimates of the number of CHNSR emigrating through the lower Yuba River via two rotary screw traps located near Hallwood Boulevard. Collect genetic samples on all length-at-date CHNSR. These data can also provide an upstream measurement to assess reach-specific loss estimates in coordination with acoustic telemetry data. • Deer, Mill, and Butte Creek rotary screw trap monitoring: Monitoring needed to develop in-season production estimates and provide data on the egg-to-fry survival and emigration timing of yearling and young-of-year CHNSR. Collect genetic samples on all length-at-date CHNSR. These data can also provide an upstream measurement to assess reach-specific loss estimates in coordination with acoustic telemetry data.				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• Tisdale Weir and Knights Landing rotary screw trap monitoring: Monitoring is needed to provide estimates of the number of CHNSR entering the Delta from the Sacramento River Basin. Collect genetic samples on all length-at-date CHNSR. The data obtained can be used as a point of comparison for reach-specific loss estimates from upstream sites. Weir overtopping and Sutter Bypass activation can influence the detectability of Chinook salmon at the Knights Landing monitoring station. Water entering the Sutter Bypass provides an alternative route in which juvenile salmon are routed around the Knights Landing monitoring station. Monitoring upstream of Tisdale Weir will provide an additional measure of abundance prior to weir influence. • Rotary screw trap acoustic tagging monitoring: Monitoring using acoustic tagged fish to provide estimates of loss and timing of yearling CHNSR emigrants in the fall and emigrating young-of-year CHNSR in the spring at all new and ongoing rotary screw traps. • Genetic identification of CHNSR to support ongoing and new monitoring and development of a CHNSR JPE: Genetic samples shall be collected from all fish (or a subsample of fish where appropriate) and analyzed to race to improve identification of CHNSR-sized fish observed during monitoring and better inform migration and production estimates. Permittee shall coordinate with the CDFW Genetics Lab and NMFS Southwest Fisheries Science Center regarding the methodology for collecting and analyzing all genetic samples. • Trap capture efficiency studies: Research to guide annual CHNSR JPE calculations using current methods of visibly marking trap captured and hatchery sourced fish including late fall-run and fall-run Chinook salmon. Studies should also include developing trap efficiency models using the paired acoustic tagged (AT)-coded-wire tagged (CWT) releases from Livingston Stone National Fish Hatchery (NFH), Colman NFH, and Feather River Hatchery. • A list of the entities that shall receive funding from Permittee to implement required monitoring programs. This list of required monitoring may be modified in the final monitoring plan if approved by CDFW. Permittee shall work collaboratively with the Spring-run JPE Team members to incorporate edits and comments on the draft Spring-run JPE Monitoring Plan while preparing the final plan. After the final Spring-run JPE Monitoring Plan is approved in writing by CDFW, Permittee shall fund and implement required monitoring beginning the calendar year after the effective date of this ITP, according to the timelines specified in the CDFW-approved plan. At a minimum, Permittee shall convene the Spring-run JPE Team quarterly every year following initiation of the final monitoring plan to: • Review data obtained from new and ongoing monitoring programs, • Review methods used to implement monitoring and recommend adjustments as they deem appropriate,				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials

	• Formulate an approach to calculating a CHNSR JPE, including the following elements:
	  o Total in-river escapement,
	  o Adult female estimate,
	  o Adult female estimate minus pre-spawn mortality,
	  o Average fecundity,
	  o Total viable eggs,
	  o Estimated egg-to-fry survival based on Juvenile Production Index (JPI) at ongoing and new monitoring stations/total viable eggs,
	  o Fry equivalents of juvenile production,
	  o Fry-to-smolt survival estimates,
	  o Number of smolts, and
	  o Upper river to Delta survival.
	• Request additional monitoring if it is deemed necessary to complete a CHNSR JPE within five years of the effective date of this ITP,
	• Recommend approaches to using the CHNSR JPE and monitoring results as operational criteria to minimize take of CHNSR as a result of Project operations, including operations at the south Delta export facilities, and
	• Evaluate the need to revise and update the plan to incorporate genetic testing of CHNSR when it becomes available.
	
	Permittee shall make all raw data acquired as a part of the monitoring program available to members of the Spring-run JPE Team within ten days of a request.
	
	Within four years of the effective date of this ITP, and in collaboration with the Spring-run JPE Team, Permittee shall review data collected over the past four years and prepare a draft plan that describes the approach to calculating a CHNSR JPE and long-term monitoring needed to collect the data to calculate a CHNSR JPE annually. Permittee shall submit the draft plan to the Spring-Run JPE Team for review and work collaboratively with team members to incorporate their comments into the final draft. Permittee shall submit the final plan to CDFW for approval no more than four years and six months after the effective date of this ITP to ensure that annual calculation of a CHNSR JPE is initiated within five years of the effective date of this ITP. After the final draft Spring-run JPE Plan is approved by CDFW, Permittee shall convene the Spring-run JPE Team annually to provide an annual JPE estimate for CDFW, Reclamation, USFWS, and NMFS and share all data obtained through long-term monitoring programs.				

15	Winter- and Spring-run Chinook Salmon Science Requirements. Permittee as part of the AMP shall initiate, fund, and implement new science to continue to build knowledge of CHNWR and CHNSR ecology and the status of the ESUs. Permittee shall fund and implement the following scientific studies:	ITP Condition # 7.5.3	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• Pathology Monitoring: Within two years of the effective date of this ITP Permittee shall fund and initiate monitoring to provide information on the source and magnitude of CHNSR loss prior to Delta entry including in-season studies in the Sacramento and Feather Rivers and Delta. Disease has been well documented to be present in the Central Valley and to dramatically reduce production via reduction in adult spawners and egg and juvenile mortality. • Salmon Rearing Habitat in the Bay-Delta: To inform salmonid impact assessments and restoration activities, the Permittee shall fund research activities to investigate juvenile salmonid habitat use in the Delta, Cache Slough, and Suisun Marsh, and subsequently conduct habitat occupancy modeling beginning no later than three years after the effective date of this ITP. This work shall build upon ongoing work funded by the Delta Conservancy (Identifying Suitable Rearing Habitat for Chinook Salmon in the Sacramento-San Joaquin Delta) and Permittee (Juvenile salmon distribution, abundance, and growth in restored and relict Delta marsh habitats). Data collected through this research will also inform ongoing CHNWR lifecycle modeling and the development of a new CHNSR lifecycle model. • Spring-run Chinook Life Cycle Model: Beginning five years after the effective date of this ITP Permittee shall fully fund and support the development of a life cycle model for CHNSR. This life cycle model shall be developed and informed by ongoing and new monitoring described in this ITP, along with other available science. • Winter-run Chinook entrainment prediction tool: Within thirty dates of the effective date of this ITP Permittee and CDFW will convene a technical team to develop a model focused on predicting Chinook salmon entrainment events at the SWP and CVP salvage facilities. Within one year of the effective date of this ITP a CDFW-approved model developed as a part of this technical team shall be provided to Salmon Monitoring Team staff to use as a part of real-time risk assessments alongside other tools described in Condition of Approval 8.1.5.1. Permittee shall work collaboratively with members of the Spring-run JPE Team to review study plans, data, and reports associated with both studies. All final reports documenting the results of these studies shall be subject to CDFW approval.				
16	Longfin Smelt December Larval Surveys. Permittee shall fully fund at least one additional SLS survey and associated sampling and processing costs to be implemented by CDFW staff between December 1 and January 31, annually. The timing of additional SLS surveys shall be determined each year by CDFW Smelt Monitoring Team staff based on observations of LFS in the Chipps Island Trawl beginning on November 1. The additional surveys requested by CDFW Smelt Monitoring Team staff shall use the same sampling methodology as the SLS, however they shall be restricted in spatial extent to the following	ITP Condition # 7.6.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	central and south Delta stations: 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919.				
17	Larval Smelt Entrainment Monitoring. Permittee shall fund and implement a new Smelt Larval Entrainment Program to quantify larval DS and LFS entrainment into CCF. Within ninety days of the effective date of this ITP Permittee shall convene a meeting of CDFW, DWR, USFWS, and Reclamation Smelt Monitoring Team staff to begin planning larval smelt monitoring protocol to fulfill this Condition of Approval. Smelt Monitoring Team staff shall evaluate options to conduct additional larval surveys within CCF and immediately outside CCF to better quantify larval entrainment into CCF. Permittee shall prepare and submit a draft monitoring plan to support a test pilot of the Smelt Larval Entrainment Program to participating Smelt Monitoring Team members for review and comment. Permittee shall work collaboratively with Smelt Monitoring Team members to incorporate their edits and feedback into the monitoring plan and pilot program. Permittee shall implement the pilot program within two years of the effective date of this ITP. Permittee shall provide raw data from the pilot program to CDFW and work collaboratively with the Smelt Monitoring Team members to use new information from the pilot program to develop a final monitoring plan within three years of the effective date of this ITP. Permittee shall fund and implement the final CDFW-approved monitoring plan and provide data to the Smelt Monitoring Team after each survey.	ITP Condition # 7.6.2	Within ninety days of the effective date of this ITP	Permittee	
18	Longfin Smelt Science Program Priorities. Permittee as part of the AMP shall convene a meeting of the Longfin Smelt Science Program within 120 days of the effective date of this ITP. The Longfin Smelt Science Program shall include experts from CDFW, DWR, USFWS, and SWP Contractors. Permittee shall prepare a draft Longfin Smelt Science Program research plan in collaboration with the science program members that describes new LFS science needed to improve the understanding of LFS ecology and impacts as a result of SWP and CVP operations prior to December 1, 2020. The plan shall include, but not be limited to, the following science priorities: • A schedule for implementation including deadlines for draft and final reports for each study required. • Develop a mathematical life cycle model for LFS, verified with field data collection, as a quantitative tool to characterize the effects of abiotic and biotic factors on LFS populations. • New and ongoing monitoring that: o Applies equal effort throughout the known spawning and rearing distribution spanning the Delta, Suisun Marsh, Suisun Bay, Napa-Sonoma Marsh and Alviso Marsh in South Bay. o Characterizes the distribution and abundance of adult, larvae and juvenile life stages. o Facilitates estimates of survival probabilities among life stages.	ITP Condition # 7.6.3	Within 120 days of the effective date of this ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	○ Characterizes changes in abundance and distribution of life stages across a range of hydrologic conditions, including different water year types. ○ Considers revisions to existing IEP monitoring programs to expand the spatial distribution of LFS sampling. ○ Addresses factors that influence LFS population abundance, distribution, and catchability, including vertical migration behavior, water transparency, and other factors that support growth and survival. • Complete LFS lifecycle in captivity at the FCCL. • Characterize LFS spawning substrate and spawning microhabitat requirements. • Improve understanding of LFS spawning substrate distribution in the Delta, Cache Slough, and Suisun Marsh. • Improve understanding of adult migration behavior and review the current conceptual model that assumes adult staging is followed by rapid migration into lower salinity water and spawning soon thereafter. • Improve the understanding of juvenile LFS outmigration behavior and transport mechanisms for out-migrating fish, as it related to the potential for miscuing resulting in increased entrainment at the south Delta facilities. Permittee shall work collaboratively with the science program members to incorporate edits and comments on the draft Longfin Smelt Science Plan while preparing the final plan. After the final Longfin Smelt Science Plan is approved in writing by CDFW, Permittee shall fund and implement required monitoring and science according to the timelines specified in the final plan. At a minimum, Permittee shall convene the Longfin Smelt Science Program quarterly every year following initiation of the final Longfin Smelt Science Plan to: • Review data obtained from new and ongoing monitoring programs. • Review methods used to implement monitoring and recommend adjustments as they deem appropriate. • Review draft results from new and ongoing science. Permittee shall make all raw data and modeling acquired as a part of the Longfin Smelt Science Plan available to members of the Longfin Smelt Science Plan within ten days of a request.				
19	<u>Science to Improve Understanding of Delta Smelt Habitat in the Summer and Fall</u>. There is a need for additional science to further investigate the spatial and temporal distribution of abiotic and biotic factors influencing DS habitat and survival during the summer-fall time period. To study habitat effects on DS survival as part of the AMP, Permittee shall work collaboratively with CDFW and the Delta Coordination Group (Condition of Approval 9.1.3.1) to develop and conduct studies during implementation of the Summer-Fall Action	ITP Condition # 7.6.4	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Plan, including deployment of the Additional 100 TAF block of water (Condition of Approval 8.19) when it is available as described in the Delta Outflow Operations Plan (Condition of Approval 8.20). The Additional 100 TAF could be deferred in above normal or wet years and redeployed to operate the SMSCG in the summers of dry years, or supplement spring-summer outflow in below-normal years to provide DS habitat and improve DS survival during this critical portion of their life history (Condition of Approval 8.19). The benefits associated with the Additional 100 TAF block of water shall be evaluated in conjunction with new monitoring in Grizzly Bay (Condition of Approval 9.1.3.3) to better quantify changes in salinity associated with SMSCG operations. This new science shall also facilitate testing and evaluating components of the Delta Smelt Resiliency Strategy by studying outflow effects on DS habitat.				
20	Barker Slough Pumping Plant Sediment and Aquatic Weed Removal. If Permittee seeks to conduct aquatic weed or sediment removal in the vicinity of the BSPP when water temperatures are likely to be less than 25˚C, Permittee shall coordinate with CDFW at least seven days prior to initiating the aquatic weed or sediment removal. Permittee shall provide a written description of the planned aquatic weed or sediment removal activities to CDFW including a description of whether activities are planned outside the embayment and the floating booms as shown in Figure 1 in the Project Description. Permittee shall ensure that a Designated Biologist is onsite before, during, and after the planned activities to assess the potential for take of DS or LFS that would not otherwise occur as a result of Project operations and permitted diversions at the BSPP.	ITP Condition # 7.7	Throughout the term of the ITP	Permittee	
21	Data Accessibility. Permittee shall provide CDFW with access to all raw data and associated analyses and reports for all monitoring required in Condition of Approval 7 of this ITP and described in the Project Description within 60 days of collection of data or completion of analyses and reports, and otherwise upon request.	ITP Condition # 7.8	Throughout the term of the ITP	Permittee	
Take Minimization Measures - The following requirements are intended to ensure the minimization of incidental take of Covered Species in the Project Area and associated impacts of the taking during Covered Activities. Permittee shall implement and adhere to the following conditions to minimize take of Covered Species.					
22	Real-time Operations, Monitoring, and Technical Teams. Permittee shall monitor and manage Project operations in response to risk assessments conducted by collaborative real-time operations monitoring teams that include representatives from CDFW, DWR, USFWS, NMFS, SWRCB and Reclamation.	ITP Condition # 8.1	Throughout the term of the ITP	Permittee	
23	Smelt Monitoring Team. The purpose of the Smelt Monitoring Team is to meet weekly beginning November 1 and throughout the OMR management season and implementation of the Summer-Fall Action, or more often as needed, to consider and discuss: • The status of DS and LFS;	ITP Condition # 8.1.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• DS and LFS survey and salvage data at the SWP and CVP facilities; • Delta hydrology; • Other pertinent biotic or abiotic factors; • Exposure of DS and LFS to impacts associated with the operation of the CVP and SWP; • DS and LFS sensitivity to changes in behaviors of sheltering, foraging, and migration; • Results from the CDFW-approved DS life cycle model; and • The need to implement changes in operations as described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.17, 8.18, 8.19, 8.20, 9.1.3.1 and 9.1.3.2 The Smelt Monitoring Team shall include representatives from CDFW, USFWS, NMFS, DWR, SWRCB, and Reclamation. To further advance collaboration, upon convening, the Smelt Monitoring Team may invite, one other expert in fish biology, hydrology, or operations of the SWP and CVP each from the SWP Contractors and a non-governmental organization (NGO) to participate in specific meetings of the Smelt Monitoring Team and assist with their discussion and analyses. Permittee shall: • Convene the first meeting of the Smelt Monitoring Team within three days of the effective date of this ITP and weekly thereafter. In each year, Permittee shall convene the Smelt Monitoring Team meeting weekly, beginning no later than October 1 each year, throughout the time frame when Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.7, 8.8, 8.17, 8.18, 8.19, 8.20, and 9.1.3.1 may be initiated, control operations, or off-ramp. • Distribute a meeting agenda, with relevant documents and analyses to be discussed (as applicable), to team members at least two working days prior to each Smelt Monitoring Team meeting. • Record and distribute regular meeting notes within two working days of each Smelt Monitoring Team meeting to team members for review. Incorporate member comments and post final notes on a publicly available website. • Provide an annual written report to CDFW no later than October 1 following the salvage season of approximately October through June. This report shall include a summary of major actions taken during the year to implement Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.7 and 8.8, an evaluation of their effectiveness, and recommendations for future actions. • Call for a special meeting of the Smelt Monitoring Team outside the regular weekly schedule, upon request from CDFW or any other Smelt Monitoring Team member. Such meetings shall be scheduled within one working day of receiving a request, and shall be held in a timeframe responsive to the				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	issue(s) warranting the meeting. The Smelt Monitoring Team shall: • Provide advice for real-time management of operations to Permittee, CDFW, and WOMT consistent with the Project Description, Conditions of Approval in this ITP, and the applicable ESA authorizations, within one working day of each Smelt Monitoring Team meeting. • Meet weekly, or more often as needed, to consider and discuss survey data, salvage data, and other pertinent biotic and abiotic factors and conduct risk assessments (Condition of Approval 8.5.1.2).				
24	Salmon Monitoring Team. The purpose of the Salmon Monitoring Team is to meet weekly to consider and discuss survey data, salvage data, and other pertinent biotic and abiotic factors as described in Conditions of Approval 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7. The Salmon Monitoring Team shall include representatives from CDFW, USFWS, NMFS, DWR, SWRCB, and Reclamation. To further advance collaboration, upon convening, the Salmon Monitoring Team may invite one other expert in fish biology, hydrology, or operations of the SWP and CVP each from the SWP Contractors and an NGO to participate in specific meetings of the Salmon Monitoring Team and assist with their discussion and analyses. Permittee shall: • Convene the first meeting of the Salmon Monitoring Team within three days of the effective date of this ITP and weekly thereafter. In each year, Permittee shall convene the Smelt Monitoring Team meeting weekly, beginning no later than October 1 each year, throughout the time frame when Conditions of Approval 8.3.1, 8.3.2, 8.3.3, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8 may be initiated, control operations, or off-ramp. • Distribute a meeting agenda, with relevant documents and analyses to be discussed (as applicable), to team members at least two working days prior to each Salmon Monitoring Team meeting. • Record and distribute regular meeting notes within two working days of each Salmon Monitoring Team meeting to team members for review. Meeting notes shall include issues considered, recommendations made, key information on which recommendations were based, and incorporate member comments. Final notes shall be posted on a publicly available website. • Provide an annual written report to CDFW no later than October 1 following the salvage season of approximately October through June. This report shall include a summary of major actions taken during the year to implement Conditions of Approval 8.3.1, 8.3.2, 8.3.3, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, an evaluation of their effectiveness, and recommendations for future	ITP Condition # 8.1.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	actions. • Call for a special meeting of the Salmon Monitoring Team outside the regular weekly schedule, upon request from CDFW or any other Salmon Monitoring Team member. Such meetings shall be scheduled within one working day of receiving a request, and shall be held in a timeframe responsive to the issue(s) warranting the meeting. The Salmon Monitoring Team shall: • Provide advice for real-time management of operations to Permittee, CDFW, and WOMT consistent with the Project Description, Conditions of Approval in this ITP, and the applicable ESA authorizations, within one working day of each Salmon Monitoring Team meeting. • Review Project operations in the Delta and the data collected from ongoing monitoring programs annually. • Meet weekly, or more often as needed, to conduct a risk assessment (Condition of Approval 8.1.5.1) and consider and discuss survey data, salvage data, and other pertinent biotic and abiotic factors. • Estimate the percentage of CHNWR and young-of-year CHNSR that are currently 1) upstream of the Delta, 2) in the Delta, or 3) exited the Delta past Chipps Island. • Estimate the risk of entrainment in to the central Delta and the SWP and CVP export facilities and identify factors that influence the entrainment risks such as percent of the population in the Delta, Delta Cross Channel (DCC) gate operations, Sacramento River and San Joaquin River flows and a range of possible OMR flows. • As required by Condition of Approval 8.1.4 conduct a collaborative risk assessment and recommend OMR targets to minimize the risk of exceeding 50% or 75% of the single year loss threshold (Condition of Approval 8.6.1) to the WOMT (Condition of Approval 8.1.3) within one working day of each Salmon Monitoring Team meeting and follow the process outlined in Condition of Approval 8.1.4.				
25	Water Operations Management Team. Beginning no later than October 1 each year Permittee shall convene the WOMT on a weekly basis until the end of OMR management (Condition of Approval 8.8), or the end of implementation of the Summer-Fall Action (Condition of Approval 9.1.3.2), whichever is later. The WOMT shall be composed of manager-level representatives from Reclamation, DWR, USFWS, NMFS, SWRCB, and CDFW with decision-making authority. This management-level team shall facilitate timely decision-support and decision-making at the appropriate level.	ITP Condition # 8.1.3	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	The Smelt and Salmon Monitoring Teams shall report weekly updates, operations advice, and risk analyses to the WOMT. Each week the WOMT shall review and evaluate these risk assessments and operational advice, discuss potential changes to Project operations, and make final determinations for Covered Species minimization needs and water operations. If WOMT representatives do not achieve a consensus regarding final determinations for Covered Species minimization and Project operations, Permittee and CDFW shall prepare written summaries of their operational recommendations to the Directors for discussion and final decision per Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).				
26	Collaborative Approach to Real-time Risk Assessment. Beginning no later than October 1 through the end of OMR Management (see Condition of Approval 8.8) the Smelt and Salmon Monitoring Teams shall meet weekly, or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and prepare risk assessments as described in Conditions of Approval 8.1.1, 8.1.2, 8.1.5.1 and 8.1.5.2. The Smelt and Salmon Monitoring Teams shall prepare operations advice for the WOMT as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, including advice on operations. The Smelt and Salmon Monitoring Teams shall each prepare risk assessments and operations advice. Within each team, staff jointly develop the risk assessment and supporting documentation to accompany operations advice (see Conditions of Approval 8.1.5.1 and 8.1.5.2). DWR and CDFW Smelt and Salmon Monitoring Team staff may conclude different operations advice is warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval. The Smelt and Salmon Monitoring Teams shall communicate their advice to WOMT. The WOMT shall then confer and attempt to reach a resolution and agreed-upon Project operations. If a resolution is reached, Permittee shall operate consistent with the decision regarding Project operations from WOMT. If the WOMT does not reach a resolution, the CDFW Director may require Permittee to implement an operational recommendation provided by CDFW. CDFW will provide its operational decision to Permittee in writing. Permittee shall implement the operational decision required by CDFW. Permittee shall ensure that its proportional share (see Condition of Approval 8.10) of the OMR flow requirement as a part of the operational decision is satisfied.	ITP Condition # 8.1.4	Throughout the term of the ITP	Permittee	
27	Real-time Risk Assessments. The Smelt and Salmon Monitoring Teams (Conditions of Approval 8.1.1 and 8.1.2) shall prepare weekly risk assessments, or more often as required, and operations advice (as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7) during their discussions and analyses. The Smelt and Salmon Monitoring Teams shall provide the risk assessments	ITP Condition # 8.1.5	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	and pertinent supporting information to the WOMT (Condition of Approval 8.1.3) within one business day of each meeting.				
28	Salmon Monitoring Team Risk Assessments. Salmon Monitoring Team risk assessments shall include, but not be limited to, Components A – F and associated data sources listed below: A. Assessment of hydrologic, operational and meteorological information i. Water operations conditions data: • Antecedent actions (e.g. DCC gate closure and required actions such as first flush, etc.) • Current controlling factor(s) • Water temperatures • Tidal cycle • Turbidity • Salinity ii. Water operations outlook data: • Meteorological forecast • Outages • Diversions • Storm event projection iii. Projection data: • DCC gate status • Freeport flows • Vernalis flows • Old River at Bacon Island (OBI) and Freeport turbidities • South Delta Exports • OMR B. Assessment of biological information for CHNWR and CHNSR i. CHNWR population status data: • Adult escapement • Redd distribution and fry emergence timing • JPE and hatchery releases • Distribution of natural CHNWR, Livingston Stone NFH CHNWR releases, and CHNWR in Battle Creek: o % of juveniles upstream of the Delta o % of juveniles in Delta o % of juveniles past Chipps Island • CHNSR population data Adult escapement • Redd distribution and fry emergence timing • Hatchery release (in-river vs. downstream) • Distribution of natural and hatchery fish:	ITP Condition # 8.1.5.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	○ % of juveniles upstream of the Delta ○ % of juvenile in the Delta ○ % of juveniles past Chipps Island ii. Change in risk of entrainment into the central Delta • Change in routing risk of entrainment into the central Delta • Comparison to the previous week iii. Change in risk of entrainment into the central Delta • Change in routing risk of entrainment into the central Delta • Comparison to the previous week C. Assessment of risk of entrainment into the central Delta and CVP/SWP facilities for CHNWR and CHNSR in the Sacramento River: i. Data sources to assess sensitivity to entrainment into the central Delta from the Sacramento River and western Delta: • In-Delta distribution of fish • Acoustic telemetry, trawls (e.g. Spring Kodiak), EDSM catch, rotary screw traps, seines, and hatchery release notifications • Hydraulic footprint • STARS model • Enhanced Particle Tracking Model (EPTM) (e.g. transitions between regions) • Data from new monitoring required in Conditions of Approval 7.5 in this ITP ii. Exposure risk (low, medium, high): • Distribution of juvenile CHNWR estimated to be in the lower Sacramento and northern Delta • Distribution of juvenile CHNSR estimated to be in the lower Sacramento and northern Delta • Distribution of hatchery produced salmonids ○ Incorporation of real-time acoustic tracking of AT/CWT fish • Anticipated emigration to continue into the Delta iii. Routing risk (low, medium, high): • Flows in the Sacramento River predicted with upcoming storm events • DCC gate position • Prediction of tidal interaction at Georgiana Slough ○ Inflow to Delta from Sacramento River and the interaction of the muting of tidal effects around Georgiana Slough • Precipitation in the forecast for the weekend and increasing river flows effects of routing into central and interior delta iv. Overall entrainment risk: Combination of the above two risk assessments in ii and iii.				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	D. CVP/SWP facilities entrainment risk for CHNWR and CHNSR in the central Delta over the next week: i. Data sources to assess sensitivity to entrainment into the south Delta from the San Joaquin River and central Delta • In-Delta distribution of fish • Acoustic telemetry, trawls (e.g. Spring Kodiak), EDSM catch, rotary screw traps, seines, and hatchery release notifications • Hydraulic footprint • EPTM (e.g. transitions between regions) ii. Data sources to assess sensitivity to entrainment in salvage in the south Delta • In-Delta distribution of fish • Acoustic telemetry, trawls (e.g. Spring Kodiak), EDSM catch, rotary screw traps, seines, and hatchery release notifications, and salvage monitoring data at the SWP and CVP facilities • Trend analysis (historical timing) • Survival analysis (e.g. Zeug and Cavallo CWT Model) • Tillotson entrainment model, or other entrainment models as they are available • EPTM (e.g. transitions between regions) • New monitoring required by Condition of Approval 7.5 in this ITP iii. Exposure risk assessments (low, medium, high): • Listed Chinook salmon from the Sacramento River basin observed in monitoring sites in the lower Sacramento River and northern Delta (fish at the junction of Georgiana Slough, Mokelumne River, and San Joaquin River confluence). • Prediction of flows expected to change due to precipitation events. • Salvage trends in relation to OMR • Future export modifications iv. Reporting OMR/export risk: • OMR -2,500 cfs: LOW • OMR -3,500 cfs: LOW • OMR -5,000 cfs: MEDIUM • OMR -6,250 cfs: MEDIUM-HIGH • OMR -7,500 cfs: HIGH • OMR -9,000 cfs: HIGH v. Overall entrainment risk: Combination of the above two risk assessments in iii and iv E. Annual loss threshold risk				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	i. Salvage loss at the SWP and CVP facilities compared to estimated remaining population in Delta and upstream of the Delta ii. Define risk of hitting a threshold, 50%, or 75%, or 100%, and actions to minimize that happening iii. Daily loss thresholds hit and subsequent loss and associated operations F. Alternative actions, if any i. Operations scenario ii. Alternative exposure analysis				
29	Smelt Monitoring Team Risk Assessments. Smelt Monitoring Team risk assessments shall include, but not be limited to, Components A – F and associated data sources listed below: A. Assessment of hydrologic, operational and meteorological information i. Water operations conditions: • Antecedent actions (e.g. DCC gate closure and actions such as integrated early winter pulse protection, etc.) • Current controlling factor(s) • Water temperatures • Tidal cycle • Turbidity • Salinity ii. Water Operations Outlook: • Meteorological forecast • Outages • Diversions • Storm event projection iii. Projections: • Date • DCC status • Freeport flows • Vernalis flows • OBI and Freeport turbidities • South Delta exports • OMR B. Assessment of biological information for DS and LFS i. DS population status • EDSM • LCM • Biological conditions (spawned/unspawned)	ITP Condition # 8.1.5.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	ii. % in Delta zones LFS population status • FMWT and Bay Study iii. Change in exposure • Comparison to the previous week C. Assessment of risk of entrainment into the central Delta and CVP/SWP facilities for DS and LFS in the Sacramento River: i. Data sources to assess sensitivity to entrainment into the central Delta from the Sacramento River and western Delta: • In-Delta distribution of fish • Trawls (e.g. Spring Kodiak, FMWT, SFBS, and EDSM) catch • Hydraulic footprint • EPTM (e.g. transitions between regions) • New monitoring required by Conditions of Approval 7.6.1 and 7.6.2 in this ITP ii. Exposure risk (low, medium, high): • Distribution of DS estimated to be downstream of the lower Sacramento and northern Delta • Distribution of all life stages of larval and juvenile DS and LFS estimated to be in the lower Sacramento and northern Delta • Anticipated onset of spawning movement into upstream Delta habitats. iii. Routing risk (low, medium, high): • Flows in the Sacramento River predicted with upcoming storm events • Precipitation in the forecast for the weekend and increasing river flows effects of routing into central and interior delta iv. Overall entrainment risk: Combination of the above two risk assessments in ii and iii. D. CVP/SWP facilities entrainment risk for DS and LFS in the central Delta over the next week: i. Data sources to assess sensitivity to entrainment into the south Delta from the San Joaquin River and central Delta • In-Delta distribution of fish • Trawls (e.g. Spring Kodiak, FMWT, SFBS, and EDSM) catch • Hydraulic footprint • EPTM (e.g. transitions between regions) • New monitoring required by Conditions of Approval 7.6.1 and 7.6.2 in this ITP ii. Data sources to assess sensitivity to entrainment in salvage in the south Delta				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• In-Delta distribution of fish • Trend analysis (e.g., historical timing) • Temperature conditions • New monitoring required by Conditions of Approval 7.6.1 and 7.6.2 in this ITP iii. Exposure risk assessments (low, medium, high): • DS or LFS observed in monitoring sites in the lower Sacramento River, northern Delta, lower San Joaquin River and Sacramento-San Joaquin confluence • Daily salvage thresholds exceeded, subsequent loss, and associated operations • Recruitment informed by available life cycle model • Prediction of flows expected to change due to precipitation events. • Salvage trends in relation to OMR • Future export modifications • Environmental surrogates iv. Reporting OMR/export risk: • OMR -2,500 cfs: LOW • OMR -3,500 cfs: LOW • OMR -5,000 cfs: MEDIUM • OMR -6,250 cfs: MEDIUM-HIGH • OMR -7,500 cfs: HIGH • OMR -9,000 cfs: HIGH v. Overall entrainment risk: Combination of the above two risk assessments in iii and iv. E. Alternative actions, if any • Operations scenario • Alternative exposure analysis				
30	Independent Review Panels. In the event that an independent review panel is convened to review aspects of the Project or AMP, Permittee shall provide drafts of 1) the list of potential panel participants, 2) the panel charges and associated review questions, and 3) the panel report and findings to CDFW for review at least 20 days before they are scheduled to be finalized. Permittee shall incorporate CDFW comments into the final panel selection and panel charge before they are finalized. Permittee shall facilitate CDFW communication with panelists, as requested, to help address CDFW questions on the draft panel report before a final report is completed. Permittee shall work collaboratively with CDFW to address CDFW comments in the final panel report.	ITP Condition # 8.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
31	Onset of OMR Management. From the onset of OMR Management (initiated as described in Conditions of Approval 8.3.1, 8.3.2, or 8.3.3) to the end (Condition of Approval 8.8) Permittee shall maintain a 14-day average OMR index that is no more negative than -5,000 cfs, except during OMR Flex operations (see Condition of Approval 8.7) or if a more positive OMR index is required. The OMR index shall be calculated using the equation provided in Hutton (2008). When a more positive OMR index is required by any Condition of Approval of this ITP, except when ending OMR Flex During Excess Conditions (Condition of Approval 8.7), Permittee shall reduce south Delta exports to achieve the new required OMR index within three days of exceeding a threshold or acceptance of flow advice (see Conditions of Approval 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.28.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8). The new moving average will be calculated beginning no later than the third day moving forward.	ITP Condition # 8.3	Throughout the term of the ITP	Permittee	
32	Integrated Early Winter Pulse Protection. Between December 1 and January 31 each year Permittee shall reduce south Delta exports for 14 consecutive days to maintain a 14-day average OMR index no more negative than -2,000 cfs, and convene the Smelt Monitoring Team within one day of triggering the following criteria: • Three day running average daily flows at Freeport greater than, or equal to, 25,000 cfs, AND • Three day running average of daily turbidity at Freeport is greater than, or equal to, 50 Nephelometric Turbidity Units (NTU), OR • The Smelt Monitoring Team determines that real-time monitoring of abiotic and biotic factors indicates a high risk of DS migration and dispersal into areas at high risk of future entrainment. After maintaining a 14-day average OMR index no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMR index no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8). The Integrated Early Winter Pulse Protection Action may only be initiated once during the December 1 through January 31 time period each year.	ITP Condition # 8.3.1	Throughout the term of the ITP	Permittee	
33	Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded	ITP Condition # 8.3.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	(Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.				
34	Adult Longfin Smelt Entrainment Protection. After December 1, if an Integrated Early Winter Pulse Protection (Condition of Approval 8.3.1) has not yet initiated, Permittee shall reduce south Delta exports to maintain a 14-day average OMR index no more negative than -5,000 cfs and initiate OMR Management (Condition of Approval 8.3) if: • Cumulative combined LFS expanded salvage (total estimated LFS counts at the CVP and SWP salvage facilities beginning December 1 through February 28 exceeds the most recent Fall Midwater Trawl (FMWT) LFS index divided by 10, OR • Real-time monitoring of abiotic and biotic factors indicates a high risk of LFS movement into areas at high risk of future entrainment, as determined by DWR and CDFW Smelt Monitoring Team staff. When evaluating the possibility of LFS movement into areas that may be subject to an elevated risk of entrainment, the Smelt Monitoring Team shall evaluate catch of LFS with fork length ≥ 60 mm by the Chipps Island Trawl (conducted by USFWS) as an early warning indicator for LFS migration movement into the Delta, in addition to other available survey and abiotic data. The Smelt Monitoring Team shall communicate the results of these risk assessments and advice to the WOMT (Condition of Approval 8.1.3), and operational decisions shall be made as described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).	ITP Condition # 8.3.3	Throughout the term of the ITP	Permittee	
35	OMR Management for Adult Longfin Smelt. From the onset of OMR Management (Condition of Approval 8.3) through February 28, the Smelt Monitoring Team shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.1.5.2) and decide whether to recommend an OMR flow requirement between -5,000 cfs and -1,250 cfs to minimize entrainment and take of adult LFS. The Smelt Monitoring Team may provide advice to restrict south Delta exports for seven consecutive days to achieve a seven-day average OMR index within three risk categories: • Low risk: OMR between -4,000 cfs to -5,000 cfs • Medium risk: OMR between -2,500 cfs to -4,000 cfs • High risk: OMR between -1,250 cfs to -2,500 cfs If a risk assessment conducted by the Smelt Monitoring Team determines that a more restrictive OMR flow requirement is needed to minimize take of adult LFS, the Smelt Monitoring Team shall provide its advice to WOMT (Condition of Approval 8.1.3) and operational decisions shall be made following the process described in	ITP Condition # 8.4.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment). This Condition will terminate when a high-flow off-ramp occurs (Condition of Approval 8.4.3), or when LFS spawning has been detected in the system, as determined by the Smelt Monitoring Team, or, if there is disagreement and resolution is not reached within WOMT, as determined by CDFW. The Smelt Monitoring Team shall consider results from Additional LFS Larval Sampling (Condition of Approval 7.6.1) to inform its assessment of the start of LFS spawning. After LFS spawning has been observed, Permittee shall implement Condition of Approval 8.4.2 to minimize take of larval and juvenile LFS.				
36	Larval and Juvenile Longfin Smelt Entrainment Protection. From January 1 through June 30, when a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period exceeds one of the following thresholds: • LFS larvae or juveniles found in four or more of the 12 SLS or 20 mm stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919), or • LFS catch per tow exceeds five LFS larvae or juveniles in two or more of the 12 stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919). Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Permittee shall also immediately convene the Smelt Monitoring Team to conduct a risk assessment (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities, determine if an OMR flow restriction is warranted, and recommend an OMR flow limit between -1,250 and -5,000 cfs. The Smelt Monitoring Team risk assessment and operational advice shall be reviewed by the WOMT (Condition of Approval 8.1.3) via the Collaborative Real-time Decision-making process (Condition of Approval 8.1.4). Permittee shall operate to the export restriction and OMR flow target approved through Conditions of Approval 8.1.3 and 8.1.4. Each week the Smelt Monitoring Team shall convene to conduct a new risk assessment and determine whether to maintain, or off ramp from, export restrictions based on the risk to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management). From January 1 through June 30, DWR and CDFW Smelt Monitoring Team staff shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities. As a part of the risk assessment the Smelt Monitoring	ITP Condition # 8.4.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Team shall provide advice on the appropriate OMR flow targets to minimize LFS entrainment or entrainment risk, or both. The Smelt Monitoring Team shall provide its advice to WOMT (Condition of Approval 8.1.3) and use the Collaborative Approach to Real-time Risk Assessment process described in Condition of Approval 8.1.4 to determine if an OMR flow restriction is warranted and determine OMR flow limit between -1,250 and -5,000 cfs. The OMR flow limit shall be in place until the next risk assessment conducted by the Smelt Monitoring Team determines that it is no longer necessary to minimize take or related impacts to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).				
37	High Flow Off-Ramp from Longfin Smelt OMR Restrictions. OMR management for adult, juvenile, or larval LFS as described in Conditions of Approval 8.4.1 and 8.4.2 are not required, or would cease if previously required, when river flows are (a) greater than 55,000 cfs in the Sacramento River at Rio Vista or (b) greater than 8,000 cfs in the San Joaquin River at Vernalis. If flows subsequently drop below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, the OMR limit previously required as a part of Conditions of Approval 8.4.1 and 8.4.2 shall resume.	ITP Condition # 8.4.3	Throughout the term of the ITP	Permittee	
38	Turbidity Bridge Avoidance. The purpose of this Condition is to minimize the risk of entrainment of adult DS in the corridors of the Old and Middle rivers into the south Delta export facilities. This Condition is intended to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the south Delta export facilities, which historically has been associated with elevated salvage of pre-spawning adult DS. After the Integrated Early Winter Pulse Protection (Condition of Approval 8.1.3) or February 1 (whichever comes first), until April 1, Permittee shall manage exports to maintain daily average turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. If the daily average turbidity at OBI is greater than 12 NTU, Permittee shall restrict south Delta exports to achieve an OMR flow that is no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 NTU. If, after five consecutive days of OMR flow that is less negative than -2,000 cfs, the daily average turbidity at OBI is not less than 12 NTU the Smelt Monitoring Team may convene to assess the risk of entrainment of DS (Condition of Approval 8.1.5.2). The Smelt Monitoring Team may provide advice to WOMT regarding changes in operations that could be conducted to minimize the risk of entrainment of DS (Condition of Approval 8.1.3). The Smelt Monitoring Team may also determine that OMR restrictions to manage turbidity are infeasible and may instead provide advice for a different OMR flow target that is between -2,000 and -5,000 cfs and is protective based on turbidity and adult DS distribution and salvage to the WOMT for consideration (Condition of	ITP Condition # 8.5.1	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). Turbidity readings at individual sensors can generate spurious results in real time. Spurious results could be incorrectly interpreted as a turbidity bridge, when in fact the cause is a result of local conditions or sensor error. To assess whether turbidity readings at OBI are attributable to a sensor error or a localized turbidity spike, Permittee, in coordination with Reclamation, may consider and review data from other nearby locations and sources. Additional information that will be reviewed include regional visualizations of turbidity, alternative sensors, and boat-based turbidity mapping, particularly if there was evidence of a local sensor error. Permittee may bring data from these additional sources to the Smelt Monitoring Team for consideration during the development of a risk assessment to be provided to the WOMT for evaluation (Condition of Approval 8.1.3). Permittee shall use the decision-making process described Condition of Approval 8.1.4 (Collaborative Real-time Risk Assessment) to determine if south Delta exports may increase after five-days of OMR no more negative than -2,000 cfs, or to determine that this action is not warranted due to a sensor error or localized turbidity event. Permittee shall implement this action until CDFW is in agreement that the action may be ended or modified.				
39	Larval and Juvenile Delta Smelt Protection. If the five-day cumulative salvage of juvenile DS at the CVP and SWP facilities is greater than or equal to one plus the average prior three years' FMWT index (rounded down), Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Additionally, if the five-day cumulative salvage threshold is met or exceeded, Permittee shall immediately convene the Smelt Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.2) and determine the future risk of entrainment and take of larval and juvenile DS. The Smelt Monitoring Team may provide advice to further restrict south Delta exports to maintain a more positive OMR than -5,000 cfs. The Smelt Monitoring Team may provide advice for further restrictions within three risk categories: • Low risk: Limit OMR between -4,000 cfs to -5,000 cfs • Medium risk: Limit OMR between -2,500 cfs to -4,000 cfs • High risk: Limit OMR between -1,250 cfs to -2,500 cfs The duration and magnitude of operational advice shall be provided to the WOMT (Condition of Approval 8.1.3) and decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). When conducting risk assessments to evaluate the risk of entrainment and take of juvenile DS the Smelt Monitoring Team shall evaluate the following information	ITP Condition # 8.5.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	sources, in addition to any other models or surveys they deem appropriate and those listed in Condition of Approval 8.1.5.2: • Results from a CDFW- approved DS life cycle model. • DS recruitment levels identified by the Smelt Monitoring Team using the CDFW-approved life cycle model that links environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval DS in June per number of spawning adults in the prior February-March period. • Hydrodynamic models and forecasts of entrainment informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile DS that could be entrained. If expanded salvage at the CVP and SWP facilities of juvenile DS exceeds 11 within a three-day period under this condition, Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -3,500 cfs. If juvenile DS continue to be salvaged at the CVP and SWP facilities during the seven days of OMR restrictions, then Permittee shall continue restrictions and request a risk assessment by the Smelt Monitoring Team to determine if additional advice and subsequent restrictions are warranted and provide advice to WOMT (see Condition of Approval 8.1.3) and follow the decision-making process described in Condition of Approval 8.1.4.				
40	Winter-run Single-year Loss Threshold. In each year, Permittee shall, in coordination with Reclamation, operate the Project to avoid exceeding the following single-year loss thresholds: • Natural CHNWR (loss = 1.17% of JPE) • Hatchery CHNWR (loss = 0.12% of JPE) The loss threshold and loss tracking for hatchery CHNWR does not include releases into Battle Creek. Loss of CHNWR at the at the CVP and SWP salvage facilities shall be calculated based on length-at-date criteria. Annual loss of natural and hatchery CHNWR at the CVP and SWP salvage facilities shall be counted cumulatively beginning November 1 each calendar year through June 30 the following calendar year. CHNWR shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the 2018 CDFW loss equation (Attachment 6).	ITP Condition # 8.6.1	Throughout the term of the ITP	Permittee	

	During the water year, if cumulative loss of natural or hatchery CHNWR exceeds 50% of the annual loss threshold, Permittee shall restrict south Delta exports to maintain a 14-day average OMR index no more negative than -3,500 cfs through the end of OMR Management (see Condition of Approval 8.8). After 14 days of operations to maintain an OMR index no more negative than -3,500 cfs Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and loss of natural and hatchery CHNWR is no longer present. Risks shall be measured against the potential to exceed the next single-year loss threshold. The results of this risk assessment and associated OMR recommendations shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4. The -3,500 cfs OMR flow operational criteria, adjusted and informed by this risk assessment, shall remain in effect until the end of OMR Management (Condition of Approval 8.8). During the water year, if cumulative loss of natural or hatchery CHNWR at the at the CVP and SWP salvage facilities exceeds 75% of the single-year loss threshold, Permittee shall restrict OMR to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs through the end of OMR Management (Condition of Approval 8.7). After 14 days Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and take of natural and hatchery CHNWR is no longer present. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4. The -2,500 cfs OMR flow operational criteria adjusted and informed by this risk assessment shall remain in effect until the end of OMR Management (Condition of Approval 8.8). During the water year, if natural or hatchery CHNWR cumulative loss at the at the CVP and SWP salvage facilities exceeds the single-year loss threshold, Permittee shall immediately convene the Salmon Monitoring Team to review recent fish distribution information and operations and provide advice regarding future planned Project operations to minimize subsequent loss during that year. The Salmon Monitoring Team shall report the results of this review and advice to the WOMT (see Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). If the single-year loss threshold is exceeded, Permittee and Reclamation shall also convene an independent panel to review Project operations and the single-year loss threshold prior to November 1, as described in Condition of Approval 8.2. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that lead to an exceedance of the single-year loss threshold, and make				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	recommendations on modifications to Project implementation, or additional actions to be conducted to stay within the single-year loss threshold in subsequent years. Permittee shall, in coordination with Reclamation, continue monitoring and reporting salvage at the at the CVP and SWP salvage facilities. Permittee and Reclamation shall continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) late fall-run and yearling CHNSR surrogates. The Salmon Monitoring Team shall use reported real-time salvage counts along with qualitative and quantitative tools to inform risk assessments (see Condition of Approval 8.1.5.1).				
41	Early-season Natural Winter-run Chinook Salmon Discrete Daily Loss Threshold. To minimize entrainment, salvage, and take of early-migrating natural CHNWR Permittee shall restrict south Delta exports for five consecutive days to achieve a five-day average OMR index no more negative than -5,000 cfs when daily loss of older juveniles (natural older juvenile Chinook salmon and yearling CHNSR used as a surrogate for CHNWR) at the SWP and CVP salvage facilities exceeds the following thresholds: • From November 1 – November 30: 6 older juvenile Chinook salmon • From December 1 – December 31: 26 older juvenile Chinook salmon All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the equation provided in CDFW 2018 (Attachment 6). This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.	ITP Condition # 8.6.2	Throughout the term of the ITP	Permittee	
42	Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold. To minimize entrainment, salvage, and take of natural CHNWR during the peak and end of their migration through the Delta. Permittee shall restrict south Delta exports for five days to achieve a five-day average OMR index no more negative than -3,500 cfs when daily loss of natural older juveniles at the SWP and CVP salvage facilities exceeds the following thresholds based on the JPE reported in January of the same calendar year: • January 1 – January 31: 0.00635 % of the CHNWR JPE • February 1 – February 28: 0.00991 % of the CHNWR JPE • March 1 – March 31: 0.0146 % of the CHNWR JPE • April 1 – April 30: 0.00507 % of the CHNWR JPE • May 1 – May 31: 0.0077 % of the CHNWR JPE All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the equation provided in CDFW 2018 (Attachment 6). This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an	ITP Condition # 8.6.3	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	amendment to this ITP.				
43	Daily Spring-run Chinook Salmon Hatchery Surrogate Loss Threshold. To minimize entrainment of emigrating natural juvenile CHNSR from the Sacramento River and tributaries, including the Feather and Yuba rivers into the channels of the central Delta, south Delta, CCF, and the Banks Pumping Plant, Permittee shall restrict exports based on the presence of hatchery produced CHNSR surrogate groups at the CVP and SWP salvage facilities. CHNSR surrogate groups shall consist of all in-river fall- and spring-run surrogate release groups of Chinook salmon from the Coleman National Fish Hatchery, Feather River Hatchery, and the Nimbus Fish Hatchery. Each water year between February 1 and June 30 Permittee shall reduce south Delta exports for five consecutive days to achieve a five-day average OMR index no more negative than -3,500 cfs when: • Feather River Hatchery coded wire tagged (CWT) CHNSR surrogates (includes both spring- and fall-run hatchery release groups) cumulative loss at the at the CVP and SWP salvage facilities is greater than 0.25% for each release group, OR • Coleman National Fish Hatchery and Nimbus Fish Hatchery CWT fall-run release groups cumulative loss at the at the CVP and SWP salvage facilities is greater than 0.25% of the total in-river releases for each release group. This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.	ITP Condition # 8.6.4	Throughout the term of the ITP	Permittee	
44	Funding for Spring-run Hatchery Surrogates. Permittee shall provide at least $72,000 one-time start-up costs per hatchery and $150,000 of additional funding each year for each hatchery to CDFW to support the following hatchery surrogate release group protocol to enable implementation of Condition of Approval 8.6.4: • 100% CWT for each hatchery in-river surrogate release group • Unique CWT for each hatchery in-river surrogate release group to allow differentiation among groups at the salvage facilities • At least two hatchery in-river surrogate release groups per hatchery, per year Permittee shall provide sufficient funding to ensure that all hatchery surrogate release groups can be produced in addition to annual production releases. Locations and times of year for in-river surrogate releases shall be developed to best represent natural juvenile CHNSR migration into the Sacramento River and Delta. Permittee shall provide technical support and guidance to CDFW, as needed, to inform CDFW's development of its annual plan for in-river surrogate releases. CDFW's annual planning includes specifying the number of fish included in each release group, and the	ITP Condition # 8.6.5	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	timing and the locations of in-river releases.				
45	Evaluate Proactive Salmon Entrainment Minimization During Real-time Operations. When a new Chinook salmon entrainment model is developed and approved by CDFW as required by Condition of Approval 7.5.3, it shall be evaluated during real-time operations for two water years by the Salmon Monitoring Team (Condition of Approval 8.1.2) as a part of their weekly risk assessments (Condition of Approval 8.5.1.1). If Permittee and CDFW agree that the new entrainment model provides a more proactive approach to minimizing CHNWR entrainment and loss, while providing the same level of protection as Conditions of Approval 8.6.2 and 8.6.3, Permittee may request an amendment to the ITP to modify or replace Conditions of Approval 8.6.2 and 8.6.3 with salmon entrainment thresholds based on the entrainment model. When a CHNSR JPE is approved by CDFW and implemented (see Condition of Approval 7.5.2), Permittee and CDFW staff shall work with the Spring-run JPE Team to evaluate minimization provided by Condition of Approval 8.6.4. Permittee may request an amendment to the ITP to modify or replace Conditions of Approval 8.6.4 and 8.6.5 with CHNSR entrainment minimization measures that incorporate new information gleaned from the new monitoring and CHNSR JPE.	ITP Condition # 8.6.6	Throughout the term of the ITP	Permittee	
46	OMR Flexibility During Delta Excess Conditions. Permittee may increase exports to capture peak flows in the Delta during storm-related events (hereafter OMR flex) when: • The Delta is in excess conditions, AND • QWEST is greater than 0, AND • A measurable precipitation event has occurred in the Central Valley, AND • Permittee, in coordination with Reclamation, determines that the Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows, AND • None of the following Conditions of Approval are controlling Project operations: 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4, AND • Risk assessments conducted by the Salmon and Smelt Monitoring Teams (Conditions of Approval 8.1.5.1 and 8.1.5.2) indicate that an OMR more negative than -5,000 cfs is not likely to trigger an additional real-time OMR restriction (Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4), AND • Cumulative salvage at the CVP and SWP facilities of yearling Coleman NFH late fall-run Chinook salmon (as yearling CHNSR surrogates) is less than 0.5% within any of the release groups, AND • Risk assessments conducted by the Salmon and Smelt Monitoring Teams determines that no changes in spawning, rearing, foraging, sheltering, or	ITP Condition # 8.7.7	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	migration behavior as a result of OMR Flex operations beyond those anticipated to occur through operations described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4 are likely to occur. If none of the restrictions listed above apply, Permittee may increase south Delta exports but shall manage Project operations to achieve a five-day average OMR index no more negative than -6,250 cfs. The decision to operate under this Condition of Approval shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment), and SWP OMR flex is subject to approval by CDFW. If, during OMR flex operations, any of the following conditions occurs, Permittee shall reduce south Delta exports to achieve a 14-day average OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required by another Condition of Approval. The more positive OMR index shall be achieved within 48 hours of the occurrence of the condition, and the 14-day moving average shall apply from that point forward. • Risk assessments conducted by the Salmon and Smelt Monitoring Teams (Conditions of Approval 8.1.5.1 and 8.5.1.2) indicate that an OMR more negative than -5,000 cfs is likely to trigger an additional real-time OMR restriction (Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4), OR • Cumulative salvage at the CVP and SWP facilities of yearling Coleman NFH late fall-run Chinook salmon (as yearling CHNSR surrogates) exceeds 0.5% within any of the release groups, OR • A risk assessment conducted by the Salmon or Smelt Monitoring Teams identifies changes in spawning, rearing, foraging, sheltering, or migration behavior as a result of OMR Flex operations beyond those anticipated to occur through operations described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4, OR • Operational restrictions described in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.17 are required.				
47	End of OMR Management. Permittee shall operate the Project to meet the requirements included in Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, and 8.6.4 to ensure that entrainment and take of Covered Species is minimized during the OMR Management season through June 30, or until the following species-specific off-ramps occur: • LFS and DS: Daily mean water temperature at CCF is greater than 25°C for three consecutive days.	ITP Condition # 8.8	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• CHNWR and CHNSR: o More than 95% of CHNWR and CHNSR have migrated past Chipps Island as determined by the Salmon Monitoring Team, AND o Daily average water temperature at Mossdale exceeds 22.2°C for 7 non-consecutive days in June, AND o Daily average water temperature at Prisoner's Point exceeds 22.2°C for 7 non-consecutive days in June.				
48	Construct and Operate a Salmonid Migratory Barrier at Georgiana Slough. A salmonid migratory barrier at Georgiana Slough is expected to provide a higher probability of survival for emigrating juvenile CHNWR and CHNSR that encounter the Sacramento River-Georgiana Slough junction and reduce entrainment of emigrating CHNWR and CHNSR into the central and south Delta. Permittee shall construct and operate a salmonid migratory barrier at Georgiana Slough within three years of the effective date of this ITP. This timeline shall be subject to Permittee attaining required state and federal permits. If permits are not obtained within 2.5 years after the effective date of this ITP, Permittee shall confer with CDFW to determine a timeline for permit acquisition and construction of the migratory barrier. Permittee shall develop a Georgiana Slough Migratory Barrier Operations Plan and associated operating criteria in collaboration with CDFW, USFWS and NMFS to maximize benefits to migrating CHNWR and CHNSR. Permittee shall prepare a draft Georgiana Slough Migratory Barrier Operations Plan and submit it to CDFW, USFWS, and NMFS at least 120 days before beginning construction and deployment of the barrier. Operation of the Georgiana Slough Migratory Barrier shall not commence until the final Georgiana Slough Migratory Barrier Operations Plan and associated criteria are approved in writing by CDFW. Permittee as part of the AMP shall continue pilot investigations to refine the understanding of barrier efficiency and benefits to Covered Species in coordination with CDFW, NMFS and USFWS. This ITP does not provide take authorization for construction of the migratory barrier at Georgiana Slough. Permittee shall submit a separate 2081(b) application for incidental take authorization associated with construction of the barrier.	ITP Condition # 8.9.1	Throughout the term of the ITP	Permittee	
49	Evaluate Benefits of Salmonid Guidance Structures at Sutter and Steamboat Sloughs. Fish guidance structures near the junction between the Sacramento River and Sutter and Steamboat sloughs are expected to provide a higher probability of survival for emigrating juvenile CHNWR and CHNSR by increasing the proportion of juveniles that enter Sutter and Steamboat sloughs and minimizing the proportion of juveniles that migrate into the central and south Delta. Within two years of the effective date of this ITP, Permittee as part of the AMP shall use SDM, in collaboration with CDFW, NMFS, and USFWS, to evaluate a range of potential	ITP Condition # 8.9.2	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	approaches to designing and operating fish guidance structures near Sutter and Steamboat sloughs. Permittee shall submit a draft report documenting the results of the SDM process and associated implementation recommendations to CDFW, NMFS, and USFWS within three years of the effective date of this ITP.				
50	SWP Proportional Share. Due to the historically coordinated operations of the SWP and CVP, joint operational criteria related to OMR flows and export restrictions have been developed for SWP and CVP that assume coordinated implementation by Permittee and Reclamation. Conditions of Approval 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, 8.8, and 8.17 set out such operational criteria that assume coordination by Permittee and Reclamation to meet the criteria and that are subject to the process set out in this condition. During the term of this ITP there may be instances when operational requirements stated in or determined by these Conditions of Approval are different from operational requirements of the applicable ESA authorizations, which govern operations at the CVP as well as the SWP. If an operational restriction required by this ITP, pursuant to one or more of the Conditions of Approval listed above, is more restrictive than the then-controlling operations required by the applicable ESA authorizations, Permittee shall take the following steps to meet its proportional share of the operational criteria stated or determined by the Condition of Approval(s) at issue: 1) Permittee is legally bound, both statutorily and through agreements with the Bureau of Reclamation, not to utilize State facilities (including the CCF, Banks Pumping Plant, the California Aqueduct, and the SWP share of San Luis Reservoir) or allow third parties (including the CVP) to use State facilities in a manner that would result in a violation of law, including the operational criteria stated in or determined by Conditions of Approval 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, 8.8, and 8.17 of this ITP. 2) If prohibiting the use of state facilities for CVP purposes will not result in conditions that meet the operational criteria stated in or determined by the Condition of Approval at issue, Permittee shall provide CDFW with a written estimate of the total allowed exports at both the SWP and CVP facilities that would be required to meet the operational criteria stated in or determined by the Condition of Approval at issue. 3) Under Excess Conditions: Based on the written estimate prepared under paragraph 2 of this condition, Permittee shall reduce exports at the Banks Pumping Plant to 40% of the estimated total allowed exports that would be allowed if both the SWP and CVP were operating to meet the requirement stated in or determined by the Condition of Approval at issue.	ITP Condition # 8.10	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Under Balanced Conditions: Based on the written estimate prepared under paragraph 2 of this condition, Permittee shall reduce exports at the Banks Pumping Plant to 35% of the estimated total allowed exports that would be allowed if both the SWP and CVP were operating to meet the requirement stated in or determined by the Condition of Approval at issue. Excess and Balanced Conditions are defined in Section 1.4 of the Project Description. The SWP shares of allowable exports in Step 3 above are defined based on the SWP share of exports during excess and balanced conditions described in the 2018 COA Addendum. This condition in combination with other Conditions of Approval required by this ITP are intended to further satisfy Permittee's obligations pursuant to CESA. If the COA is revised after the effective date of this ITP, Permittee shall notify CDFW per Condition of Approval 5. Permittee shall not be required to reduce exports below 600 cfs, the minimum required to health and safety standards.				
51	Ongoing comparison of OMR Index to Tidally Filtered OMR. The United States Geological Survey (USGS) Tidally Filtered Method to calculate OMR flow is defined in the NMFS 2009 BiOp and uses values reported by the USGS for the Old River at Bacon Island and Middle River at Middle River monitoring stations. Permittee shall continue to calculate and report OMR as estimated using the USGS Tidally Filtered Method in all risk analyses conducted as a part of the Smelt and Salmon Monitoring Teams and reported to the WOMT, in addition to OMR flows as calculated using the OMR Index. Permittee shall provide raw data for the daily OMR Index and USGS Tidally Filtered OMR and a report comparing the estimates over the prior water year annually as a part of the ASR (Condition of Approval 7.2).	ITP Condition # 8.11	Throughout the term of the ITP	Permittee	
52	Barker Slough Pumping Plant Longfin and Delta Smelt Protection. Permittee shall operate the BSPP to protect larval LFS from January 15 through March 31 of dry and critical water years. Permittee shall operate to protect larval DS from March 1 through June 30 of dry and critical years. If the water year type changes after January 1 to below normal, above normal or wet, this action will be suspended. If the water year type changes after January to dry or critical, Permittee shall operate according to this Condition of Approval. From January 15 through March 31 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval LFS are detected at Station 716. In addition, in its weekly meetings from January 15 through March 31, the Smelt Monitoring Team shall review LFS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval LFS at the BSPP. When recommended by the Smelt Monitoring Team, and as approved through the decision-making processes described in	ITP Condition # 8.12	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP according to the advice provided by the Smelt Monitoring Team. From March 1 through June 30 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval DS are detected at Station 716. In addition, in its weekly meetings from March 1 through June 30, the Smelt Monitoring Team shall review DS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval DS at the BSPP (including temperature and turbidity). When recommended by the Smelt Monitoring Team, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs. The DS requirements described in this condition may be adjusted to align with USFWS requirements to minimize take of DS through an amendment to this ITP.				
53	Water Year Type Definition. All references to water year type in this ITP shall be defined based on the Sacramento Valley Index unless otherwise noted.	ITP Condition # 8.13	Throughout the term of the ITP	Permittee	
54	Clifton Court Forebay Aquatic Weed Control Practices. Permittee may apply Aquathol K and copper-based aquatic pesticides, as needed, from June 28 to August 31. Permittee may apply Aquathol K and copper-based aquatic pesticides, if necessary, prior to June 28 or after August 31 if the average daily water temperature within the CCF is greater than or equal to 25°C, and if DS, LFS, CHNWR and CHNSR are not at additional risk from the treatment, as confirmed by CDFW, NMFS and USFWS. Before applying aquatic pesticides outside of the June 28 to August 31 time frame, Permittee shall notify and confer with CDFW, NMFS and USFWS to determine whether ESA- or CESA-listed fish species are present and at risk from the proposed treatment. Permittee may apply Aquathol K and copper-based aquatic pesticides, outside of the June 28 to August 31 timeframe and when the average daily water temperature in the CCF is below 25°C only as approved by CDFW and subject to the following conditions. Permittee shall: • Close the CCF radial gates for 24 hours after Aquathol K application is completed, unless CDFW determines that rapid dilution of the herbicide would be beneficial to reduce the exposure duration to Covered Species present within the CCF. • Monitor the salvage of Covered Species at the Skinner Fish Facility prior to the application of the aquatic herbicides and algaecides in the CCF. If salvage of Covered Species occurs Permittee shall confer with CDFW prior to initiating	ITP Condition # 8.14	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	aquatic weed control. • Close the radial intake gates at the entrance to the CCF for at least 24 hours prior to the application of Aquathol K and copper compounds pesticides to allow fish to move out of the targeted treatment areas and toward the salvage facility and to minimize the possibility of aquatic pesticide diffusing into the Delta. • Close the radial gates for a minimum of 12 and up to 24 hours after treatment with Aquathol K and copper compounds to allow for the recommended duration of contact time between the aquatic pesticide and the treated vegetation or cyanobacteria in CCF, and to reduce residual endothall concentration for drinking water compliance purposes. Permittee shall not open radial gates until a minimum of 36 hours (24 hours pre-treatment closure plus 12 hours post-treatment closure). • Close the radial gates prior to the application of peroxide-based algaecides to minimize the possibility of the algaecide diffusing into the Delta. Permittee may reopen the radial gates immediately after treatment with peroxide-based algaecides. • Ensure that aquatic herbicides are applied by a licensed applicator under the supervision of a California Certified Pest Control Advisor. • Apply aquatic herbicides and algaecides by boat or by aircraft. • Apply aquatic herbicides by boat using a subsurface injection system for liquid formulations and a boat- mounted hopper dispensing system for granular formulations. Applications shall start at the shoreline and move systematically farther offshore, enabling fish to move out of the treatment area. • Use helicopter or aircraft for aerial application of aquatic herbicides during times when wind speeds are less than 15 mph to prevent spray drift. • Restrict application to the smallest area possible (no more than 50% of the CCF at one time) that provides relief to SWP operations or water quality. • Collect water quality samples to monitor copper and endothall concentrations within or adjacent to the treatment area, per NPDES permit requirements, before, during and after application. Additional water quality samples may be collected during the following treatment for drinking water compliance purposes. • Measure dissolved oxygen concentration prior to and immediately following application within and adjacent to the treatment zone.				
55	Skinner Fish Salvage Facility CDFW Staff. To support implementation of Conditions of Approval 7.4, 7.4.1, 7.4.2 and 7.4.3 Permittee shall fully fund two existing Environmental Scientist and one new Senior Environmental Scientist Specialist CDFW staff positions to work collaboratively with DWR Skinner Fish Salvage Facility staff starting on July 1 in the same year this ITP becomes effective. Permittee shall work collaboratively with these CDFW staff to ensure that they have the access and information needed to perform their	ITP Condition # 8.15	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	duties and discuss roles and responsibilities relative to existing DWR facility staff. CDFW staff duties will include, but not be limited to, the following: • Receive daily salvage data from the SWP and CVP fish salvage facilities, • Conduct salvage data QA/QC, • Train salvage facility staff, • Monitor salvage facility operations, • Work collaboratively with DWR staff to develop a revised Skinner Fish Facility Operations Manual v 2.0 October 19. 2005 (see Condition of Approval 7.4.2), • Review annual savage reports, • Receive notifications regarding inspections or maintenance of fish protective equipment, • Work collaboratively with Permittee to develop a new protocol which describes the decision-making process prior to reducing sampling times, • Engage in real-time decision making to determine whether reduce count times are needed and measures to ensure adequate detection of Covered Species during reducing count times, and • Conduct special studies to refine estimates of entrainment, expanded salvage, and loss (see Condition of Approval 7.4.3) Permittee shall provide reasonable access to the Skinner Fish Salvage Facility for the three CDFW staff identified in this Condition of Approval.				
56	Relationship Between the Adaptive Management Program and This ITP. The Adaptive Management Program (Attachment 2, AMP) shall be used to consider and address scientific uncertainty regarding the Bay-Delta ecosystem, Covered Species ecology, and to inform the understanding of minimization of take and impacts of the taking associated with the operational criteria in this ITP. The AMP may result in recommendations regarding operational components described in Conditions of Approval in this ITP, and consequently Permittee may request amendment of this ITP based on new information developed through new science and monitoring (Condition of Approval 5) and according to the amendment standards and processes identified in CESA's implementing regulations. The AMP shall be used to build scientific understanding of Covered Species and evaluate potential changes in the operational criteria in this ITP. The AMP (Attachment 2) describes this structure and steps associated with adaptive management in more detail. The AMP does not govern real-time operations. Recommendations of the AMP shall not commit Permittee or CDFW to a definite course of action related to ITP amendments. The AMP shall not modify CDFW's discretionary decision-making as set out in the Conditions of Approval, CESA, or CESA's implementing regulations.	ITP Condition # 8.16	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Condition of Approval 5 describes circumstances when CDFW anticipates that Permittee may request an amendment to this ITP in the future, including amendments that may be requested in response to recommendations from the AMP.				
57	Export Curtailments for Spring Outflow. As described in Sections 1.5 and 3.17 of the Project Description, as part of the Voluntary Agreement process, Permittee and its SWP Contractors have proposed a reduction in SWP exports to protect outflows in the spring time period. Each year, following the finalization of the March forecast, Permittee will confer with CDFW regarding export reductions from April 1 to May 31. If in any year during the term of this ITP, Permittee and its SWP Contractors identify in a written operations plan, submitted to CDFW following the March forecast, and throughout April and May conduct SWP export reductions pursuant to the Voluntary Agreements that are consistent with the SWP export reductions required by this Condition, then the Voluntary Agreement implementation may satisfy the reductions required to meet this Condition. The following shall be implemented by Permittee during any year in which SWP export reductions pursuant to the Voluntary Agreements are not identified and conducted as described in the preceding paragraph. Permittee shall operate the Project during the spring each year to restrict exports and enhance Delta outflow. Permittee shall reduce exports from April 1 to May 31 each year to achieve the SWP proportional share (Condition of Approval 8.10) of export reductions established by the ratio of Vernalis flow (cfs) to combined CVP and SWP exports, scaled by water year type, to provide incidental spring outflow. In a critically dry year, the ratio of Vernalis flow to CVP and SWP combined exports shall be 1 to 1. In a dry year, the ratio of Vernalis flow to CVP and SWP combined exports shall be 2 to 1. In a below normal year, the ratio of Vernalis flow to CVP and SWP combined exports shall be 3 to 1. In an above normal or wet year, the ratio of Vernalis flow to CVP and SWP combined exports shall be 4 to 1[1]. In wet years SWP export curtailments required by this Condition of Approval for spring outflow in April and May is limited to 150 TAF. The ratio of Vernalis flows to export reductions is intended to serve as an operational mechanism to achieve the Delta outflow required by this Condition of Approval for minimization of the Covered Activities' impacts to Covered Species. For purposes of this Condition of Approval only, the Joaquin Valley "60-20-20" Water Year Hydrologic Classification and Indicator as defined in the Bay-Delta Plan (SWRCB 2006) is used. Permittee shall not be required to restrict operations as described above under either of the	ITP Condition # 8.17	Throughout the term of the ITP	Permittee	

[1] Ratio adjustments for multi-year droughts as outlined in the 2009 NMFS Central Valley Operations Biological Opinion would apply.

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	following circumstances: • If the three-day average Delta outflow is greater than 44,500 cfs, then Project operations shall not be controlled by this Condition until the flows drop below 44,500 cfs on a three-day average. • Permittee shall not be required by this Condition of Approval to restrict exports at the Banks Pumping Plant below its minimum health and safety exports of 600 cfs. The ratios used to establish export restrictions by water year type are a tool that incorporates San Joaquin River inflows while also allowing for a high outflow offramp of 44,500 cfs, which is expected to be driven by inflow from the Sacramento River. Spring export curtailments are intended to augment Delta outflow during a critical time in the life history of all four Covered Species. When April and May Delta outflow is augmented salinity in Suisun Bay is reduced and central Delta productivity is dispersed westward, improving habitat for both Delta and longfin smelt. At the upper end of managed flows when X2 is in San Pablo Bay, export curtailments help maintain this favorable location and sustain food web productivity and other conditions for improved longfin smelt recruitment in San Pablo Bay. Reductions in outflow during such conditions could restrict longfin smelt nursery habitat upstream to less favorable habitat in Carquinez Strait. Augmenting spring outflow through export curtailments improves migratory conditions for CHNWR and CHNSR by reducing Covered Activities' impacts on routing and through-Delta survival. Maintaining a higher Delta outflow during this time period will also provide a proactive approach to entrainment minimization that is expected to reduce CHNWR and CHNSR routing into the central and south Delta and minimize loss of all Covered Species at the SWP export facility. Additionally, increases in Delta outflow are associated with increased food web transport to, and productivity in, Suisun Bay. Immediately following the SWRCB's adoption of final Voluntary Agreements Permittee, SWC and CDFW will meet and confer to review the Project in light of the final form of the Voluntary Agreements. Consistent with Condition of Approval 5, CESA, and CESA's implementing regulations, the Permittee and CDFW, in consultation with SWC and as appropriate depending on the results of that review, may replace the ratio of Vernalis flows to exports used as an operational mechanism to determine spring outflow volumes in this condition of approval, based on the final Voluntary Agreements and as part of such amendment process.				
58	Potential to Redeploy up to 150 TAF for Delta Outflow. Permittee shall curtail exports at the Banks Pumping Plant to maintain the SWP contribution to spring Delta outflow as required by Condition of Approval 8.17 from April 1 to May 31. If approved in writing by CDFW, Permittee may increase exports at the Banks Pumping Plant between April 1 and May 31 above what would otherwise be allowed by operating to	ITP Condition # 8.18	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Condition of Approval 8.17. When making the determination about whether to approve an increase in exports CDFW will weigh the benefits of increasing exports to bank water for other purposes against the risk of entrainment of Covered Species or impacting Covered Species habitat during that water year. If an increase in Project exports is approved by CDFW in April and May, the increase in the volume of water exported during this time period, up to 150 TAF (hereafter Spring Outflow Block), shall be accounted for by Permittee and available for use by CDFW after March 1 of the next water year, except if the following year is critical. The Spring Outflow Block is in addition to the water required to achieve criteria in Table 9-A in Condition of Approval 9.1.3.1 and the Additional 100 TAF Block (Condition of Approval 8.19). Condition of Approval 8.19, Delta Outflow Operations Plan and Report, describes the required planning, accounting, and reporting process that shall be used by Permittee, in collaboration with CDFW, each year following a water year in which CDFW approves an increase in exports during April and May. CDFW is most likely to approve an increase in exports for the purpose of building a Spring Outflow Block in wetter water years. In wet water years Permittee may export no more than 30 TAF above what would be allowed by operating to Condition of Approval 8.17. This 30 TAF is intended to offset the water required to operate SMSCG for 30 days during summers of dry years that follow a below normal water year as described in Condition of Approval 9.1.3.1, Table 9-A.The timing and magnitude of exports to capture 30 TAF in a wet year shall be described in the Delta Outflow Operations Plan (Condition of Approval 8.20) to avoid sharp reductions in Delta outflow during April and May that may increase take of Covered Species as a result of entrainment into the central and south Delta. In addition, Permittee shall provide a Spring Outflow Block Report to CDFW by August 1 of the same water year in which the increased exports are approved by CDFW. The Spring Outflow Block Report shall quantify the increase in Project exports, account for the water available in the Spring Outflow Block, and include the following daily information from April 1 through May 31: • Delta outflow • Delta conditions (excess vs. balanced) • Total exports at Banks Pumping Plant • Jones Pumping Plants • OMR index • San Joaquin inflow • Flow at Freeport • Controlling factor each day and associated SWP allowable exports • Estimated daily exports at Banks Pumping Plant from April 1 – May 31 of that year that would have occurred if all SWP operations remained the same except exports were restricted by operating to Condition of Approval 8.17				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	Permittee shall address comments and questions from CDFW on the draft Spring Outflow Block Report before it is finalized and submitted to CDFW for approval, no later than October 31. The following water year, Permittee shall adjust operations of the Project to provide the Spring Outflow Block (as specified in the CDFW-approved Delta Outflow Operations Plan, Condition of Approval 8.20), unless that water year is critical. The Spring Outflow Block shall be stored in Oroville Reservoir and will be subject to spill if redeployed to the following year. Permittee shall ensure that the water provided by the SWP achieves the defined purpose in the CDFW-approved Delta Outflow Operations Plan by dedicating the Spring Outflow Block of water to outflow for the duration of this ITP through agreements with downstream water users, a term-limited Section 1707 dedication as provided under the California Water Code, reliance on Term 91 conditions as enforceable by the SWRCB, or other means to ensure the water is not diverted for any intended use other than Delta outflow.				
59	Additional 100 TAF for Delta Outflow. To provide benefits to DS or LFS during a critical part of their life histories Permittee shall operate the project to provide a flexible block of water to enhance Delta outflow during the spring, summer, or fall months. Permittee shall provide 100 TAF of water to supplement Delta outflow (Additional 100 TAF) as approved by CDFW. Permittee shall provide the Additional 100 TAF of water subject to the following conditions: • This water may be used in June through September of wet and above normal water years, and the October immediately following, to supplement Delta outflow in addition to flow required to meet the criteria in Condition of Approval 9.1.3.1, Table 9-A, and improve DS habitat. • As approved by CDFW, the Additional 100 TAF of water available in a wet or above normal water year may instead be deferred and redeployed in the following water year to supplement Delta outflow during the March through September time period, or the October immediately following the end of that water year. The Additional 100 TAF shall be provided in addition to outflow required to meet the criteria in Table 9-A of Condition of Approval 9.1.3.1 in that following year, except if the following year is dry. The Additional 100 TAF is not required to be provided if the following water year is critical as determined by the May forecast with planning beginning in February each year as described in Condition of Approval 8.20, Delta Outflow Operations Plan and Report. • The Additional 100 TAF shall be stored in Oroville Reservoir and will be subject to spill from Oroville Reservoir if redeployed to the following year.	ITP Condition # 8.19	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• The Additional 100 TAF from a wet or above normal water year may be deferred only to the following water year, or the October immediately following the end of that water year. Permittee shall provide the Additional 100 TAF as described in the CDFW-approved Delta Outflow Plan (Condition of Approval 8.20). In determining the use of the Additional 100 TAF, CDFW and Permittee will plan for the possibility that the following year is dry and this water would be needed to operate the SMSCG for 60 days during the June – October time period. Sixty days of SMSCG operations in the summer of a dry year is anticipated to require an additional 60-70 TAF of Delta outflow to ensure that other Project operating requirements (including Delta salinity standards) are met. CDFW anticipates that another high-priority use of the Additional 100 TAF, if deferred and redeployed to the following year, would be to supplement outflow in the spring of below normal water years. Permittee shall ensure that the water provided by the SWP achieves the defined purpose in the CDFW-approved Delta Outflow Operations Plan by dedicating the 100 TAF to outflow for the duration of this ITP through agreements with downstream water users, a term-limited Section 1707 dedication as provided under the California Water Code, reliance on Term 91 conditions as enforceable by the SWRCB, or other means to ensure the water is not diverted for any intended use other than Delta outflow.				
60	<u>Delta Outflow Operations Plan and Report</u>. Conditions of Approval 8.18 and 8.19 describe blocks of water that shall be made available to supplement spring, summer or fall Delta outflow at the discretion of CDFW. Additionally, Condition of Approval 9.1.3.1 describes a requirement to operate the SMSCG during above normal, below normal, and dry water years and operate to an X2 standard in September and October of wet and above normal water years. Each year, to facilitate the planning, accounting, and reporting of these Conditions of Approval, Permittee shall: 1) Develop and operate to a Delta Outflow Operations Plan: • Beginning no later than February 1, work collaboratively with CDFW to develop a draft Delta Outflow Operations Plan that describes: o The amount of water available to supplement Delta outflow associated with the Additional 100 TAF (Condition of Approval 8.19) and Spring Outflow Block (Condition of Approval 8.18). o The timing and volume of water to be made available on a daily basis between March 1 and October 31 associated with the available blocks of water. o Anticipated Project operational actions (e.g. export restrictions or storage releases) that would be taken to ensure the available blocks of water supplement Delta outflow.	ITP Condition # 8.20	Throughout the term of the ITP	Permittee	

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	○ An accounting of how and when each available block of water would be used to supplement Delta outflow in addition to water required to operate to X2, SMSCG operational criteria, or other controlling operational criteria as required in Table 9-A and Condition of Approval 9.1.3.2. ○ Ongoing coordination with CDFW throughout deployment of the available blocks of water to evaluate operations relative to the requirements described in the Final Delta Operations Plan. • Permittee shall work collaboratively with CDFW on an ongoing basis after February 1 to update the draft Delta Outflow Operations Plan based on refinements in understanding of Covered Species status and distribution, Project operations, and hydrologic and temperature forecasts. • Submit the draft Delta Outflow Operations Plan to CDFW no less than 15 days prior to the start date of operational requirements described in the plan and incorporate CDFW comments and edits into the final plan no less than five days prior to the start of operational requirements described in the plan. • Operate the Project consistent with the final CDFW-approved Delta Outflow Operations Plan. 2) By October 31, submit to CDFW a draft Delta Outflow Operations Report that includes the following daily information throughout the duration of the implementation of the Delta Outflow Operations Plan that year: • Delta outflow • Total exports at Banks Pumping Plant • Total exports at Jones Pumping Plant • OMR index • USGS Tidally Filtered OMR flow • San Joaquin inflow • Flow at Freeport • Flow on the Feather River immediately below Thermalito • State and federal share stored in San Luis Reservoir • Releases from the following reservoirs: ○ Nimbus ○ Keswick ○ Oroville ○ Whiskeytown • Jersey Point salinity • Salinity at Belden's Landing • Flow as measured at Lisbon Weir				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• Delta outflow controlling factor each day and associated allowable SWP exports • Minimum required Delta outflow that would be required to meet applicable controlling standards • Documentation of the volume and timing of the Additional 100 TAF and Spring Outflow Block planned to be used in that year according to the CDFW-approved Delta Outflow Operations Plan • Depiction of operations that would have occurred during the timeframe outlined in the Delta Outflow Operations Plan for that water year if the available blocks of water and the Summer-Fall Action had not been implemented. This depiction shall include estimates of all required hydrologic data points used to quantify actual operations during the same time period. 3) Incorporate CDFW comments and edits into the draft Delta Outflow Operations Report and submit it to CDFW for approval before December 1.				
61	Drought Contingency Planning. On October 1, if the prior water year was dry or critical, Permittee, in coordination with Reclamation, shall meet and confer with USFWS, NMFS, SWRCB, and CDFW to develop a drought contingency plan to be implemented if dry conditions continue into the following year. On February 1 if dry conditions continue, Permittee shall submit the drought contingency plan to CDFW and shall update the plan monthly based on current and forecasted hydrologic conditions. If dry conditions continue, Permittee shall regularly convene this group to evaluate hydrologic conditions and the potential for continued dry conditions that necessitate implementation of measures identified in the drought contingency plan for the current water year. By February 1 of each year following the development of a drought contingency plan, Permittee shall submit a report to CDFW on the measures employed during the previous year, including an assessment of their effectiveness.	ITP Condition # 8.21	Throughout the term of the ITP	Permittee	
Compensatory Mitigation					
62	Tidal Wetland Habitat Restoration for Delta Smelt. Within 6 years of the effective date of this ITP, Permittee shall complete siting, design, restoration, and conservation of 8,000 acres of DS tidal wetland habitat as compensatory mitigation to expand the diversity, quantity, and quality of DS rearing and refuge habitat in the tidal portions of the Delta and Suisun Marsh. This requirement is carried forward from the compensatory mitigation obligation originally established in the 2008 BiOp and associated CDFW consistency determination. Permittee shall site, design, restore, and conserve an additional 396.3 acres of DS tidal	ITP Condition # 9.1.1	Within 6 years of the effective date of this ITP		

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	wetland habitat as compensatory mitigation for increased diversions at the BSPP. Permittee shall coordinate with USFWS and CDFW during the process of site selection and restoration design for HM lands intended to serve as compensatory mitigation for impacts to DS habitat. HM lands and restoration designs shall be informed by the specifications and habitat crediting process described in the 2012 *Fish Restoration Program Agreement Implementation Strategy*, the *Draft 2008 FWS BiOp Delta Smelt Crediting Decision Model Guidelines*, and the *Draft 2008 FWS BiOp Delta Smelt Crediting Decision Model* (Guidance for Smelt HM Lands Suitable for Compensatory Mitigation, Attachment 4). All DS tidal wetland habitat restoration shall be subject to approval by CDFW.				
63	Habitat Restoration for Longfin Smelt. Within 6 years of the effective date of this ITP, Permittee shall complete siting, design, restoration, and conservation of 800 acres of LFS mesohaline habitat and 396.3 acres of LFS tidal wetland habitat as compensatory mitigation to expand the diversity, quantity, and quality of LFS rearing and refuge habitat in the tidal portions of the Delta and Suisun Marsh. The requirement to restore and conserve 800 acres of mesohaline habitat is carried forward from the compensatory mitigation obligation originally established in the 2009 ITP issued by CDFW for take of LFS. Permittee shall coordinate with CDFW during the process of site selection and restoration design for HM lands intended to serve as compensatory mitigation for impacts to LFS habitat. HM lands and restoration designs shall be informed by the specifications and habitat crediting process described in the 2012 *Fish Restoration Program Agreement Implementation Strategy*, the *Draft 2008 FWS BiOp Delta Smelt Crediting Decision Model Guidelines*, and the *Draft 2008 FWS BiOp Delta Smelt Crediting Decision Model* (Guidance for Smelt HM Lands Suitable for Compensatory Mitigation, Attachment 4) and adapted for the specific habitat requirements of LFS, as approved by CDFW. All LFS mesohaline habitat restoration shall be subject to approval by CDFW.	ITP Condition # 9.1.2	Within 6 years of the effective date of this ITP		
64	Delta Smelt Summer-Fall Habitat Action. The DS summer-fall habitat action (Summer-Fall Action) is intended to benefit DS food supply and habitat, thereby contributing to the recruitment, growth, and survival of DS. The FLaSH conceptual model[2] states that DS habitat should include low-salinity conditions of 0 to 6 parts per thousand (ppt), turbidity of approximately 12 NTU, temperatures below 25°C, food availability, and littoral or open water physical habitats. The highest-quality habitat in Suisun Marsh and Grizzly Bay includes areas with complex bathymetry, in deep channels close to shoals and shallows, and in proximity to extensive tidal or freshwater marshlands and other wetlands. The Summer-Fall Action will provide the aforementioned habitat components in the Suisun Marsh and Grizzly Bay through a range of actions by water year type to improve water	ITP Condition # 9.1.3	Throughout the term of this ITP		

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	quality and food supplies. As described in Sections 1.5 and 3.9.2 of the Project Description, proposals under the Voluntary Agreements may be implemented in a way that complements the Delta Smelt Summer-Fall Habitat Action by providing summer outflow during above normal, below normal, and dry water year types, in a manner that is equivalent to or greater than the flow needed to achieve the standards described in Conditions of Approval 9.1.3.1 and 9.1.3.2 for Permittee. Permittee shall implement SMSCG operations as described in Conditions of Approval 9.1.3.1 and 9.1.3.2 through its operations, including through reducing its exports at Banks Pumping Plant.				
65	Summer-Fall Action Plan. Each year Permittee shall initiate the process to develop a plan to operate the Project, achieve criteria described in Table 9-A and requirements in Conditions of Approval 8.19, 9.1.3, and 9.1.3.2, and implement additional actions, as available, including monitoring, science, and food enhancement actions to enhance DS habitat (Summer-Fall Action Plan). As a part of this annual planning and implementation process, reports documenting summer-fall operations and results from monitoring (including Condition of Approval 9.1.3.3) and scientific investigations (including Condition of Approval 7.6.4) shall be used to better understand DS habitat during the summer-fall time period and investigate the way in which SWP-CVP operations interact with the full range of components of DS habitat. The planning process will investigate the extent to which providing flow and low salinity conditions of various volumes and locations improves the quality and quantity of DS habitat and food in the summer and fall, and whether DS survival, viability, and abundance improves in response to the Summer-Fall Action. The planning process shall also consider tradeoffs between actions to benefit DS and effects on other Covered Species. For example, the planning process shall include consideration of the potential for CHNSR juvenile stranding in upstream tributaries associated with reservoir releases. The Summer-Fall Action Plan shall be developed based on hydrologic, operational, and temperature forecasts using the best available modeling to plan SMSCG operations (Table 9-A in the ITP) to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 ppt in all but dry years following below normal years. In a dry year following a below normal year the Summer-Fall Action Plan shall be developed to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 6 ppt. CDFW anticipates that a three-day average salinity of 4 ppt at Belden's Landing (or 6 ppt in dry years following below normal years) may be met by operating the SMSCG intermittently throughout the summer-fall. The required days of SMSCG operations (Table 9-A) need not be on consecutive days. As a result, this action is likely to extend beyond the required number of days of SMSCG operations to maximize benefits to DS. Project operations shall be consistent with the operations described in the Summer-Fall Action Plan from June – October each year. Permittee shall meet and confer with CDFW within thirty days of the effective date of this	ITP Condition # 9.1.3.1	Throughout the term of this ITP		

	ITP to determine actions to implement June – August to improve Delta smelt habitat to the maximum extent feasible, including the possibility of operating the SMSCG. The requirements described in this Condition shall begin with the 2021 water year. Permittee shall: • Within 30 days of the effective date of this ITP, convene a Delta Coordination Group (two representatives each from DWR, Reclamation, USFWS, NMFS and CDFW and one representative each from the CVP water contractors and SWP water contractors) to select a SDM model and complete initial model runs (and annual model runs thereafter) testing various approaches to satisfying environmental and biological goals, based on the criteria described in Table 9-A, monitoring and science, and additional actions, if available, such as DS food enhancement actions (see Section 3.9.1 in the Project Description and Section 5.3.3 in the FEIR). • Distribute a meeting agenda to group members at least four working days prior to each Delta Coordination Group meeting. • Record and distribute regular meeting notes within two working days of each Delta Coordination Group meeting to group members for review. Incorporate member comments and post final notes on a publicly available website. • Before April 15, develop a draft Summer-Fall Action Plan in collaboration with the Delta Coordination Group accounting for forecasted hydrology and temperatures over the summer and fall that describes: ○ How planned operations are expected to meet the criteria in Table 9-A based on the anticipated water year type; ○ Planned operations of the SMSCG if the group anticipates an above normal, below normal, or dry water year, including whether the SMSCG operations are anticipated to be conducted pursuant to the Voluntary Agreements or by Permittee independently; ○ A schedule for applying the Additional 100 TAF as described in the CDFW-approved Delta Outflow Operations Plan, if applicable; ○ Planned studies and monitoring during the planned Summer-Fall Action Plan to improve understanding of DS summer-fall habitat and survival during this time period (see Conditions of Approval 7.6.4 and 9.1.3.3); ○ A schedule for regular meetings and coordination between CDFW and Permittee throughout the implementation of the Summer-Fall Action Plan each year; ○ Habitat conditions expected to be achieved through use of the Additional 100 TAF (Condition of Approval 8.19) as described in the CDFW-approved Delta Outflow Operations Plan to supplement Delta outflow during the spring, summer, or fall and further improve DS habitat conditions beyond those required through operations criteria				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	governing X2 and SMSCG operations included in Table 9-A; ○ Hypotheses to be tested through ongoing monitoring and scientific investigations, the suite of actions and operations conducted to test the hypotheses, and the expected outcomes; and ○ Information learned from data and prior year Summer-Fall Action Reports. • Submit the draft Summer-Fall Action Plan to the Delta Coordination Group and work collaboratively to address comments and prepare a final report no later than May 15. • No later than December 31 annually, Permittee shall submit a draft Summer-Fall Action Report to the Delta Coordination Group that: ○ Synthesizes results from abiotic and biotic monitoring conducted during the prior summer-fall season; ○ Synthesizes results from actions conducted as a part of the Summer-Fall Action Plan including scientific research and additional summer-fall food actions; ○ Describes Project operations (including south Delta exports and dates of SMSCG operations) implemented to comply with the final Summer-Fall Action Plan for the prior water year; ○ Includes all raw data from monitoring efforts conducted as a part of the Summer-Fall Action; ○ Includes the criteria required in Table 9-A and summaries of monitoring data demonstrating whether criteria were met through planned operations. • Submit a final Summer-Fall Action Report to the Delta Coordination Group that incorporates comments and edits from CDFW prior to February 28 each year. Each year, the Delta Coordination Group shall: • Collaboratively assess forecasted hydrologic conditions, precipitation and temperature forecasts, and review available information regarding the distribution and abundance of DS and LFS prior to March 15. • Use a SDM model to analyze the environmental and biological goals based on the criteria described in Table 9-A, proposed DS food enhancement summer-fall actions (see Section 3.9.1 in the Project Description and Section 5.3.3 of the FEIR), and make predictions regarding the potential outcomes for various implementation scenarios. This structured decision-making process shall be used to inform the Summer-Fall Action Plan prepared each year. • Review draft Summer-Fall Action Plan prior to May 1.				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	• Collaboratively review available monitoring data and results from scientific studies following the completion of a Summer-Fall Action. • Review the draft Summer-Fall Action Report and provide comments to Permittee to assist in developing a final report prior to February 28. • Use the results from prior year reports to inform the subsequent SDM modeling exercise and develop future Summer-Fall Action Plans. The Summer-Fall Action shall be included in the Four-Year Reviews under the Adaptive Management Program (Attachment 2), including the SDM model used to develop the annual Summer-Fall Action Plan. If, in a given year, CDFW does not approve the Summer-Fall Action Plan developed by the Delta Coordination Group, CDFW may develop a new Summer-Fall Action Plan, consistent with the parameters of Conditions of Approval 8.19, 8.20, 9.1.3, 9.1.3.1, and 9.1.3.2 and Table 9-A, and submit it to Permittee prior to June 1. Permittee shall operate the Project consistent with the CDFW-developed Summer-Fall Action Plan beginning June 1.				
66	Summer-fall Delta Smelt Habitat During Successive Dry Years. Permittee shall operate the Project to enhance DS summer-fall habitat as described in Conditions of Approval 9.1.3.1, except if the current water year is dry and was preceded by a dry or critical water year. If a dry water year was preceded by a dry or critical water year, Permittee shall confer with CDFW prior to April 1 to collaboratively develop a plan for June through October to enhance DS habitat to the maximum extent practicable. Permittee shall evaluate their ability to operate the SMSCG during the June – September time period and implement other appropriate actions to enhance DS habitat.	ITP Condition # 9.1.3.2	Throughout the term of this ITP		
67	Improved Monitoring in Grizzly Bay. Permittee shall convene the Smelt Monitoring Team within 60 days of the effective date of this ITP to collaboratively develop a draft Grizzly Bay Monitoring Plan to identify and implement three additional monitoring stations and improve measurement of temperature, salinity, turbidity, and other relevant abiotic factors in areas expected to be influenced by planned operations of the SMSCG in the summer and fall. At least one of these new stations shall be sited in the western margin of Grizzly Bay near the mouth of Montezuma Slough. Permittee shall submit the draft Grizzly Bay Monitoring Plan to CDFW and the IEP Science Management Team (SMT) for review and comments. After CDFW and IEP SMT review, Permittee shall prepare a final Grizzly Bay Monitoring Plan to deploy, maintain, and fund these additional monitoring stations within nine months of the effective date of this ITP and submit the final Grizzly Bay Monitoring Plan to CDFW for review. If approved by CDFW, Permittee shall implement the final Grizzly Bay Monitoring Plan and incorporate data from new monitoring stations into annual Summer-Fall Action	ITP Condition # 9.1.3.3	Throughout the term of this ITP		

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	data collection, planning and reporting processes within one year of the effective date of this ITP.				
68	Rio Vista Estuarine Research Station. Permittee shall provide 66% of the total funding required during the term of this ITP to construct the Rio Vista Estuarine Research Station (RVERS) to provide long-term support for Bay-Delta science and research to enhance the understanding of Covered Species ecology. RVERS shall be constructed in conjunction with the USFWS Fish Technology Center, a research facility for cultured fish and a potential future home for Delta smelt refuge populations.	ITP Condition # 9.1.4	Throughout the term of this ITP		
69	Mitigation for Impacts Associated with Project Operations. Within six months of the effective date of this ITP, Permittee shall fund at least one restoration project annually identified in coordination with CDFW, NMFS, USFWS, Reclamation and other entities undertaking restoration and enhancement in the Sacramento River watershed. Permittee shall fund a total of $20,000,000 for restoration projects over the term of the ITP as approved by CDFW. The selected restoration projects shall provide one or more of the biological benefits described below to CHNWR and CHNSR in the Sacramento River watershed upstream of the Delta, as compensatory mitigation for impacts associated with Project operations. Larger restoration projects may be carried over multiple years. Restoration projects shall align with CHNWR and CHNSR recovery needs and be guided by information in the Salmon Resiliency Strategy. *Biological Benefits of Improved Juvenile Upstream Rearing Habitat*: Channelization of rivers to manage flood risk and convert wildlife habitat to agricultural use has eliminated 95% of riparian and floodplain wetland habitat in the Central Valley. Historically, these habitats benefited rearing CHNWR and CHNSR by providing increased primary productivity and prey availability, refuge from predators, respite from high flows, and efficient locations to feed. These benefits allow for increased growth of juvenile CHNWR and CHNSR, which may be reflected in higher adult return rates. Remaining riparian and floodplain wetland habitat in the Sacramento and San Joaquin river basins is largely unavailable for rearing juvenile CHNWR and CHNSR due to the reduced frequency and duration of seasonal over-bank flooding. Restoring connectivity of floodplains with adjacent streams increases the available habitat that is inundated with the frequency and duration of suitable floodplain rearing habitat. This connectivity with adjacent streams is critical to provide volitional entry and exit for rearing juveniles that cue migration based on the hydrograph of the river. Projects to improve rearing habitat for juvenile salmonids are limited in scope by engineered leveed waterways, but primarily include breaching or setbacks of levees to create bench habitat. These habitats provide shallow water foraging and refuge habitat for rearing juveniles. Other projects include channel margin enhancement that focuses on improving channel	ITP Condition # 9.2.1	Throughout the term of this ITP		

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	geometry and restoring riparian, marsh, and mudflat habitats on the water side of levees. Similar to breaching and setbacks of levees, channel margin enhancement is expected to increase rearing habitat through enhancement and creation of additional shallow water habitat that will provide foraging opportunities and refuge from unfavorable hydraulic conditions and predation. Restoring juvenile rearing habitat is intended to increase habitat diversity and complexity, which can lead to population resiliency during times of increased temperatures and water demands. *Biological Benefits of Improved Adult Passage*: Passage barriers exist in many forms, including low-flow road crossings, bridges, flow control structures, and dams. Many of these structures require minimum flows to allow passage; however, flows are often limited due to high water demands. Each in-water structure within the Sacramento and San Joaquin river basins can cause delays in upstream passage for CHNWR and CHNSR. CHNWR and CHNSR may sustain injuries or experience pre-spawn mortality due to stress as they attempt to navigate barriers. Loss of upstream spawners can lead to a reduction in genetic diversity as well as a decrease in juvenile production. The decline in CHNWR and CHNSR populations increased following the construction of major water project facilities and development projects in the mid-1900s. Many of these projects impede or completely block upstream migration of CHNWR and CHNSR to historic cold-water spawning and rearing habitats. This has led to a reduction in available spawning habitat (e.g., suitable spawning and egg incubation temperatures and flow) and has increased competition and hybridization between CHNSR and CHNFR. As a result of reduced spawning habitat CHNWR and CHNSR are more vulnerable to serious effects of elevated, and potentially lethal, temperatures during egg incubation that can occur in most years. The frequency of increased temperatures is expected to increase with increased water demands and climate change, necessitating the evaluation of passage above known barriers. Improving fish passage throughout the Sacramento and San Joaquin river basins will reduce migratory delays and loss of adult CHNWR and CHNSR at barriers and can enhance ecosystem function through improved habitat connectivity. After consulting with Reclamation, USFWS, and NMFS, Permittee and CDFW shall work each year to collaboratively select the restoration projects to be funded to restore and enhance CHNWR and CHNSR spawning and rearing habitat on the Sacramento River and its tributaries. CDFW acknowledges that planning, environmental review, and permitting may be necessary for restoration project implementation and funding under this Condition of Approval may be used for these project development activities. In some cases, implementation may be in the form of funding a restoration project in				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	whole or in part to supplement restoration projects being implemented by others, when appropriate and approved by CDFW and when CDFW determines that funding under this Condition of Approval will ensure additive benefits to CHNSR and CHNWR that would not occur in the absence of Permittee's contribution. However, under no circumstances shall any funds under this Condition of Approval be used to fund any other regulatory permitting requirement other than those established in this ITP. Final allocation of this funding shall be subject to CDFW approval each year. If, as described in Section 1.6 of the Project description and as part of the Voluntary Agreement Review (Section 3.13.9), the Voluntary Agreements are approved and Permittee, or its SWP Contractors acting on Permittee's behalf, conduct habitat restoration for CHNWR and CHNSR, Permittee and CDFW shall collaborate to review the Project in light of the final form of the Voluntary Agreements. Consistent with Condition of Approval 5, CESA, and CESA's implementing regulations, Permittee and CDFW will utilize results from the review to consider whether the Voluntary Agreements' implementation modifies the scope or nature of the Project, or the circumstances under which it is implemented, to an extent that warrants a permit amendment.				
70	Implement the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project. Within 6 years of the effective date of this ITP Permittee shall implement the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (Salmonid Habitat and Fish Passage Project). The objective of the Salmonid Habitat and Fish Passage Project is to enhance floodplain rearing habitat and fish passage in the Yolo Bypass by implementing the Project as described in in Alternative 1 of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Final EIR/EIS. This project will benefit CHNWR, CHNSR, Central Valley steelhead, and the Southern DPS of North American green sturgeon to benefit CHNWR, CHNSR, Central Valley steelhead, and the Southern DPS of North American green sturgeon. The first objective of the Salmonid Habitat and Fish Passage Project is to increase the availability of floodplain rearing habitat for juvenile CHNWR, CHNSR, and Central Valley steelhead. This action can also improve conditions for Sacramento splittail and Central Valley fall-run Chinook salmon. Specific biological goals include: • Improve access to seasonal habitat through volitional entry • Increase access to and acreage of seasonal floodplain fisheries rearing habitat • Reduce stranding and presence of migration barriers • Increase aquatic primary and secondary biotic production to provide food through an ecosystem approach The second objective of the Salmonid Habitat and Fish Passage Project is to reduce	ITP Condition # 9.2.2	Within 6 years of the effective date of the ITP		

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials

	migratory delays and loss of fish at Fremont Weir and other structures in the Yolo Bypass. Specific biological goals include:
	
	• Improve connectivity within the Yolo Bypass for passage of salmonids and green sturgeon
	• Improve connectivity between the Sacramento River and the Yolo Bypass to provide safe and timely passage for:
	  ○ Adult CHNWR between mid-November and May when water surface elevations in the Sacramento River are amenable to fish passage
	  ○ Adult CHNSR between January and May when elevations in the Sacramento River are amenable to fish passage
	  ○ Adult California Central Valley steelhead in the event their presence overlaps with the defined seasonal window for other target species when elevations in the Sacramento River are amenable to fish passage
	  ○ Adult Southern DPS green sturgeon between February and May when elevations in the Sacramento River are amenable to fish passage.
	
	Primary Project activities include the construction of a notch in Fremont Weir located in the Northern Yolo Bypass, including the construction of the following features:
	
	• *Intake channel:* The intake channel shall connect the Sacramento River to the proposed headworks structure at the appropriate elevation to facilitate an upstream fish passage facility for adult fish and for passing rearing habitat flows and juvenile salmonids.
	• *Headworks structure:* The headworks structure shall bisect the existing Fremont Weir on the east side and would control the diversion of Project flow from the Sacramento River into the Yolo Bypass. It would also serve as the primary upstream fish passage facility for adult fish and the primary facility for passing rearing habitat flows and juvenile salmonids into the Yolo Bypass. The components of the headworks shall include a concrete control structure, an upstream vehicular bridge crossing, and a concrete channel transition, which transitions the rectangular sides of the control structure to the side channel slopes of the transport channel.
	• *Transport channel:* The transport channel shall serve as the primary facility for upstream adult fish passage between the existing Tule Pond and the headworks structure. It would also serve as the primary channel for conveying juvenile salmonids and rearing habitat flows from the headworks structure to the existing Tule Pond.
	• *Downstream channel improvements:* Improvements shall be made to the existing channel that extends from the Tule Pond outlet to the beginning of Tule Canal. The improvements would be made to facilitate upstream adult fish passage between the existing Tule Canal and Tule Pond.				

	Mitigation Measure	Source	Implementation Schedule	Responsible Party	Status/Date/ Initials
	The location of each of these facilities is described in Alternative 1 in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Final EIR/EIS. The project also includes a supplementary fish passage structure located on the west side of Fremont Weir.				

STATE WATER PROJECT

DRAFT ADAPTIVE MANAGEMENT PLAN

APPENDIX J to the FEIR

MARCH 5, 2020

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DRAFT ADAPTIVE MANAGEMENT PLAN

J.1 INTRODUCTION

Adaptive management is a science-based approach to evaluate management actions and address uncertainties associated with those actions to achieve specified objectives and to inform subsequent decision making. When correctly designed and executed, adaptive management provides a means to evaluate management actions and their underlying scientific basis using formal science programs to assess their efficacy in achieving conservation objectives by comparing the outcomes to predicted responses, and providing the scientific basis for continuing, modifying, or abandoning the action or implementing an alternative action.

The Delta Reform Act of 2009 identifies adaptive management as the desired approach to achieve continuous improvement in management planning in the Sacramento-San Joaquin Delta system. Consistent with the Delta Reform Act, the Department of Water Resources (DWR), the Department of Fish and Wildlife (DFW), and the State Water Contractors (SWC) (collectively, "the Implementing Entities") intend to utilize adaptive management to inform operation of the State Water Project (SWP) and related activities described herein, consistent with the requirements of the California Endangered Species Act (CESA).

While the adaptive management program (AMP) described in this document pertains only to specified operations of the SWP and activities undertaken by DWR concomitant to those operations, and will be used to support the California Fish and Game Code Section 2081 permit issued for operation of the SWP, upon unanimous agreement among the Implementing Entities it may be: (i) expanded in the future to include other operations and activities; or (ii) implemented in a coordinated manner with other adaptive management programs covering such operations and activities. These will include coordination with ongoing implementation of the 2019 Biological Opinions for the Central Valley Project (CVP)[1] and SWP, and may include implementation of Voluntary Agreements or other activities undertaken under the oversight of the State Water Resources Control Board.

The Implementing Entities anticipate that it may be necessary to undertake additional monitoring and research that builds on existing efforts in order the carry out this adaptive management program. The Implementing Entities intend to use the Collaborative Science and Adaptive Management program (CSAMP), Inter-agency Ecological Program (IEP) Science Management Team (SMT) and Project Work Teams (PWT) and the Delta Science Program (DSP), as appropriate to develop study designs and subsequent evaluations and synthesis of monitoring data and research results. Furthermore, four-year independent science reviews will be used to evaluate the results of management actions subject to this AMP.

[1] Through integration with the processes described in Appendix C Real-Time Water Operations Charter of the Final Biological Assessment for Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and the State Water Project, October 2019.

The Implementing Entities will establish an Adaptive Management Team (AMT) to carry out this adaptive management program. Members of the AMT will include one designated representative[2] and one designated alternate each from DWR, DFW, and a SWP contractor. In addition, the AMT will use input from DSP in order to organize and guide the activities. The AMT's role in implementing this adaptive management program is described in the sections below.

The Implementing Entities intend to draw upon inter-agency technical teams as described above, as well as selected experts as needed, to develop plans to implement and track required monitoring and research identified in Appendix JA, as well as to evaluate the program and or program components. Where appropriate, the Implementing Entities will engage with the U.S. Bureau of Reclamation (Reclamation) and the federal fish agencies to pursue and implement certain actions through collaborative planning with the goal of continuing to identify and undertake actions that benefit listed species (see Section 4.12.3 of the Final Biological Assessment for Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and the State Water Project, October 2019).

Working through the collaborative process outlined in this document, the Implementing Entities commit to reach consensus within the AMT to the maximum extent possible, while still retaining individual agency discretion to make decisions (as appropriate). To that end, the Implementing Entities seek to use the flexibility provided by an adaptive management approach in a way that balances gaining knowledge to improve future management decisions with taking actions in the face of uncertainty and achieving the best outcomes possible for CESA-listed species.

J.2 INTENT AND OBJECTIVES

Through the AMP described in this document, the Implementing Entities are committed to the ongoing adaptive management of permitted operations of the SWP and related activities. In its role as operator of the SWP, DWR seeks to avoid, minimize, and fully mitigate adverse effects of SWP operations on CESA listed species, while improving operational flexibility and increasing water supply reliability of existing South Delta diversion facilities. More specifically, the intent of this AMP is to:

1. Provide a common definition of adaptive management and explain how it links to the incidental take permit for long-term operations of the SWP (SWP Incidental Take Permit [ITP].).
2. Describe how adaptive management for ongoing operations of the SWP, as it operates in coordination with the CVP, will be implemented to assist DWR in complying with applicable California law, including CESA.
3. Identify the key uncertainties about how combined SWP and CVP water operations and other management actions to benefit CESA-listed species can be implemented to meet regulatory standards applicable to CESA.

[2] "Designated Representative" means in the case of DWR and CDFW the official representative designated by the director to act on her or his behalf, and in the case of the SWP contractors the official representative designated by the SWC board of directors to act on their behalf.

4. Develop and implement a science program necessary to address uncertainties and support implementation of adaptive management, working in coordination with CSAMP, IEP, other adaptive management programs, and the DSP as appropriate.
5. Identify the SWP operations and activities that will be subject to adaptive management.
6. Describe the decision-making and governance structure that will be used to implement the AMP including adaptive management changes.
7. Describe the structure for communication among the Implementing Entities and with the broader stakeholder community regarding implementation of the AMP.
8. Describe funding for the AMP.
9. Describe the relationship between the AMP and real-time operations.

The objectives of the Implementing Entities are to: (i) continue the long-term operation of the SWP in a manner that improves water supply reliability and water quality consistent with applicable laws, contractual obligations, and agreements; (ii) address scientific uncertainties related to the effects of water project operations on listed species in relation to proposed actions; (iii) use the knowledge gained from the scientific study and analysis described in the AMP to avoid, minimize and fully mitigate the adverse effects of SWP operations on CESA-listed aquatic species; and (iv) provide a mechanism for incorporating adaptive management into the SWP ITP issued for long-term operation of the SWP.

J.2.1 SCOPE OF AMP

Each existing operation and activity and each adaptive management change must be accompanied by: (1) a set of criteria that the implementing entities can use to determine whether the action is having the anticipated impacts; and (2) monitoring that will provide the data necessary in order to determine whether the performance measures are being met. It may be necessary to undertake additional monitoring and research that builds on existing efforts in order to carry out this adaptive management program. The AMP would draw upon the CSAMP and the DSP, where appropriate, to assist with these monitoring and research efforts as well as program evaluation.

The AMP extends to specified operations of the SWP and activities undertaken by DWR concomitant to those operations. They include, but are not limited to the following:

A. Operation of Harvey O. Banks Pumping Plant
B. Daily and annual loss thresholds restricting OMR;
C. Delta Smelt Summer-Fall Habitat Actions, including food enhancement actions;
D. Cultured Delta Smelt studies;
E. Spring outflow actions;
F. Additional summer-fall actions;
G. Role of habitat restoration in improving conditions for listed fish species;
H. Efficacy of Delta Smelt supplementation;

I. Installation of the South Delta temporary barriers, including installation of other seasonal barriers, as determined necessary by the AMT;

J. Installation of the Georgiana Slough non-physical barrier to minimize entrainment of out-migrating Sacramento River salmonids into the central and South Delta;

K. Evaluation of non-physical barriers to route emigrating Sacramento River into Sutter and Steamboat Sloughs to improve through Delta survival to Chipps Island;

L. Clifton Court Forebay predator management;

M. Development of a Juvenile Production Estimate (JPE) Science Plan (by September 1, 2020);

N. Development of a JPE index for Spring-run Chinook Salmon (within 5 years of ITP issuance);

O. Development of predictive tools for management of entrainment;

P. Longfin Smelt Science Program monitoring and Lifecycle Modeling; and

Q. Monitoring associated with all of the foregoing.

Many of these topics are described in more detail in Appendix JA.

Adaptive management is used to evaluate the efficacy of the above-identified operations, actions and related activities, by addressing areas of known uncertainty, improving scientific understanding by filling data gaps, and weighing whether new information should be incorporated into the ITP through an amendment. To do so, the AMT will oversee efforts to monitor and evaluate existing operations and related activities. In addition, the AMT through the CSAMP will utilize structured decision-making to assess the relative benefits or impacts of those operations and activities for listed species. The AMT will also identify proposed adaptive management changes to those operations and activities. Any proposed changes to project operations or related activities through adaptive management should provide equivalent or increased conservation benefits to the listed species.

As noted above, a key part of the AMP will be the development of performance metrics to guide the program. It is expected that there would be both short-term (e.g., habitat attributes) and long-term (e.g., abundance) metrics. Performance metrics would be based on a suite of measures that will include monitoring (long-term surveys; new measurements), experimental methods (e.g., fish enclosures), and modeling (e.g., 3-D modeling, life cycle modeling).

J.2.1.1 FOUR-YEAR REVIEWS

In January of 2024 and January of 2028, the AMT in coordination with Reclamation, will convene an independent panel to review OMR management and measures to improve survival through the South Delta, Spring flow maintenance for longfin smelt, and the Delta Smelt Summer-Fall Habitat Action including food enhancement actions. Establishment of independent review panels composed of subject matter experts is a key component of this adaptive management approach to operation of the SWP. DFW will and, NMFS, USFWS, and DSP may provide technical assistance and input regarding the panel and its panel charge. The panel would evaluate the efficacy of these and other project actions and make recommendations. The independent panels would review actions for consistency with

applicable guidance and will provide information and recommendations to DWR and DFW. DWR, in consultation with Reclamation, will provide the results of the independent review to NMFS and USFWS. DWR will coordinate with Reclamation to document a response to the independent review and DWR may develop and propose changes to management actions through the AMT using the ITP amendment process.

J.3 GOVERNANCE AND DECISION-MAKING

The AMT will include one designated management level representative and one designated alternate each from DWR, DFW, and the SWC. The AMT will coordinate with Reclamation, DSP, FWS, and NMFS, as appropriate on matters of common interest. The AMT may draw upon additional staff from any of the Implementing Entities or consultants engaged by one or more of the Implementing Entities to provide technical assistance or other support. The Implementing Entities, through the AMT, are responsible for support, coordination, and implementation of the AMP, and shall:

A. Be responsible for supporting components of those monitoring and research needs identified in the IEP annual work plan, Implementation Plan for Science Plan to Assess the Effects of Ambient Environmental Conditions and Flow-Related Management Actions on Delta Smelt (Reed March 2019) and by Collaborative Science Workgroups that the AMT determines are necessary to carry out the AMP as required in the ITP. Existing IEP PWT's, CSAMP scoping teams and subcommittee's and groups called for under the Real-Time Water Operations Charter of the Biological Assessment will be used to the maximum extent practicable.

B. Serve as a venue for identifying monitoring and research needs not addressed in other science forums, and route requests for those science needs to the appropriate entity with the capacity to complete them, or with approval of the Implementing Entities, the AMT may initiate work to address priority science needs.

C. Develop proposals for adaptive management actions or development of discrete proposals, based on consensus among AMT members. Proposals for adaptive management actions should include a description of the action, the anticipated consequences of its implementation, and whether the action can be implemented consistent with the existing SWP ITP or will require a permit amendment. Adaptive management actions will be implemented on a pilot, annual, or long-term basis.

D. Track monitoring and research that the AMT determines are necessary to carry out the AMP.

E. Task technical teams associated with the AMT to regularly synthesize the best available scientific information regarding the covered species and their habitats and the effects of SWP operations and activities on those species and habitats based on established criteria.

F. Recommend changes to operations and activities subject to this adaptive management program as well as monitoring protocols where appropriate based upon the results of science and monitoring requirements in the ITP.

G. Refer proposed adaptive management changes to project operations or activities covered under the ITP and changes in monitoring or study protocols, as appropriate, to the Delta

Science Program for review by an independent science panel individually or as part of the four-year reviews described above.

H. Assure transparency in the implementation of the AMP.

I. Comply with Reporting Annual Work Plan and Budget, and Annual Progress Report requirements set forth in Sections J.4 and J.5.

Under the AMP, the results of monitoring and research will inform proposed adaptive management changes. The Implementing Entities commit to working collaboratively to reach consensus on recommended adaptive management changes to the maximum extent feasible and to elevate any disputes over decisions to appropriate levels of officials for each Entity. Each Implementing Entity retains discretion to make decisions, as appropriate within its authority, after considering the available information and taking into account the input of the other Implementing Entities through the AMT.

- DWR retains the authority to operate the project provided it does not deviate from the Project Description, violate any permit condition, or jeopardize the continued existence of the listed species.
- CDFW retains the authority to suspend or revoke the permit in the event DWR violates any permit condition.

If any adaptive management action changes the project description including water operations or other management activities, permit requirements, DWR will first seek to amend the SWP ITP[3].

J.4 ANNUAL WORK PLAN AND BUDGET

On an annual basis, the AMT will prepare an Annual Work Plan and Budget for the upcoming year that are in addition to required monitoring listed in the ITP or that is part of the IEP annual work plan. If the Work Plan describes activities that spans multiple years, the Budget will cover the entire period. The Work Plan will describe the proposed activities of the AMP. The Budget will set out projected expenditures and identify the sources of funding for those expenditures.

The AMT will develop and approve the Annual Work Plan and Budget. As part of this process, the Implementing Entities will participate in developing the draft plan. The final Annual Work Plan and Budget will be completed no later than one month prior to the beginning of the activities described therein. Upon approval the Work Plan will be posted on Permittees website.

The Implementing Entities will ensure the draft plan accurately sets forth and makes adequate provision for the implementation of the SWP ITP terms under which the SWP operates.

At a minimum, the Annual Work Plan and Budget will contain the following information.

A description of the planned actions under the AMP.

A. A description of the planned monitoring actions and the entities that will implement those actions.

[3] DWR will first seek to amend the SWP ITP and any needed authorizations by other state, federal, and local agencies.

B. A description of the anticipated research to be undertaken and the entities that will conduct the studies.

C. A budget reflecting the costs of implementing the planned actions.

D. A description of the sources of funds that will be used to support the budget.

J.5 ANNUAL PROGRESS REPORT

At the end of each implementation year, the AMT will prepare an Annual Progress Report. The report will provide an overview of the AMT activities carried out during the previous implementation year and provide information sufficient to demonstrate that the proposed action is being implemented consistent with the provisions of the Work Plan and the SWP ITP.

The AMT shall solicit input on the draft of the Annual Progress Report from its members prior to its review and approval. The AMT shall finalize and approve the Annual Progress Report within six months of the close of the reporting year. Moreover, these actions will also rely on web-based reporting, allowing some of the results of adaptive management actions to be examined on a real-time basis. For example, DWR recently used Bay-Delta Live as a platform to display real-time information on water quality and fish for the SMSCG and North Delta Food Web Actions. Note, however, complete reporting of all metrics for a given action will likely require a full-year or more. This is because certain metrics are time consuming to develop (e.g., zooplankton, larval fish), and more sophisticated modeling (e.g., life cycle, 3-D modeling) requires substantial time. Nonetheless, the AMT will make every effort to make data available in a timely fashion to facilitate annual planning of adaptive management actions and support structured decision making.

The annual progress report will include, among other things, the following types of information.

1. An assessment of the implementation and efficacy of operations covered by this AMP during the prior year.
2. A summary of the habitat actions that have been initiated, are in progress, or have been completed in the prior year, including information regarding the type, extent, and location of protected and restored habitat for covered species.
3. Identification of actions that have not been implemented on schedule and an explanation for the deviation from schedule. For actions that are behind schedule, a suggested schedule or process for completing them will also be included.
4. Documentation of monitoring and research actions during the prior year.
5. Adaptive management changes made during the prior year, including the scientific rationale for the action.
6. Work done in coordination with CSAMP, the DSP, and/or other entities in the prior year.
7. An accounting of the funding expended in the prior year.

The annual report will be prepared in coordination with Reclamation to document joint implement activities, monitor performance, and report on compliance with the commitments in the Proposed Project as described in the Biological Assessment and associated 2019 BOs and the CESA ITP.

J.5.1 FUNDING

The Implementing Entities agree to secure funding sufficient to implement this AMP.

It is expected that the Adaptive Management Plan will require substantial additional IEP resources to support the required evaluations. The specific level of support remains to be determined and will likely vary substantially depending on the adaptive management actions conducted each year. Based on recent experience with pilot North Delta Food Web and Suisun Marsh Salinity Control Gate flow actions, it is anticipated that the required annual cost for monitoring and adaptive management support would be approximately $2 million/year. However, the final budget could change substantially based on input from the AMT, CSAMP, and independent reviews.

J.6 RELATIONSHIP OF ADAPTIVE MANAGEMENT TO REAL-TIME OPERATIONS

The adaptive management and decision-making processes described here do not apply to real-time operations; where individual real-time operations decisions must be made on a daily, weekly or monthly time scale. However, changes to operational criteria in the SWP ITP may be changed over time through the adaptive management process based on new information. Such a change will require an amendment of the SWP ITP.

APPENDIX JA. ADAPTIVE MANAGEMENT TOPIC AREAS AND SCIENCE ELEMENTS

The following summarizes some of the major study areas and monitoring to be pursued as part of the Adaptive Management work. These include actions that are the focus of the current ITP, as well as projects that will be coordinated with the federal biological opinions. Note that this list is not meant to be exhaustive; rather, the intent is to provide more detail about some of the key components. For each project it is expected that the adaptive management team will work to develop individual work plans complete with predictions, metrics, and other relevant information.

JA.1 FLOW ACTIONS ACROSS WET AND DRY YEARS

DWR and CDFW intend to better understand how the management of water and habitat across various hydrologic conditions affect abiotic and biotic habitat quality and covered species abundance. Testing real-time SWP exports is one important component of this concept, allowing increased exports when impacts to fish potentially can be avoided or minimized. An important aspect of this concept is improving conditions during drier periods, and how the SWP can contribute to that through the shifting of exports to wetter conditions. To test the potential abiotic and biotic benefits, DWR proposes to maintain its current spring outflow contribution across all water year types, but allow, in consultation with CDFW, for flexibility in operations during some wet conditions per the real-time operations described in 3.3.1 OMR Management of its Incidental Take Permit Application, and to provide additional water for outflow in drier subsequent spring, summer, and fall periods.

JA.2 SUMMER-FALL FLOW ACTIONS

There is a recognized lack of understanding of factors influencing Delta smelt survival in the summer and fall. To study habitat effects on Delta Smelt survival, DWR has proposed summer-fall actions as described below. This water would also be for the purposes of testing and evaluating components identified in the Delta Smelt Resiliency Strategy by studying outflow effects on Delta smelt habitat.

Operation of the Suisun Marsh Salinity Control Gates (SMSCG) for up to 60 days (non-consecutive) in AN, BN, and to achieve a salinity of 4 ppt at Belden's Landing.

Provide an adaptively-managed 100 TAF block of Delta outflow in June through October in Wet and Above Normal years, as managed through the AMP with the approval of CDFW and in coordination with the Delta Coordination Team (DWR, CDFW, Reclamation, FWS, NMFS).

Initially, this water will be used in August of wet and above normal years to maintain a monthly average X2 of 80 km to the extent possible to test hypotheses and narrow uncertainty. However, subject to the AMP, CDFW may define an alternative purpose of this volume of water within the June through October period of the identified year types.

Alternatively, this 100 TAF block for Wet and Above Normal years may instead be used as additional outflow in the spring, summer, or fall of the following year to enhance habitat conditions for longfin

and Delta smelt, except if the following year is Critical. An expected potential use would be operation of the SMSCG June through September in Dry water years.

If the 100 TAF block is deferred for use in the following year, it will be subject to spill and will not be available if spilled. The water block from Wet or Above-Normal year can be deferred only to the following year.

JA.3 ADAPTIVE MANAGEMENT IN COORDINATION WITH FEDERAL BIOLOGICAL OPINIONS

Through the Delta Coordination Group, Reclamation and DWR shall develop a multi-year science and monitoring plan consistent with selected structured decision-making models within 9 months of signing the National Environmental Policy Act Record of Decision (ROD). The Delta Coordination Group may use the IEP or CSAMP (or similar entity) to review project design and the science and monitoring plan. Within six months of signing the ROD, the Delta Coordination Group shall meet to select a structured decision-making model; and complete model runs testing various approaches to satisfying the environmental and biological goals, utilizing the available toolbox of approaches. The Delta Coordination Group shall provide the initial results of its modeling exercise in a memorandum to Reclamation, DWR, CDFW, and the Fish and Wildlife Service. The process for Delta Smelt Summer-Fall Habitat Action development and approval is incorporated by reference from the BA.

The Delta Smelt Summer-Fall Habitat Action will be incorporated into the "Four Year Reviews" under the "Governance" section of this AMP, and all reasonable and practical recommendations shall be incorporated into the Delta Smelt Summer-Fall Habitat Action. The structured decision-making model and the multi-year science and monitoring plan will be part of this Peer Review.

JA.3.1 SACRAMENTO DEEPWATER SHIP CHANNEL FOOD STUDY

Reclamation proposes to repair or replace the West Sacramento lock system to hydraulically reconnect the ship channel with the mainstem of the Sacramento River. The ship channel has the potential to flush food production into the north Delta for delta smelt when paired with an ongoing food study. This is the topic of an in-progress study of phyto- and zooplankton production in the ship channel. Follow-up activities will include the use of structured decision making do evaluate the costs and benefits of this concept relative to other management strategies.

JA.3.2 NORTH DELTA FOOD SUBSIDIES/COLUSA BASIN DRAIN STUDY

DWR, Reclamation, and water users propose to increase food entering the north Delta by moving water from the Colusa Basin into the Yolo Bypass and north Delta in July and/or September. Reclamation would work with DWR and partners to augment flow in the Yolo Bypass in July and/or September by closing Knights Landing Outfall Gates and routing water from Colusa Basin into Yolo Bypass to promote fish food production.

JA.3.3 Suisun Marsh and Roaring River Distribution System Food Subsidies Study

Water users propose to add fish food to Suisun Marsh through coordinating managed wetland flood and drain operations in Suisun Marsh, Roaring River Distribution System food production, and reoperation of the Suisun Marsh Salinity Control Gates. As noted in the Delta Smelt Resiliency Strategy, this management action may attract Delta Smelt into the high-quality Suisun Marsh habitat in greater numbers, reducing use of the less food-rich Suisun Bay habitat (California Natural Resources Agency 2016). Infrastructure in the Roaring River Distribution System may help drain food-rich water from the canal into Grizzly Bay to augment Delta Smelt food supplies in that area. In addition, managed wetland flood and drain operations can promote food export from the managed wetlands to adjacent tidal sloughs and bays. Reclamation and DWR will monitor dissolved oxygen at Roaring River Distribution System drain location(s) to ensure compliance with Water Quality Objectives established in the San Francisco Bay Basin Plan when Delta Smelt food actions are being taken.

JA.3.4 Spring-Run Chinook Salmon Management

Development of Spring-run Chinook Salmon JPE from BO RPM 10, within 5 years Reclamation and DWR shall assess a potential Performance Objective for young-of-year CV spring-run Chinook (See detail below)

- Develop an initial report for consideration of the four-year panel review (2024).
- Prepare summary report of findings by September 2025.
- Consider and revise incidental take estimate, based on new information.

JA.3.5 Science and Monitoring

- Support science actions such as marking and tagging/survival studies for Battle Creek Reintroduction, spring pulse flow actions and for studying alternative release strategies for Coleman National Fish Hatchery fall-run.
- Support science, model development and monitoring; experimental design (with validation monitoring) for spring pulse flows.
- Reclamation and DWR should update and recalibrate models to use recent data to strengthen their ongoing application base for the purpose of minimizing the effect of take. Models that would benefit from recalibration include.
    - Loss-density method or other methods recommended by CSAMP
    - Delta Passage Model
    - IOS model
    - SWFSC Central Valley Winter-Run Chinook Life Cycle Model
- In order to reduce uncertainties regarding the mechanisms and extent of take in the form of juvenile salmonid behavioral modifications to hydrodynamic changes in the South Delta that are associated with water operations, Reclamation and DWR should:

- Implement the recommendations of the CAMT 2017 workplan for salmonids (Salmonid Scoping Team 2017a; Salmonid Scoping Team 2017b). As part of this workplan, Reclamation and DWR should fund continued development of enhanced particle tracking modeling that is sensitive to realistic changes in South Delta operations, analyze existing data, and conduct experiments to assist in model development.
- Develop an adaptive management approach to test key alternative hypotheses (e.g., exports are important in addition to inflow in some circumstances in influencing juvenile salmon behavior, etc.). This experimental approach should build on lessons learned from VAMP, the six-year steelhead study, and the CSAMP/CAMT gap analysis report and recent Delta salmonid research workshop (that occurred on May 22, 2018). The study design would likely need to test both more restrictive and less restrictive approaches given low survivals in the South Delta.
- This experimental operational approach could be paired with habitat restoration and or predator management actions/studies in the Delta and on the main stem San Joaquin River.

JA.4 LONGFIN SMELT SCIENCE PROGRAM

CDFW, DWR and the State Water Contractors (SWC) entered into an agreement in 2014 to implement a multiyear Longfin Smelt Science Program. The Longfin Science Program was described in a Study Plan that identified the Napa River, Coyote Creek, and other areas that required further study of environmental factors affecting the species distribution and reproduction. In addition, the Study Plan focused studies on sampling efficiency, including time of day, water transparency, and tidal conditions. The Study Plan was intended to address eight research questions, six of which were examined over the course of an initial 5-year period of field study and data analysis. The Longfin Smelt Science Program would be continued. An updated Study Plan will be developed jointly with DWR, CDFW and the SWC and would address issues that include external issues influencing population abundance, distribution, habitat use, and catchability, including vertical migration behavior and water transparency and other factors that support growth and survival. A primary goal of this effort is to improve management of Longfin Smelt, and to identify potential management actions that could improve its status.

Components of the Science Plan include:

- Longfin smelt life cycle model. DWR, CDFW and SWC will work collaboratively using the best available science to develop a mathematical life cycle model for Longfin Smelt, verified with field data collection, as a quantitative tool to characterize the effects of abiotic and biotic factors on Longfin Smelt populations.
- Factors that influence abundance growth, survival, habitat use, and distribution
- Revisions to existing IEP monitoring programs to expand the spatial distribution of LFS sampling
- Completing the LFS life cycle in captivity at the FCCL
- Characterize LFS spawning substrate and spawning microhabitat requirements
- Studies to improve the understanding of adult migration behavior.

JA.5 CONDUCT FURTHER STUDIES TO PREPARE FOR DELTA SMELT REINTRODUCTION FROM STOCK RAISED AT THE UC DAVIS FISH CONSERVATION AND CULTURAL LABORATORY

DWR is proposing to continue supporting the operation and research being conducted by the University of California, Davis (UC Davis), Fish Conservation and Culture Laboratory (FCCL). The two main goals of the FCCL are to maintain a refuge Delta Smelt population in captivity that is as genetically close as possible to the wild population and provide a safeguard against extinction. The culture technique has been improved continuously over the years and the survival rate of cultured Delta Smelt at the FCCL is high (UC Davis 2019).

The FCCL is undertaking multiple research projects that will continue to add to the understanding of Delta Smelt and other species. The laboratory works collaboratively with other researchers from different agencies and institutions, assisting them with research projects and providing them with experimental fish populations of all life stages. The FCCL currently is expanding and renovating existing facilities, increasing the capacity for culture and research. Ongoing and future studies include the following:

- The FCCL currently is conducting studies to characterize and better understand Delta Smelt spawning behavior. Because spawning behavior has never been observed in the wild and has not been formally described yet, it is unclear how and where Delta Smelt naturally spawn. In ongoing experiments, the laboratory is conducting studies that characterize Delta Smelt spawning behavior under natural conditions and examining spawning substrate preferences. The findings from these studies will be critical to continued recovery and conservation efforts.
- The FCCL is investigating the optimum conditions for hatching Delta Smelt eggs in the wild. The current laboratory practice has been optimized to hatch good-quality eggs within 10 days of spawning, although it is important to consider the conditions in which the eggs are spawned in the wild. The laboratory is studying the effects of salinity and flow rate on the survival and condition of Delta Smelt eggs. This information will inform the proposed egg frame trials as well as the conservation of suitable breeding grounds.
- The FCCL is testing the possibilities of using an egg frame, created by the Lake Suwa Fishing Collective in Hokkaido, Japan for future restoration of Delta Smelt in the Delta. The frame was designed for hatching Wakasagi (*Hypomesus nipponensis*) into a body of water with constant flow. The water flow condition around the eggs in the frame will be studied using computational flow Incidental Take Permit Application for Long-Term Operation of the California State Water Project 3-51 Project Description dynamics, and the results will be used to suggest a suitable environment for applying the egg frame in the Delta.
- The FCCL is taking steps toward promoting survival of individual families by conducting trials using small culture containers that can rear single families at a time. This method could reduce competition between families and increase the survival of each individual family. The FCCL is carrying out trials to assess this factor by individually incubating an equal number of eggs from one,

four, or eight family groups; parentage analysis will assess the survival of each family in these groups.

- The FCCL was able to increase survival rates to a level sufficient for the successful culturing of Delta Smelt from the egg through adult stage; the first complete life cycle in captivity was established in 2000–2001. Currently, the FCCL focuses on improving existing rearing techniques, with the goals of increasing the system's efficacy and rearing success. Some of the laboratory's current areas of emphasis are as follows:
    - Tank size and system parameters: As fish develop from newly hatched larvae to adults, they are transferred multiple times between fish-rearing systems to fulfill the needs of each life stage. Black interior tanks are used for all fish, as clear and acrylic tanks have been found to stress fish. Light is administered to the tanks, with varying intensities corresponding to what has been deemed optimal for each life stage. Each recirculating system provides ultraviolet (UV) sterilization, both particle and biological filtration, and heat pumps for temperature control. Currently, the FCCL is testing stocking densities and feeding rates for each tank and also is developing smaller culturing systems for research purposes.
    - Turbidity effect: Early-larval and late-larval stages require different turbidity environments to promote feeding. Although it is not completely understood why larval stages require turbidity, it is thought that the suspended particles provide a visual contrast that enables larval stages to better find their prey. Turbidity is introduced via the addition of concentrated algae. As fish mature into the adult stage, algal addition gradually is decreased to gently transition the fish into clearer water environments.
    - Weaning strategies: As the smelt develop, they are transitioned from a live prey diet to a dry feed diet. The FCCL currently is researching this topic to determine the best time for weaning.
    - Salinity: In their natural environment, Delta Smelt inhabit estuary areas of relatively low salinity. The precise environmental salinity values vary seasonally, in accordance with each year's freshwater availability. In collaboration with researchers at UC Davis, the FCCL is conducting experiments that analyze the physiological effects of salinity on Delta Smelt.

JA.6 CONTINUE STUDIES TO ESTABLISH A DELTA FISH SPECIES CONSERVATION HATCHERY

The Delta Smelt (*Hypomesus transpacificus*) is currently in severe decline within its native range in the Sacramento-San Joaquin Delta. Delta Smelt have declined to such low numbers that it is difficult to detect them in traditional surveys, and it is possible that the species cannot sustain itself without additional recovery actions. In an effort to conserve the species, a refuge population has been maintained at the UC Davis FCCL in Byron, CA since 2006 (a smaller population exists as a backup to the FCCL at Livingston Stone Hatchery in Shasta Lake, CA). The refuge population provides fish for research purposes, but more importantly, is a reservoir of Delta Smelt genetic diversity that has been specifically managed for potential wild population supplementation or reintroduction.

Currently, FCCL fish have not been released into the Delta, except as part of a predation study in a South Delta fish facility (Castillo et al. 2012). Yet under the present circumstances, there is a need to at

least have an emergency plan to guide possible release of refuge fish into the wild. Logic suggests that the easiest and most effective course of action at present may be to supplement the wild population before it goes extinct. Unfortunately, little is known about the most effective way to release Delta Smelt into the Delta for the purpose of recovering the species. In recognition of this issue, since 2017 DWR has facilitated studies with the overarching goal of determining the best methods to manage Delta Smelt releases from the refuge population to benefit the wild with maximum survival, retention of genetic diversity, and minimal risk to the wild population. A first step was the organization of a public workshop that identified some of the major scientific uncertainties and to guide future studies (Lessard et al. 2018). This workshop has led to DWR's collaborative work with UC Davis, USFWS, CDFW, and Reclamation to conduct initial investigations.

The current work plan includes work on genetics, pathology, behavior, a Hatchery and Genetic Management Plan, and test use of hatchery fish in experimental enclosures placed in the wild. Ultimately, the goal of this work is to develop an adaptive population supplementation plan that will assemble current knowledge about Delta Smelt, describe successful supplementation/reintroduction approaches for other fish species, identify research priorities, recommend monitoring approaches for evaluating supplementation strategies, and detail facility upgrade requirements for the refuge population.

DWR is proposing to continue collaborative laboratory and field work to develop a strategy for successful reintroduction of Delta Smelt to their natural environment in the wild and prevention of extinction. Some of this work on cultured fish could also be useful in the design and evaluation of different management approaches such as flow actions and tidal wetlands restoration projects. The work will be led by the Culture and Supplementation of Smelt (CASS) Steering Committee (SC), composed of CDFW, USFWS, Reclamation, DWR, and UC Davis. For 2020 it is anticipated that the primary research activities will be deployment of custom smelt cages in multiple habitats (channel, tidal wetlands) and geographic areas (Suisun, Sacramento River, North Delta), genetic analysis of the wild and hatchery population, pathology, and behavioral studies. The specific details of the work will be subject to input and review by the agency hatchery advisory group. However, it is anticipated that caged smelt could be an important tool to help evaluate different management actions as part of the Adaptive Management Plan.

JA.7 SCIENCE TO IMPROVE UNDERSTANDING OF DELTA SMELT HABITAT IN THE SUMMER AND FALL

There is currently a gap in our understanding of the spatial and temporal distribution of abiotic and biotic factors influencing DS habitat and survival during the summer-fall time period. To study habitat effects on DS survival, the AMT in coordination with Reclamation and CSAMP will support the development and completion of studies during implementation of the Summer-Fall Action Plan, including deployment of the Additional 100 TAF block of water when it is available as described in the Delta Outflow Operations Plan. The benefits associated with the Additional 100 TAF block of water will be evaluated in conjunction with new monitoring in Grizzly Bay to better quantify changes in salinity

associated with SMSCG operations. This new science can also facilitate testing and evaluating components of the Delta Smelt Resiliency Strategy by studying outflow effects on DS habitat.

JA.8 MONITORING ELEMENTS

JA.8.1 CONTINUATION OF EXISTING MONITORING

Existing monitoring programs through the Interagency Ecological Program (IEP[4]) and FWS (Enhanced Delta Smelt Monitoring[5] [EDSM] program) includes monitoring to track the status of listed species of fish, and also monitoring to ascertain performance of minimization measures associated with operations of the South Delta export facilities and their fish salvage programs. The major components of this program and DWR's commitments are summarized below in Table JA-1.

Existing monitoring programs and proposed modifications to existing IEP programs will facilitate tracking status of listed species of fish and evaluating effectiveness of minimization measures. Incidental take associated with the IEP monitoring programs is authorized via ESA Section 10(a)(1)(A) Research and Enhancement Permits and state FGC Section 2081(a) permits. Monitoring to track performance of the South Delta export facilities and their fish salvage programs is authorized through the existing biological opinions (NMFS 2009 [Section 13.4]; USFWS 2008). Use of scientific collection permits constitutes a conservative approach to take authorization associated with monitoring activities because such permits need periodic renewal, at which time methodology can be updated to ensure that incidental take is minimized consistent with available knowledge and techniques. Thus, it is expected that continuation of existing monitoring would receive take authorization either through issuance of scientific collection permits, or through an alternative consultation pathway.

JA.8.2 PROPOSED MODIFICATIONS TO IEP SAMPLING PROGRAMS

Through IEP's science management plan review process (IEP 2014), DWR will undertake a review of existing IEP larval monitoring programs to propose an expansion of CDFW SLS and 20 mm programs given new information showing that longfin smelt have a more robust distribution, both temporally (i.e., spawning window) and spatially (i.e., habitat and regions) than what is monitored by these programs (MacWilliams et al. 2016; Grimaldo et al. 2017a; Lewis et al. 2019; Grimaldo et al. 2017b. submitted manuscript). This review will be completed within one year of ITP issuance. As part of the mitigation program, the construction of RVERS is included, which should improve IEP's sampling program. This facility has been permitted through a separate state and federal environmental review process.

[4] This program is described and data are archived at http://www.water.ca.gov/iep/activities/monitoring.cfm.

[5] This program is described and data are archived at https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm

JA.8.3 MONITORING OF HABITAT RESTORATION SITES

DWR and CDFW will use the Tidal Wetland Monitoring Framework (2017), prepared as part of the Fish Restoration Program, to develop monitoring plans to assess environmental characteristics of restored habitat (e.g., salinity and zooplankton abundance) and evaluate the benefit to listed fish, lower trophic consumers, water quality, and effects on listed botanical and wildlife species. Aquatic monitoring will focus on regional and site-specific habitat characteristics associated with listed fish species. Monitoring plans will be developed as part of each restoration action that will include both pre- and post-project monitoring requirements. These plans will be independently reviewed and evaluated by technical teams or a science panel. Monitoring will rely as much as possible on data from existing regional monitoring efforts under the IEP. In addition, site-specific monitoring data will be collected within each project site prior to restoration action. Expansion of long-term Delta-wide monitoring efforts will assist with the fulfillment of monitoring requirements.

Table JA-1: IEP Core Long-Term Monitoring Elements

Title	Principal Investigator
Fall Midwater Trawl (FMWT)	CDFW
Summer Townet Survey (STN)	CDFW
Est and Marine Fish Survey (Bay Study)	CDFW
Bay Shrimp and Crab Surveys (Bay Study)	CDFW
Delta Flows Network	USGS
20mm Delta Smelt Survey (20mm)	CDFW
Juvenile Salmon Monitoring (DJFMP)	USFWS
Coleman Late Fall Run Tagging	USFWS
Mossdale Spring Trawl (Mossdale)	CDFW
Environmental Monitoring Program	DWR
Central Valley Juvenile Salmon and Steelhead Monitoring (Knights Landing)	CFDW
Upper Estuary Zooplankton Sampling	CDFW
Spring Kodiak Trawl (SKT)	CDFW
UCD Suisun Marsh Fish Monitoring	UCD
Smelt Larval Sampling (SLS)	CDFW
Operation of Thermograph Stations	USGS
Juvenile Salmon Emigration Real Time Monitoring (DJFMP)	USFWS
Tidal Wetland Monitoring	CDFW
Yolo Bypass Fish Monitoring Program (YBFMP)	DWR
Resident Fishes Survey (DJFMP)	USFWS

Note: List based on key monitoring programs in the draft 2020 work plan. The current PI and budgets for each are shown, but will change in the future based on personnel, project scope, periodic reviews, and inflation.

JA.8.4 ADDITIONAL DELTA SMELT AND LONGFIN SMELT MONITORING

Additional sampling is needed to better understand entrainment of smelts in relationship to their overall population.

- Enhanced larval monitoring inside and immediately outside CCF
- Additional SLS surveys in December in the central and south Delta to detect initiation of LFS spawning

JA.8.5 Additional Winter- and Spring-run Chinook Monitoring and Science:

- Enhanced upstream monitoring of spring-run Chinook redd distribution, redd dewatering and juvenile stranding during the water transfer window.
- After five years of monitoring and development of a spring-run JPE transition into the development of a spring-run life cycle model.
- Trap capture efficiency studies to guide JPE calculations should use current methods of visibly marking trap captured and hatchery sourced fish including late fall-run and fall-run, but should also include developing trap efficiency models using the paired acoustic-CWT releases from Livingston Stone NFH, Feather River Fish Hatchery, and Coleman NFH.

Ideas currently under consideration:

- Provide experimental spring- and winter-run Chinook fish with a specific additional marker to differentiate them from other hatchery fish thus not requiring euthanasia to read CWTs and enabling them to return to contribute to recovery after salvage.

New pathology monitoring: Monitoring to provide information on the source and magnitude of CHNSR loss prior to Delta entry including in-season studies in the Sacramento and Feather rivers and Delta. Disease has been well documented to be present in the Central Valley and to reduce production via reduction in adult spawners and/or egg and juvenile mortality.

JA.8.6 New and Existing Monitoring Required to Develop a Spring-run JPE:

A Spring-run JPE Team will be convened within 30 days of the effective date of the ITP composed of experts from CDFW, DWR, NMFS, USFWS, and Reclamation. If agreed upon by participating agencies, other experts in fish biology, hydrology, or operations of the SWP and CVP may also participate to assist with their discussion and analyses. Permittee shall prepare a draft Spring-run JPE Monitoring Plan in collaboration with the Spring-run JPE Team that describes monitoring required to inform the development of the CHNSR JPE prior to September 1, 2020. The plan shall include, but not be limited to:

- *Feather River and Lower Yuba River Adult Passage Monitoring and Escapement* Surveys: Monitoring needed to develop adult spawner abundance estimates from which to derive production estimates. Monitoring includes passage surveys via a video monitoring station at Daguerre Point Dam on the lower Yuba River and in the low flow channel in the lower Feather River. Carcass surveys, redd distribution surveys, and dewatering surveys on both the Feather River and lower Yuba Rivers would be used to complement video monitoring as needed. Life history strategy decisions during rearing and emigration (yearling versus young-of-year) make juvenile production estimates difficult. It is important to document the adult escapement to supplement juvenile data.

- *Deer, Mill, and Butte Creek Adult Passage Monitoring and Escapement Surveys*: Monitoring needed to develop adult spawner abundance estimates from which to derive production estimates. Monitoring includes passage surveys via video monitoring stations on each creek., Carcass surveys, redd distribution, and dewatering surveys would complement video monitoring as needed. Life history strategy decisions during rearing and emigration (yearling versus young-of-year) make juvenile production estimates difficult. It is important to document the adult escapement to supplement juvenile data.
- *Feather River Rotary Screw Trap Monitoring at RM 61 and 45.8*: Monitoring to provide estimates of the number of CHNSR emigrating through the upper limits of the Feather River via two existing rotary screw traps located at RM 45.8 (High Flow Channel RST) and RM 61 (Low Flow Channel RST).
- *Feather River Rotary Screw Trap Monitoring at or Below the Yuba River Mouth*: New monitoring to provide estimates of the number of CHNSR entering the Delta from the Feather River Basin. Data obtained would be used to integrate all Feather River Basin-origin fish into the CHNSR JPE. The data obtained can also be used as a point of comparison for reach-specific loss estimates from upstream sites when used in conjunction with acoustic telemetry data.
- *Lower Yuba River Rotary Screw Trap Monitoring*: Monitoring to provide estimates of the number of CHNSR emigrating through the lower Yuba River via two existing rotary screw traps located near Hallwood Boulevard. These data can also provide an upstream measurement to assess reach-specific loss estimates in coordination with acoustic telemetry data.
- *Deer, Mill, and Butte Creek Rotary Screw Trap Monitoring*: Monitoring needed to develop in-season juvenile production estimates and provide data on the egg-to-fry survival and emigration timing of yearling and young-of-year CNHSR. These data can also provide an upstream measurement to assess reach-specific loss estimates in coordination with acoustic telemetry data.
- *Tisdale Weir and Knights Landing Rotary Screw Trap Monitoring*: Monitoring is needed to provide estimates of the number of CHNSR entering the Delta from the Sacramento River Basin. The data obtained can be used as a point of comparison for reach-specific loss estimates from upstream sites. Weir overtopping and Sutter Bypass activation can influence the detectability of Chinook salmon at the Knights Landing monitoring station. Water entering the Tisdale Bypass provides an alternative route in which juvenile salmon are routed around the Knights Landing monitoring station. Monitoring upstream of Tisdale Weir will provide an additional measure of abundance prior to weir influence.
- *Rotary Screw Trap Acoustic Tagging Monitoring*: Monitoring using acoustic tagged fish to provide estimates of loss and timing of yearling CHNSR emigrants in the fall and emigrating young-of-year CHNSR in the spring.
- *Genetic Identification of CHNSR to Support Ongoing and New Monitoring*: When genetic testing to identify CHNSR is available conduct genetic sampling and analysis associated with new and ongoing monitoring programs to improve identification of CHNSR-sized fish observed.
- A list of the entities that shall receive funding from Permittee to implement required monitoring programs.

DWR shall work collaboratively with the Spring-run JPE Team members to incorporate edits and comments on the draft monitoring plan while preparing the final monitoring plan. After the final monitoring plan is approved in writing by CDFW, Permittee shall fund and implement required monitoring beginning the calendar year after the effective date of this ITP, according to the timelines specified in the monitoring plan. At a minimum, Permittee shall convene the Spring-run JPE Team quarterly every year following initiation of the final monitoring plan to:

- Review data obtained from new and ongoing monitoring programs
- Review methods used to implement monitoring and recommend adjustments as they deem appropriate
- Formulate an approach to calculating a CHNSR JPE, including the following elements:
    - Total in-river escapement,
    - Adult female estimate,
    - Adult female estimate minus pre-spawn mortality,
    - Average fecundity,
    - Total viable eggs,
    - Estimated egg-to-fry survival based on Juvenile Production Index (JPI) at RBDD/total viable eggs (this is back calculated from passage estimate at RBDD),
    - Fry equivalents of juvenile production,
    - Fry-to-smolt survival estimates,
    - Number of smolts, and
    - Upper river to Delta survival.
- Request additional monitoring if it is deemed necessary to complete a CHNSR JPE within five years of the effective date of this ITP
- Recommend approaches to using the CHNSR JPE and monitoring results as operational criteria to minimize take of CHNSR as a result of Project operations, including operations at the south Delta export facilities

All raw data acquired as a part of the monitoring program shall be available to members of the Spring-run JPE Team within ten days of a request.

Within four years of the effective date of the ITP, and in collaboration with the Spring-run JPE Team, Permittee shall prepare a draft plan to collect the data needed to calculate a CHNSR JPE. Permittee shall submit the draft plan to the Spring-Run JPE Team for review and work collaboratively with team members to incorporate their comments into the final draft. After the final draft Spring-run JPE Plan is approved by CDFW, Permittee shall convene the Spring-run JPE Team annually after the final plan is approved by CDFW to provide an annual JPE estimate for CDFW, Reclamation, USFWS, and NMFS.

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ATTACHMENT 3A
DEPARTMENT OF FISH AND WILDLIFE
HABITAT MANAGEMENT LAND ACQUISITION PACKAGE CHECKLIST FOR PROJECT APPLICANTS

The following checklist is provided to inform you of what documents are necessary to expedite the Department of Fish and Wildlife (CDFW) processing of your Habitat Management Land acquisition proposal. Any land acquisition processing requests which are incomplete when received, will be returned. The Region contact will review and approve the document package and forward it to the Habitat Conservation Planning Branch Senior Land Agent with a request to process the land acquisition for formal acceptance.

To: _____
Regional Manager, Region Name

From: _____
Project Applicant

Phone: _____

Tracking #: _____
CDFW assigned permit or agreement #

Project Name: _____

Enclosed is the complete package for the ☐ Conservation Easement OR ☐ Grant Deed

Documents in this package include:

- ☐ Fully executed, approved as to form Conservation Easement Deed or Grant Deed with legal description stamped by a licensed surveyor. Date executed: _____
- ☐ Proposed Lands for Acquisition Form (PLFAF)
- ☐ Phase I Environmental Site Assessment Report Date on report: _____
  (An existing report may be used, but it must be less than two years old.)
- ☐ Preliminary Title Report(s) for subject property is enclosed and has been reviewed for Encumbrances, including severed mineral estates, and other easements. The title report must be less than six months old when final processing is conducted.
  Included are additional documents:
  - ☐ document(s) to support title exceptions
  - ☐ document(s) to explain title encumbrances
  - ☐ a plot or map of easements/encumbrances on the property
- ☐ Policy of Title Insurance (an existing title policy is not acceptable)
- ☐ County Assessor Parcel Map(s) for subject property
- ☐ Site Location Map (Site location with property boundaries outline on a USGS 1:24,000 scale topo)
- ☐ Final Permit or Agreement (or other appropriate instrument)
  Type of agreement: ☐ Bank Agreement ☐ Mitigation Agreement
  ☐ Permit _____ Other: _____
  (write in type of permit)
- ☐ Final Management Plan (if required prior to finalizing permit or agreement or if this package is for a Grant Deed)
- ☐ Biological Resources Report
- ☐ Draft Summary of Transactions ☐ hard copy ☐ electronic copy (both are required)

ATTACHMENT 3B

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
PROPOSED LANDS FOR ACQUISITION FORM ("PLFAF")

Date: _____

TO: Regional Representative
_____
_____
_____
Facsimile:

FROM: _____
_____
_____
_____

Applicant proposes that the following parcel(s) of land be considered for approval by the California Department of Fish and Wildlife as suitable for purposes of habitat management lands to compensate the adverse environmental impacts of the Project:

Section(s)	Township	Range	County	Acres
_____	_____	_____	_____	_____

Current Legal Owner(s), of the surface and mineral estates, include Assessor's Parcel Number(s):
_____
_____
_____

General Description of Location of Parcel(s):
_____
_____
_____
_____

Land Value: $

For Region Use Only

APPROVED ___ By: _____ DATE:_____
Regional Manager's Signature

REJECTED ___

Region: _____

Explanation:_____
_____
_____

Fish Restoration Program Agreement

Implementation Strategy

Habitat Restoration and Other Actions for Listed Delta Fish

Department of Water Resources and Department of Fish and Game in coordination with the US Fish and Wildlife Service and the National Marine Fisheries Service

Cover: Prospect Island, Sacramento River Deep Water Ship Channel, and Liberty Island (Photo Credit: Dale Kolke)

State of California
The Resources Agency
Department of Water Resources
March 2012

Fish Restoration Program Agreement

Implementation Strategy

Habitat Restoration and Other Actions for Listed Delta Fish

Prepared by:

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Stephani Spaar
Dennis McEwan
Laura Flournoy
Tim Smith
Gina Benigno
Pamela Lindholm
Ling Chu
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Jason Roberts
Carl Wilcox
Jim Starr
Gina Van Klompenburg
Tim Stevens
Chandra Ferrari

Delta Stewardship Council
Kristal Davis-Fadtke

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1. Introduction

1.1 Purpose

The Fish Restoration Program Agreement (FRPA) (Appendix A), between the Department of Fish and Game (DFG) and the Department of Water Resources (DWR), was signed on October 18, 2010. FRPA addresses specific habitat restoration requirements of the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions (Biological Opinions) for State Water Project (SWP) and Central Valley Project (CVP) operations. FRPA is also intended to address the habitat requirements of the DFG Longfin Smelt Incidental Take Permit (ITP) for SWP Delta operations. The primary objective of the FRPA program is to implement the fish habitat restoration requirements and related actions of the Biological Opinions and the ITP in the Delta, Suisun Marsh, and Yolo Bypass and is focused on 8,000 acres of intertidal and associated subtidal habitat to benefit delta smelt, including 800 acres of mesohaline habitat to benefit longfin smelt, and a number of related actions for salmonids. DFG and DWR intend that habitat restoration actions implemented in compliance with the USFWS biological opinion that also meet the habitat restoration requirements of the ITP will operate to satisfy the acreage requirements of the ITP.

The purpose of this Implementation Strategy is to describe the process by which DWR and DFG will implement the FRPA program, and to satisfy Section B of FRPA. Section B of FRPA requires DWR, with assistance from DFG, to develop an Implementation Schedule that will identify restoration actions, estimated costs, targeted acreage, and a timeline for DWR's implementation of restoration actions to satisfy DWR's obligations under the Biological Opinions and ITP. Appendix B lists the specific habitat restoration requirements of FRPA, the Biological Opinions, and the ITP that pertain to this program. This document lays out the strategy to address these requirements. In addition, DWR and DFG will complete the necessary environmental compliance documents to implement site specific habitat restoration projects; this may include tiering from existing programmatic documents where appropriate.

Pursuant to FRPA, DFG will work cooperatively with and assist DWR in establishing the management and financial framework necessary to implement the FRPA program. DWR, with assistance from DFG, will begin a process to fund, plan, and implement actions, including aquatic habitat restoration to benefit delta smelt, longfin smelt, and winter-run and spring-run Chinook salmon (hereafter referred to as Covered Fish Species) to mitigate impacts to these species caused by the SWP Delta operations. Specifically, these actions include:

- Delta Smelt Biological Opinion Reasonable and Prudent Alternative (RPA) Component 4;

- NMFS Biological Opinion RPA Actions 1.2.6 and 1.6.2 in partnership with the US Bureau of Reclamation (Reclamation);
- NMFS Biological Opinion RPA Action Suite 1.6 and 1.7. FRPA will not be lead, but will provide funding and technical support assistance only;
- ITP Condition 7.

DWR's obligations focus on delta smelt, longfin smelt, and winter-run and spring-run salmon, and may also benefit steelhead, sturgeon, and other native fish species.

1.2 FRPA Goals and Objectives

The goals of FRPA, as mutually agreed upon by DWR and DFG, are to:

- Identify and implement actions that will address the habitat restoration requirements of the Biological Opinions and ITP;
- Facilitate interagency planning discussions to achieve the above goal;
- Facilitate interagency project planning forums to achieve a process that will include public openness and the interests of stakeholders;
- Utilize and incorporate sound science and current available information in developing restoration and enhancement designs;
- Maintain consistency with the Bay Delta Conservation Plan (BDCP), Delta Stewardship Council's (DSC) Delta Plan, Ecosystem Restoration Program (ERP) strategies, and other large-scale planning efforts.

Objectives to achieve these goals are to:

- Restore 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh, including 800 acres of mesohaline habitat to benefit longfin smelt, to enhance food production and availability for native Delta fishes;
- Restore processes that will promote primary and secondary productivity and tidal transport of resources to enhance the pelagic food web in the Delta;
- Increase the amount and quality of salmonid rearing and other habitat;
- Increase through-Delta survival of juvenile salmonids by potentially enhancing beneficial migratory pathways;

1.3 Program Description

The FRPA program is a joint effort between DWR and DFG in coordination with USFWS, NMFS, and Reclamation to satisfy DWR's requirements for habitat restoration and related actions to benefit fish under the Biological Opinions and ITP. The program will also satisfy requirements in FRPA. The FRPA program structure and support are discussed in this section, along with estimated costs, acreage targets, and timelines. Restoration actions are another major program component and are discussed in Section 2.

1.3.1 Program Structure and Support

The FRPA program will have a project-based organizational structure (Fig. 1) that utilizes teams to implement specific actions and provide implementation, program support, and coordination. The individual project teams will be staffed by DWR, DFG, and potentially other agency personnel, and will report to and receive direction from the Coordination and Management Team. The Coordination and Management Team is composed of staff and lower management personnel from DWR, DFG, Reclamation, NMFS, and USFWS. The Coordination and Management Team will report directly to the Policy Team, which is composed of upper management personnel from DWR and DFG. The Project Sponsor, DWR Deputy Director for Delta and Statewide Water Management, will provide overall direction and have decision-making authority for the program, including approval of the FRPA specific action SWP Project Charter (see Section 2.2.1). Director Decision Memos will be used to communicate recommended actions to the Directors of DWR and DFG, and obtain approval for implementation.

The Coordination and Management Team and the Policy Team will work with the 5-Agency Group and Implementation Management Team overseeing the Biological Opinions and ITP to ensure coordination and acceptance of FRPA efforts by DFG, USFWS, and NMFS. In addition, FRPA teams will also work with the BDCP's Fish Agency Strategy Team (FAST) to ensure coordination and acceptance of FRPA efforts for the BDCP where appropriate. This effort is being initiated under the recent BDCP Habitat Credit Memorandum of Agreement (see Section 1.4). Stakeholders, other agencies, and DWR and DFG legal counsel will also be advising the various teams throughout the implementation process.

The core DWR program support consists of one Senior Environmental Scientist, three Environmental Scientists, and one Scientific Aid. One Staff Environmental Scientist and one Associate Government Program Analyst will also assist on a part-time basis to manage the FRPA financial components. Additional DWR staff will assist as needed and available. DWR FRPA staff will lead and implement the habitat restoration requirements of the Biological Opinions and ITP in the Delta. DWR FRPA staff may provide limited staff support to habitat restoration efforts in Suisun Marsh and Yolo Bypass. However, the primary responsibility of the FRPA program in these areas will be to provide project funding as a partner on actions that will provide for habitat acreage credits or to satisfy specific actions under the ITP and NMFS RPA Suite 1.6 and 1.7.

DWR is also funding eight support positions in DFG (six Staff Environmental Scientists, one Environmental Scientist, and one Wildlife Habitat Supervisor) under the FRPA program. Major responsibilities for these positions will include assisting DWR in its restoration planning and implementation activities, monitoring and reviewing DWR's implementation schedule, and supporting operational decision-making associated with avoidance and minimization measures required under the Biological Opinions and the ITP.

Fish Restoration Program Agreement

Roles & Responsibilities/Decision-making Chart

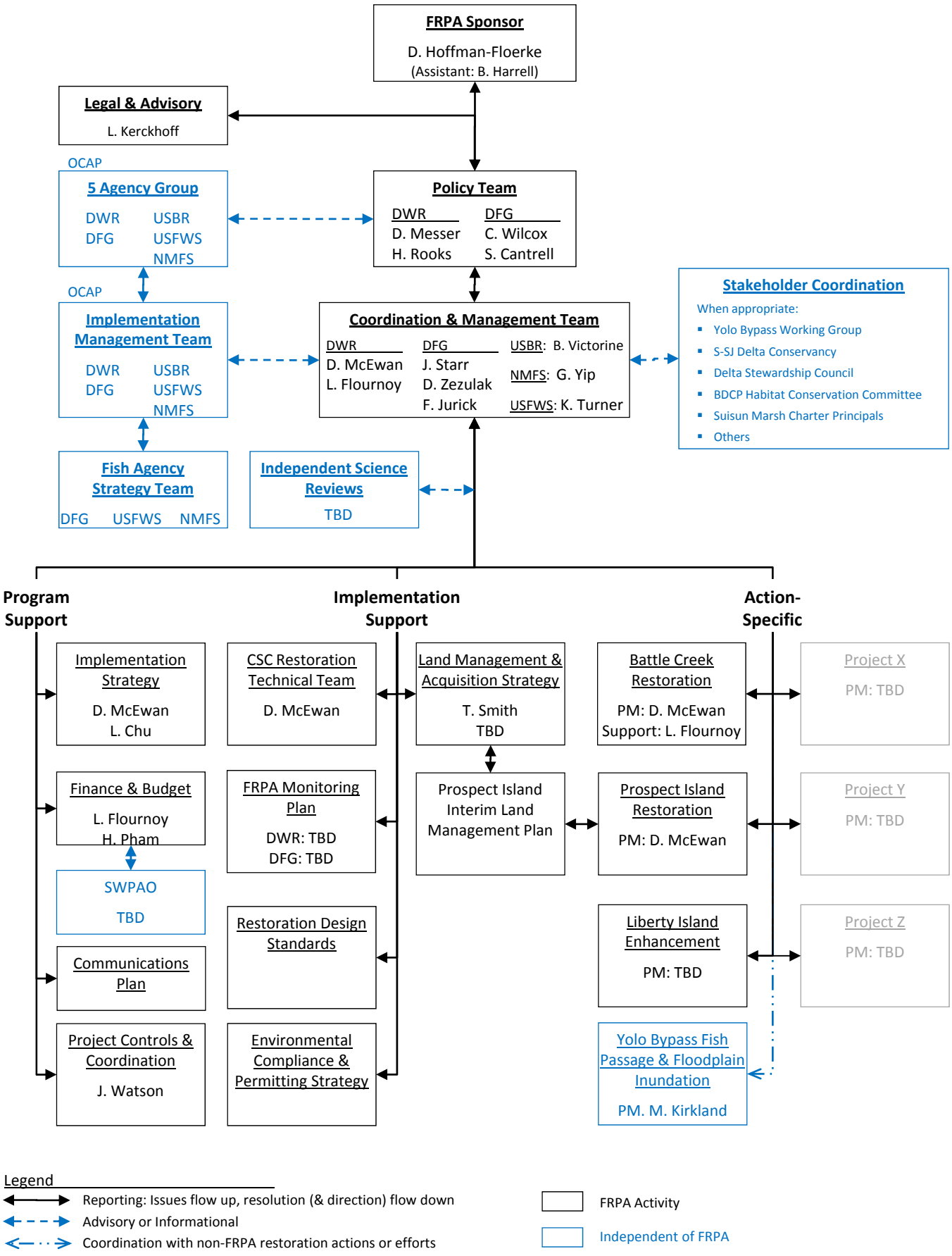

Figure 1. Roles, responsibilities, and coordination of FRPA

Science and technical support will be provided through interagency and related efforts. Interagency technical teams for the Cache Slough Complex, Suisun Marsh, and Yolo Bypass will provide scientific and technical review of the individual restoration actions, depending on the location of the project. Overall technical guidance and independent science review may also be provided by the Interagency Ecological Program (IEP) Management Team, the Delta Science Program, or others as appropriate. The Delta Stewardship Council Delta Plan and the BDCP both include discussions and processes that describe how DWR (and other habitat restoration implementing agencies) will work with USFWS, NMFS, and DFG (hereafter referred to as the Fishery Agencies) in designing, implementing, and crediting restoration projects, including the FAST process mentioned above. DWR will work with these agencies through the procedures described in these guiding documents when they are finalized.

1.3.2 Estimated Costs, Acreage Targets, and Timeline

During the FRPA negotiations, the estimated costs, acreage targets, and timelines for the FRPA program were developed as part of the agreement. The costs were based on an estimated cost per acre of restored aquatic habitat to benefit delta smelt, annual funding for anadromous fish actions, and program staffing and administration costs. An annual and 10-year total cost estimate to implement the entire Fish Restoration Program has been prepared by the FRPA Project Team as described below, and in Table 1. All costs, acreage targets, and timelines are based on the best available information and will be updated as additional information is available, and at least annually as part of reporting (see Section 4.3).

DWR and DFG management developed a per-acre cost estimate to determine the estimated cost of the FRPA implementation over the 10-year term of the agreement. The estimate of $20,000 per acre is based on previous DWR/DFG restoration project costs and is considered a reasonable upper average cost-per-acre estimate of restored habitat to use for restoration planning purposes. This estimated cost includes all components necessary to implement restoration actions, including land acquisition and management, planning, design, environmental documentation and permitting, construction, re-vegetation, monitoring, adaptive management, and long-term operation and maintenance. Based on the estimated cost of $20,000 per acre and the 8,000 acre restoration requirement, the cost to implement this aquatic habitat component of FRPA is estimated to be $160 million. Other costs associated with the program include a one-time $12 million in funding to fulfill NMFS RPA Action 1.2.6 (Battle Creek restoration), $1.5 million annually for anadromous fish actions in the Yolo Bypass (NMFS RPA Suite 1.6 and 1.7) with concurrence of DFG and the other Fishery Agencies, and annual program administration support and staffing costs for DWR and DFG. Total FRPA program costs are currently estimated at $205 million, but actual costs may vary.

Based on the 10-year agreement term and acreage requirements of the Biological Opinions and ITP, the acreage targets for the 8,000 acres of aquatic habitat to benefit delta smelt were derived proportionately for milestones at years 4, 6, 8, and 10 as indicated in Table 1. The acreage is applied toward these milestones upon securing and initiating implementation.

Fish Restoration Program Agreement		Estimated Costs in Millions ($)										
POTENTIAL RESTORATION - MITIGATION ACTIONS	ACRES[1]	Year 1	2	3	4	5	6	7	8	9	10	TOTAL
8,000 acres Intertidal-Subtidal (includes 800 acres in mesohaline area)												
Actions within Cache Slough Complex and Delta												
Prospect Island	1316											
Liberty Island	TBD											
Lower Yolo Ranch	1560											
Western Cache Slough Complex	TBD											
Little Holland Tract Acquisition	TBD											
Eastern Egbert Tract Restoration Project	TBD											
Calhoun Cut Ecological Reserve	196											
Actions within Suisun Marsh and Nearby Areas												
Hill Slough Tidal Marsh Restoration	950											
Rush Ranch	80											
Overlook Club	245											
Meins Landing	660											
Restoration Support Contract (estimated)												
Estimated Costs - 8,000 acre Requirement[2]		$8	$11	$15	$18	$18	$18	$18	$18	$18	$18	**$160**
Battle Creek Salmon and Steelhead Restoration[3]	NA	$6	$6									**$12**
Anadromous Fish Actions (Yolo Bypass and other)[3]	NA											
Lower Putah Creek Realignment	NA											
Lisbon Weir Improvements	NA											
Tule Canal Connectivity	NA											
Fremont Weir Fish Passage	NA											
Yolo Bypass Floodplain habitat	NA											
Estimated Costs - Anadromous Fish Actions		$1.5	$1.5	$1.5	$1.5	$1.5	$1.5	$1.5	$1.5	$1.5	$1.5	**$15**
Subtotal - All Restoration Actions												**$187**
Program Support												
DFG Staffing Resources (8 PY's)		$0	$1.15	$1.15	$1.15	$1.15	$1.15	$1.15	$1.15	$1.15	$1.15	**$10**
DWR Staffing Resources (5 PY's)		$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	**$8**
Subtotal - Program Support												**$18**
Percent progress - mitigation acreage target					35%		60%		80%		100%	**100%**
Total Estimated FRPA Program Costs												**$205**

1 Total acres for project; acreage credit will be determined at a later date.

2 Estimated costs based on $20,000 per acre to acquire and restore habitat for 8,000 acres required = $160 Million. Actual costs may vary.

3 FRPA will provide funding only for these projects

Table 1. Estimated costs and acreage targets for potential FRPA restoration actions

Within this 8,000 acre requirement, 800 acres of aquatic habitat in the mesohaline zone are required to satisfy the ITP.

Section 7.1 of the ITP lists restoration milestones, beginning with the acquisition and planning for the restoration of at least 160 acres of habitat within two years of issuance of the ITP, and 160 acres every two years, to complete restoration of 800 acres within 10 years. The ITP requires the habitat to be intertidal and associated subtidal wetland habitat in the mesohaline zone (Suisun Bay or Marsh) with hydrologic connectivity to open waters.

1.4 FRPA's Relationship to Other Programs

In addition to the habitat restoration efforts taking place under FRPA, there are a number of other Delta and Suisun Marsh restoration and planning efforts underway with which the FRPA program will need to coordinate. Among these are:

- Delta Stewardship Council Delta Plan,
- Bay Delta Conservation Plan,
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan,
- Ecosystem Restoration Program Stage 2 Conservation Strategy,
- Delta Native Species Recovery Plan,
- Sacramento-San Joaquin Delta Conservancy Interim Strategic Plan.

It is the intent of FRPA to work within the established framework of these and other planning efforts, and to facilitate the implementation of the habitat restoration components of these programs where appropriate. The Delta Plan and BDCP both include discussions and processes that describe how agencies can ensure consistency in the planning and implementation of habitat restoration projects. A brief description of how FRPA will coordinate with the applicable planning and restoration efforts is presented below.

DWR and DFG intend to communicate with the Delta Stewardship Council and the Delta Conservancy to ensure actions taken pursuant to FRPA are consistent with the Delta Reform Act of 2009 (SB X7 1, Steinberg), and the Delta Plan when it is adopted (estimated completion date of June 2012). The Delta Reform Act requires that proposed covered actions in the Delta be consistent with the Delta Plan. The Delta Conservancy has attended FRPA Coordination and Implementation Strategy meetings since early in 2011.

Consistent with the BDCP Planning Agreement, DWR and DFG agree that the mitigation actions implemented pursuant to FRPA may also, if appropriate be considered BDCP Early Implementation Actions intended to mitigate ongoing SWP Delta Pumping Facilities impacts on Covered Fish Species. The locations and general nature of the mitigation actions proposed by FRPA are consistent with the preliminary discussions of conservation areas and actions for the BDCP.

In addition, the BDCP parties recently finalized the *Memorandum Of Agreement Regarding The Early Implementation Of Habitat Projects For The Central Valley Project And State Water Project Coordinated Operations Criteria And Plan And Bay Delta Conservation Plan* (BDCP Habitat Credit MOA, Appendix C). This MOA sets forth a process of identifying and evaluating habitat projects intended to contribute toward SWP and CVP acreage requirements under the federal and state Endangered Species Acts, such as the habitat projects currently proposed for implementation under FRPA. The process is intended to provide assurance that acquisition and restoration of lands for habitat projects prior to implementation of BDCP will be credited toward meeting the BDCP restoration acreage objectives. FRPA will be coordinating with the MOA effort as it is implemented to provide for an efficient review, guidance, and approval process on applicable FRPA actions.

Habitat crediting will occur through the FAST process described in the BDCP Habitat Credit MOA. FAST is intended to provide technical review to the Water Agencies (DWR, Reclamation, or SFCWA) regarding the planning of habitat projects that, once developed and implemented, are expected to assist the BDCP to achieve its stated goals and objectives and contribute to the objectives of the Biological Opinions and the ITP. FAST is designed to provide an initial concept review, early technical assistance, and a prospectus review (a review of the type and amount of credit the Water Agency believes their proposed project will yield). Once the prospectus is accepted, the Fishery Agencies (NMFS, USFWS, DFG) will prepare a Crediting Recommendation and issue the Water Agency a final crediting determination for the project.

DWR is currently negotiating a Memorandum of Agreement with the State and Federal Contractors Water Agency (SFCWA MOA) to provide ongoing coordination in planning and implementing restoration projects in the Delta, Suisun Marsh, and the Yolo Bypass. The SFCWA MOA will allow DWR and SFCWA to jointly implement restoration projects that could be credited toward DWR's obligations set forth in the Biological Opinions and the ITP. The SFCWA MOA will also allow SFCWA to carry out restoration projects on its own which could later be funded by DWR and credited toward DWR's obligations set forth in the Biological Opinions and the ITP. Projects proposed under FRPA may be eligible for implementation through the SFCWA MOA, and DWR will also coordinate its activities under FRPA with SFCWA according to the procedures set forth in the MOA. SFCWA is also a party to the BDCP Habitat Credit MOA.

As stated in the SFCWA MOA, a DWR/SFCWA workgroup meets monthly to coordinate planning and implementation of restoration actions. The workgroup is responsible for reviewing potential restoration actions. The BDCP Habitat Coordination Committee, composed of representatives of several agencies, serves as an additional venue for resolving many planning and implementation issues that arise during consideration of projects. After potential restoration projects are identified, they will then be reviewed by FAST as described in the BDCP Habitat Credit MOA (see above).

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan (SMP) is intended to resolve historical conflicts by balancing protection and enhancement of existing waterfowl and wildlife values, conservation of endangered species, and protection of state and federal

water project supply quality in the Suisun Marsh. FRPA is engaging where possible as a potential funding partner in upcoming restoration projects in accordance with the SMP.

The USFWS Delta Native Fishes Recovery Plan (DNFRP) is a strategy for the conservation and restoration of Delta native fishes through the development of measures that address the unique biological needs of species and threats to their existence. As one of the Conservation Recommendations in the Delta Smelt Biological Opinion, USFWS recommends that Reclamation and DWR develop and implement restoration measures that are consistent with this plan.

In the development of the Delta Vision Strategic Plan, the Delta Vision Blue Ribbon Task Force recommended that the ERP Conservation Strategy serve as the foundation for what will ultimately become the ecosystem component of several regional conservation plans, including the BDCP. The ERP Conservation Strategy has several processes that identify, evaluate, and fund restoration actions. The ERP and DSC are coordinating efforts to ensure that ERP actions are consistent with the Delta Plan and other planning efforts. The FRPA program will coordinate with both the ERP and DSC to ensure that all actions taken pursuant to FRPA are consistent with and forward the goals of both the Delta Plan and ERP.

2. Proposed Restoration Actions

Actions proposed for implementation through FRPA will be guided by restoration scientific principles and influenced by restoration constraints (see Section 2.5). Each action will have numerous project components that may vary based on the type of action and level of FRPA involvement, and include both near-term and potential future actions within the FRPA action area. The action area includes the Yolo Bypass, the Legal Delta, and Suisun Marsh pursuant to the habitat restoration requirements of FRPA, the Biological Opinions, and the ITP. Battle Creek restoration in the upper Sacramento River basin is also included in FRPA and the Biological Opinions. DWR's responsibility for this project is limited to providing a one-time $12 million funding contribution for the current Battle Creek Salmon and Steelhead Restoration Project.

2.1 Restoration Scientific Principles

Restoration project design will be well-grounded in conservation biology and restoration science, will use the best available science, and will use adaptive management procedures to assure the overall success of the restoration actions. The term "restoration" is intended to encompass the concepts of rehabilitation, reconciliation, protection, and conservation. The goal for designing a restoration project is not to re-create a specific historical configuration; rather, restoration projects will aim to reestablish natural ecological processes and functions, leading to sustainable resilient healthy systems that meet the needs of native species and communities. Overarching restoration principals for habitat restoration under FRPA include:

- Preserve ecological succession and dynamism of the landscape, and evolutionary trajectory of species;
- Minimize the use of artificial, highly engineered systems and features to achieve restoration goals. Focus instead on restoration of historical physical, ecological, and biological processes to achieve desired results.
- Minimize intervention and impacts caused by the restoration action; work with existing landscape features and processes as much as possible;
- Seek to emulate the historical condition, where known, which will serve as the primary guidance for restoration;
- Recognize that full restoration to historical conditions will likely not be possible in most cases; reconciliation to achieve some aspects of the historical condition may be more realistic;
- Design projects so that they can be adaptively managed and minimize the need for long-term maintenance;
- Provide a diversity of habitat types to benefit multiple Covered Fish Species;
- Design and incorporate habitat features that discourage colonization by non-native species.

The above principals are consistent with guidelines established for other planning efforts, including CALFED and the DSC draft Delta Plan.

2.2. Action Components

Each action will have numerous components (listed below) that may vary based on the type of action and level of FRPA involvement. All FRPA actions will at least have a financial component. DWR anticipates significant assistance from DFG and its own consulting team in implementing proposed restoration actions.

2.2.1 Financing

The FRPA program is funded in whole by DWR through SWP funding to meet permit compliance for SWP Delta operations. Although the FRPA program will have an annual budget, each FRPA action or project component will have an individual budget within the larger program budget. Implementation of actions required by the Biological Opinions or ITP is funded by SWP funds as part of the ongoing SWP operations and maintenance, and requires coordination with DWR's State Water Project Analysis Office (SWPAO) through an internal procedure based on Water Resources Engineering Memorandum (WREM) 65 (Appendix D).

WREM 65 sets forth the procedure to initiate, authorize, administer, and manage SWP programs in a consistent and professional manner. This memorandum requires a SWP Program Initiation and Management Document (SWP Project Charter) be completed for all new SWP projects or programs that exceed $1,000,000, and also recommends that SWP projects costing less than $1,000,000 follow these procedures as a guideline, and complete a SWP Project

Charter as well. Approval levels for all new SWP programs and projects are indicated on the SWP Project Charter template (Appendix D).

SWP Project Charters will be developed for each FRPA habitat restoration action. The individual SWP Project Charters will be provided to SWPAO and routed for consideration, signature and final approval by the SWP Deputy Director (FRPA Projects Sponsor). As part of the SWPAO process, FRPA staff will present the proposed action to both the State Water Contractor (SWC) Delta Committee, and the SWC Finance Committee as directed by SWPAO. When the SWP Project Charter for a specific action is approved, the funding procedures begin and the necessary funding processes will be implemented.

For properties transferred to DFG, the establishment of an endowment fund is normally required to ensure adequate funding for operation, monitoring, and maintenance of mitigation actions such as habitat restoration projects. However, for properties transferred to DFG from DWR pursuant to a FRPA action, the long-term costs for implementation or individual actions will be directly funded by DWR in lieu of endowment funding since DWR is able to provide adequate funding assurances into the future based on DWR's long-term SWP water supply contracts.

Pursuant to the Burns-Porter Act, DWR is authorized to use SWP revenue without annual approval by the State Legislature to pay the operations and maintenance of the SWP (Water Code Section 12937(b)). This revenue is not appropriated under the annual State budget process. Costs incurred to pay for the long term operations and maintenance of fish and wildlife mitigation areas for SWP activities are considered SWP maintenance and operations obligations, included within the first priority before payment of other SWP obligations.

In addition, DWR has a strong AA bond rating and is in a good financial position to make any on-going payments for mitigation purposes. DWR's SWP contractors, which include Metropolitan Water District of Southern California, also have strong credit ratings, which provide additional assurances of DWR's ability to make on-going payments for fish and wildlife mitigation purposes required by FRPA. DWR has notified the SWP contractors of the mitigation costs estimated by FRPA for compliance with the Biological Opinions and ITP, which is now being included in annual charges to the SWP contractors.

2.2.2 Restoration Action Identification and Land Acquisition

Potential restoration sites will be chosen using the conservation strategies for the Sacramento-San Joaquin Delta and Suisun Marsh that meet the goals of the Biological Opinions and the ITP. Potential restoration sites will need to have undergone the process requirements described in the BDCP Habitat Credit MOA process. DWR is working with DFG, USFWS, NMFS, and others to identify potential habitat restoration sites and actions through FRPA that are required under the Biological Opinions and ITP. Some general areas of the Delta, Suisun Marsh, and Yolo Bypass have been identified as being conducive to aquatic habitat restoration (action identification and selection are described in more detail in Sections 2.3 and 3). Prior to

planning and implementation of restoration actions, specific parcels will be identified and acquired through a number of options. Site acquisition could be through any of the following pathways:

- utilizing existing State or public lands,
- through other public restoration efforts in the above areas,
- through a non-governmental organization (NGO) or Joint Powers Authority (JPA), such as the State and Federal Contractors Water Agency (SFCWA), and
- working with willing landowners, if the parcels are not already public lands.

Land acquisition will be accomplished through either fee title or a conservation easement. DFG will use its Habitat Management Land Acquisition Checklist to evaluate the acceptability of any property to be transferred as part of its consideration of the proposed restoration action.

Both DWR and DFG have real estate services associated with their departments. Properties can be acquired by either DWR's Real Estate Branch (REB) contained within its Division of Engineering (DOE) or Wildlife Conservation Board (WCB) that can acquire properties. In addition, there may be opportunities to acquire properties in partnerships with other entities. If lands are acquired by DWR or DFG, REB or WCB will be the lead on contacting landowners and negotiating the final purchase, with assistance from DFG and DWR's FRPA staff. DWR may also use SFCWA, an NGO, or a JPA to acquire properties for restoration.

2.2.3 Legal and Land Management Issues

There are numerous legal and land management issues related to acquiring restoration sites and implementing actions. In addition to acquisition of sites through fee title or conservation easements, there are various agreements and documents that will be needed to implement any restoration action. DWR and DFG legal counsels will be involved in all land acquisition and land management processes, and other related processes when necessary. Efforts to change or abandon any easements that may exist on acquired property will require thorough legal review. If properties for restoration are acquired by DWR, its REB will be lead on negotiations and agreements to modify existing easements, if necessary, so that the restoration projects are not constrained.

Other potential land management issues that may need to be addressed include infrastructure removal or maintenance, levee inspection and maintenance, vandalism repair, fence and road maintenance, mowing, trespassing, poaching, and trash removal.

When a site is proposed for acquisition for restoration purposes, a land management lead will be identified who will ensure that an interim land management plan will be in place upon acquisition or shortly after. This land manager will also lead the development of a post-restoration land management plan and oversee any activities needed.

2.2.4 Stakeholder Involvement and Public Outreach

Stakeholder involvement and public outreach are an important component of restoration action implementation to ensure collaboration, acceptance, and transparency. Local agencies and public involvement will occur during the restoration action implementation process. First, the FRPA process will seek potential projects and actions through a range of currently operating forums and technical teams working to develop habitat restoration opportunities throughout the action area. Second, during the planning and design phase of specific projects, there will be periodic planning update meetings to allow stakeholders, landowners, and local agencies to exchange information, discuss concerns, and provide input. Third, public involvement will be sought during the development of the environmental documents necessary to implement any project in compliance with the California Environmental Quality Act (CEQA) as defined by State law.

2.2.5 Planning and Design

DWR and DFG, along with other agencies and interested stakeholders will collaborate on the planning and design of project alternatives. An adaptive management approach will be used throughout the project planning and design process, as described in Section 4.4. The interagency technical teams (e.g. the Cache Slough Complex Interagency Technical Team) will serve as technical advisors for individual project design. Major considerations of final design selection are: efficacy and success for long-term ecological restoration in the Delta and recovery of Covered Fish Species; feasibility and cost; potential impacts to nearby landowners and other stakeholders; opportunities for advancing Delta science; compatibility with potential future projects; and ability to change project design in light of monitoring results if necessary.

2.2.6 Environmental Compliance and Permits

Environmental compliance and permitting is an integral component of action implementation. Individual projects will be subject to CEQA and possibly National Environmental Policy Act (NEPA) analysis. It is anticipated that most projects will require an Environmental Impact Report under CEQA. DWR is anticipated to be the lead for most FRPA restoration actions. However, actions may be implemented by DFG or other project proponents. In this case, environmental compliance and permitting will be the responsibility of the project lead with assistance from DWR if needed.

All impacts will be addressed pursuant to CEQA and NEPA. In addition relevant existing agreements and contracts between DWR and other parties will be upheld unless amended. As project lead, DWR and other project leads will follow the steps described in Section 3 before committing to a definite course of action for a specific habitat restoration site. DWR will prepare CEQA documentation as early in the planning process as possible to enable environmental considerations to influence project design and mitigation measures. This will occur before project plans are finalized, but late enough in the project development to provide

detailed information about the likely effects, how they can be minimized, and to evaluate alternatives. DWR intends to thoroughly assess all reasonable alternative designs that could mitigate or avoid significant effects.

DWR may develop environmental compliance documents in-house, but will most likely utilize environmental consultants to prepare these documents. DFG will provide review and assistance where needed. DWR will serve as lead agency and DFG as responsible agency unless circumstances require that a different lead agency and responsible agency be used. DWR will be responsible for all DWR and DFG costs associated with CEQA compliance for restoration projects called for under FRPA.

In addition to CEQA and NEPA, numerous permits will be needed prior to the implementation of restoration actions (see Appendix E). DWR will comply with all Endangered Species Act (ESA) and California Endangered Species Act (CESA) regulations and requirements during the development and implementation of the restoration projects. It is anticipated that, because of potential effects to flood systems for some of the restoration projects (particularly in the Yolo Bypass), the U.S. Army Corps of Engineers (USACE) and Central Valley Flood Protection Board permit compliance will be necessary as well. In addition, given the likelihood that dredged or fill materials will be discharged into federal and state waters, Central Valley Regional Water Quality Control Board permits will likely be necessary. Other potential regulatory agencies that may require permits include State Lands Commission; Delta Stewardship Council; DFG; State Historic Preservation Office (SHPO); and others as appropriate and/or identified during the CEQA and NEPA process.

2.2.7 Monitoring and Adaptive Management

DWR, with the assistance of DFG and other agencies, will develop monitoring and adaptive management plans for each restoration site (see Section 4). Monitoring and adaptive management may also occur on an area-wide or regional level that would also support the project level effort. The degree of adaptive management (active versus passive) will be determined based on the project design, and monitoring needs will be identified based on project goals and objectives with the intent of validating preliminary modeling predictions.

Per the DSC Delta Plan, proposed ecosystem restoration actions will be required to develop a formal strategy consistent with the adaptive management framework described in the Delta Plan.

2.2.8 Construction

For most actions, DWR will assume the lead role in project oversight, construction, contracting, and management with assistance from DFG. For those actions implemented by other entities or programs, DWR may provide financial assistance or cost share. If a proposed action is to enhance an existing project or habitat, DWR and DFG will work with the habitat manager for that specific area. Project oversight will be as described above for the proposed habitat

restoration action and all activities will be done in coordination with the project or land manager.

For those projects where DWR is lead, DOE will develop the design specifications and oversee the advertise-bid-award process for construction contracts. DOE will also provide contract management and oversight and construction oversight as directed by FRPA staff and consultants. Best management practices will be used to minimize project impacts including disturbance, noise, other impacts, and greenhouse gas emissions. As-built drawings will be prepared as part of the construction component. If necessary, a re-vegetation or site maintenance plan will be included to address requirements necessary for long-term project management and maintenance during the construction component.

2.2.9 Post-Project Management

DWR commits to funding in perpetuity the management and long-term maintenance of all completed habitat restoration projects done under the aegis of FRPA. A long-term management plan for the restoration will be developed and finalized during the planning and design phase. The plan will include responsibilities, strategy, and tasks for land management, monitoring, and other items needed to adaptively manage and maintain the site into the future to meet restoration goals. A long-term management agreement will be entered into between DFG and DWR for sites that DFG will manage. This agreement will include a long-term management plan, projected costs for long-term operations and maintenance, and a written commitment from DWR to fund the total long-term operations and management costs.

2.3. Near Term Actions

Restoration actions primarily fall into two categories:

- Near-Term Actions - those that have already been identified or are in the planning stages, and
- Potential Future Actions - those that have yet to be identified.

Near-Term Actions are listed below. The framework for analyzing and selecting Potential Future Actions is described in Section 3.

Near-Term Actions are projects that are in some phase of planning or have been specifically identified in the Biological Opinions or Longfin Smelt ITP. These are identified actions that will be evaluated for implementation to initiate, if appropriate, mitigation to restore habitats that enhance productivity or provide habitat for Covered Fish Species. Several Near-Term Actions, which are all in various stages of planning and may be incorporated into the FRPA program, have been identified:

- In the Cache Slough Complex (Figure 2):
    - Prospect Island Tidal Habitat Restoration

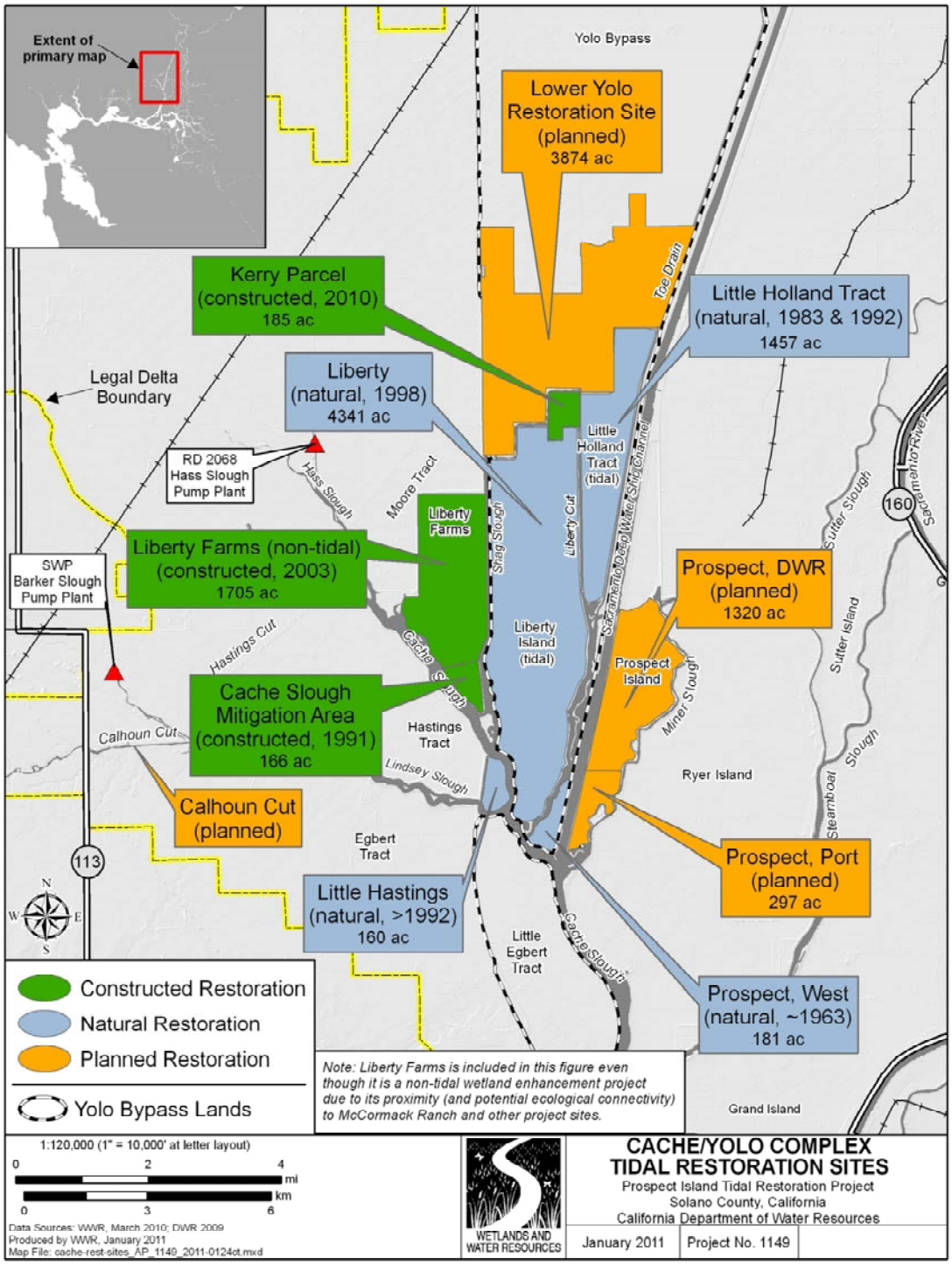

Figure 2. Near-term habitat restoration actions in the Cache Slough Complex

    - Liberty Island/Lower Cache Slough Enhancement Plan
    - Little Holland Tract Acquisition and Enhancement
    - Lindsey Slough Freshwater Tidal Marsh Enhancement
    - Lower Yolo Ranch Aquatic Habitat Restoration
- In the Suisun Marsh (Figure 3):
    - Hill Slough Tidal Marsh Restoration Project
    - Meins Landing Tidal Marsh Restoration project area
    - Rush Ranch
    - Overlook Club
- In the Yolo Bypass (Figure 4):
    - Lower Putah Creek Re-Alignment and Floodplain Restoration
    - Lisbon Weir Improvements
    - Tule Canal Connectivity
    - Fremont Weir Fish Passage
    - Increased Yolo Bypass Floodplain Inundation
- Battle Creek Salmon and Steelhead Restoration Project

The expected beneficial outcomes of the restoration actions are:

- a mosaic of dynamic habitats supporting numerous species at a significant scale;
- connection to the Yolo Bypass, Sacramento River, and Suisun Marsh;
- increased food supply for fish, birds, and marine mammals;
- landward migration of intertidal marsh over time; and
- improved hydrology so fish can reach habitats and primary production can reach the Sacramento River or other Delta waterways.

Large quantities of plankton and detritus produced by the tidally influenced wetlands would support forage on-site as well as within the Sacramento-San Joaquin Delta and Suisun Marsh (via tidal action transport). The projects will accommodate sea level rise to maintain functions of the conservation area over the long term.

Detailed descriptions of Near Term Actions can be found in Appendix F.

2.4 Potential Future Actions

Potential Future Actions are restoration projects that are expected to begin implementation in the next six to ten years. These projects would be located in the Delta, Suisun Marsh, and Yolo Bypass where existing conditions are conducive to restoration or enhancement of tidal wetlands or other habitats beneficial to the Covered Fish Species. The process of identifying, analyzing, and selecting these projects is described in the Action Selection Framework section (Section 3).

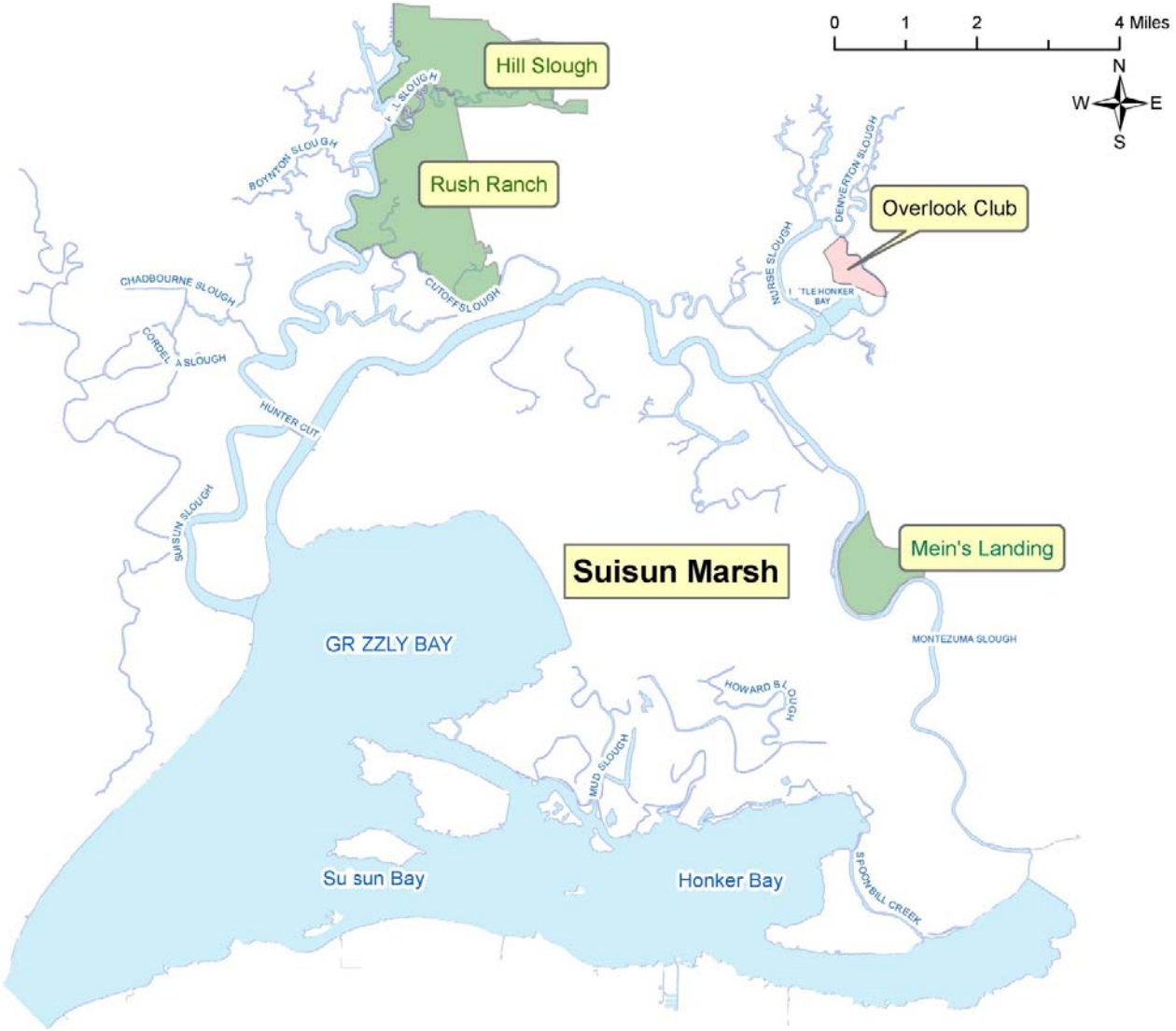

Figure 3. Near-term habitat restoration actions in Suisun Marsh

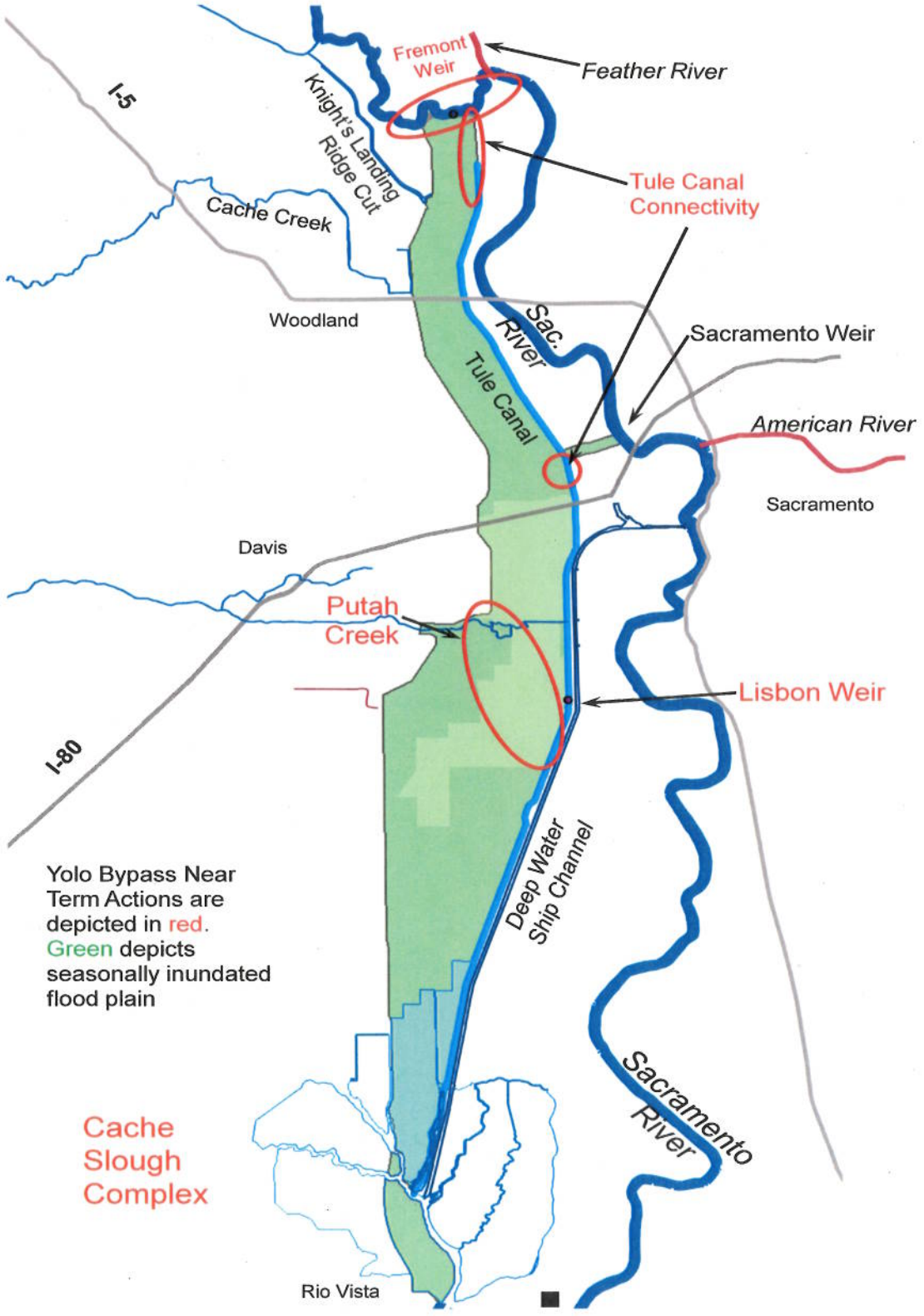

Figure 4. Near-term habitat restoration actions in the Yolo Bypass.

For tidal wetlands, elevation is probably the most important attribute for future restoration. Figure 5 shows elevations that are conducive to tidal marsh restoration. Tidal marsh generally forms between mean lower low water and mean higher high water, which in the Cache Slough Complex is between 2 and 6.5 feet above sea level (Environmental Work Group 2008). The areas that are most suitable for tidal marsh restoration are in the north Delta, which includes the Cache Slough Complex, rather than the central or interior Delta where subsidence has reduced the suitability of terrestrial areas for tidal marsh restoration.

Areas where elevations are conducive to tidal marsh restoration include (see Figure 5 for data sources):

- Western Cache Slough
- Hasting's Tract
- Eastern Egbert Tract

Potential Future Actions in the Cache Slough Complex could include:

- Fund baseline assessments and land acquisition at potential project sites;
- Develop additional tidal marsh at appropriate elevations;
- Preserve and possibly enhance current functional habitat on Little Holland Tract, Liberty Island, and other similar areas;
- Protect vegetation and habitat in the freshwater sloughs in Lindsey, Barker, and Cache Sloughs;
- Lower Yolo Bypass/Cache Slough Complex Water Diversion Evaluation and Management

The Suisun Marsh region could also provide restoration opportunities beyond those that have currently been identified. These areas include former tidal marshes that have been diked (and in many cases drained). Potential future restoration actions would include land acquisition and restoration of tidal action to provide habitat to support Covered Fish Species and to reduce ongoing adverse effects of diked lands management. FRPA would work with existing Suisun Marsh efforts primarily as a funding partner on projects.

Planning for ecological enhancements in the Yolo Bypass focuses on improving upstream and downstream fish passage, reducing straying and stranding of native fish, increasing the availability of floodplain habitat for fish rearing and spawning, and stimulating the food web in the Yolo Bypass. Modifications will need to be compatible with flood management and balance the value and needs of other existing land uses in the bypass such as agriculture, waterfowl and wildlife management, and recreation and outdoor education, and will need to consider additional constraints such as vector control and methylmercury management. Water diversions in the lower Yolo Bypass and Cache Slough Complex could be evaluated to determine if there are ecological impacts associated with current water management. If so, this could be investigated to determine if changes could be made that would reduce impacts while still meeting the needs of water users. Acquiring easements or fee title from willing land owners is likely to be required in order to allow project actions to occur. FRPA would work within the existing Yolo Bypass efforts primarily as a funding partner on projects.

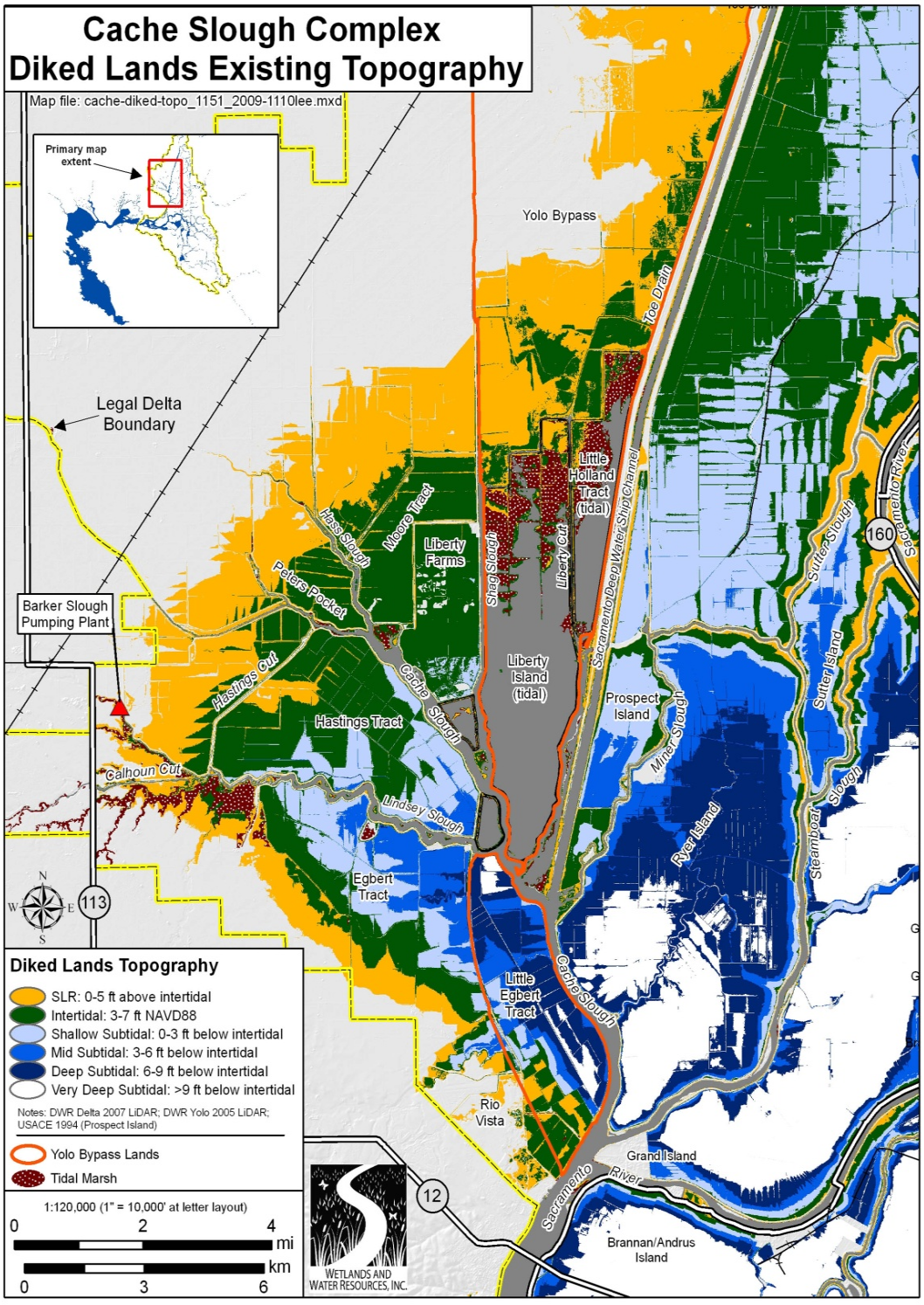

Figure 5. Land elevations within the Northern Delta

2.5 Restoration Challenges

A variety of institutional and resource challenges or constraints beyond DWR's control could impede restoration efforts under FRPA and make it difficult to achieve the FRPA acreage targets. The Implementation Strategy briefly describes some of these constraints and a generalized strategy for response through the FRPA program. Challenges or constraints may include ecological, regulatory, socio-political, land-use conditions, fiscal, or others. Response measures to ecological constraints will largely be developed and implemented as part of the adaptive management program. Previously described public outreach efforts will be an important process to address land-use constraints.

In the event of changed circumstances that create a challenge to restoration efforts, the FRPA Coordination and Management Team would evaluate the challenge or constraint, characterize interests, identify options to resolve the issue, and determine the appropriate course of action at the program or project level. This process would include close coordination with the Fishery Agencies through their membership on the FRPA Coordination and Management Team.

Some likely or potential challenges or constraints that FRPA may encounter during implementation include:

- **Modifications to the Biological Opinions or Longfin Smelt ITP** - Should substantial changes in the Delta, new scientific information, or regulatory changes result in modifications to the Biological Opinions or Longfin Smelt ITP, DWR and DFG, in cooperation with Reclamation, will meet and confer to determine what changes to this Implementation Strategy, if any, should be made to reflect the terms of the modified Biological Opinions and ITP.

- **Acquisition of suitable land in the amount needed for restoration actions** - FRPA assumes that sufficient land will be available within the Delta, Suisun Marsh, and Yolo Bypass to implement the actions set out in this Implementation Strategy. Since the amount of existing public lands may not be sufficient to meet FRPA acreage objectives, purchasing fee title or conservation easements on private lands from willing sellers will be part of the Implementation Strategy. For these reasons, DWR and DFG may experience difficulties in acquiring land for FRPA Potential Future Actions. FRPA will work and partner with other restoration planning efforts and entities where possible to help ensure that lands are suitable for restoration and to help meet FRPA acreage goals.

- **Land and water use and environmental conflicts** – Counties, landowners, and other stakeholders have concerns regarding the conversion of lands currently in agricultural production to natural habitat. In response to this, Yolo County has recently enacted a moratorium on habitat restoration, and it is possible that other Delta counties may do likewise. As a State agency, DWR is not bound by zoning restrictions or moratoriums of this nature. However, in order to facilitate restoration in a cooperative manner, DWR

will make every effort to work cooperatively with the county governments and comply with county ordinances and policies.

- **Levee failures** – Single or multiple levee failures may affect both the ability to restore areas and the benefits to Covered Fish Species provided by FRPA actions after implementation. Multiple levee failures could be of such magnitude that it renders most responses through FRPA infeasible, precludes implementation of actions outlined in the strategy, or significantly diminishes the function of FRPA restored habitat. FRPA will identify and undertake actions to the extent reasonable and practicable within the parameters of this Implementation Strategy's adaptive management program to moderate the ecological effects of potential multiple levee failures on existing projects.

- **Environmental laws, regulations, and other requirements** - Various State and federal permits and authorizations will be necessary to carry out restoration actions. Changes or modifications that may be needed to an action during implementation to ensure compliance with these laws or regulations may result in reduced progress and an extended schedule for completion. The FRPA program will be as pro-active as feasible to avoid potential schedule impacts through early coordination with regulatory entities.

- **Climate change** - Climate change is anticipated to cause changes over the next century that will impact potential recovery efforts throughout the Delta, Suisun Marsh, and Yolo Bypass. These changes are expected to include increased temperatures, changes in weather patterns, and a rise in sea levels. Climate change and its associated effects will create some uncertainty in the ability of FRPA to meet its objectives. FRPA restoration actions will be developed to address the range of predicted effects of climate change on sea level and watershed hydrology over the term of FRPA using the best scientific information available. Accommodations for sea level rise will be built into all restoration projects.

3. Action Selection Framework

The proposed fish restoration actions described in FRPA Attachment 4, and any additional FRPA actions, will be identified and mutually agreed upon by DWR and DFG in coordination with the USFWS and NMFS through the process described below.

The BDCP Habitat Credit MOA and draft Delta Plan both include discussions and processes that describe how DWR (and other habitat restoration implementing agencies) will work with the Fishery Agencies in designing, implementing, and crediting restoration projects. DWR will work with these agencies through the procedures described in these documents, listed above, to facilitate a uniform process designed to coordinate habitat restoration activities that will complement each other.

3.1 Action Identification Process

The Fish Restoration Action Development and Evaluation Process includes:

- Potential restoration actions will be identified by DFG, DWR, other agencies, stakeholders, public, and others.
- Potential restoration actions will be evaluated and developed by DFG and DWR in coordination with Reclamation, USFWS and NMFS following the criteria set forth in Section 3.2, below.
- Proposed fish restoration actions will be evaluated using the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) conceptual models or other equivalent tools, and will be peer reviewed using the Action Selection Framework or its successor.
- Proposed fish restoration actions may be modified by information obtained from the public, other agencies, the DRERIP evaluation, or other sources.
- Proposed fish restoration actions will undergo FAST project review, as described in the BDCP Habitat Credit MOA.
- Proposed fish restoration actions agreed upon by DFG and DWR will be submitted, in coordination with Reclamation, to the Fishery Agencies for review and comment as to consistency with requirements in the Delta Smelt Biological Opinion RPA Component 4 and the applicable Salmon Biological Opinion RPA Actions, and to obtain written approvals for proposed restoration actions prior to any commitment of resources.
- A written approval as to consistency with the Longfin Smelt ITP for proposed restoration actions will also be obtained from DFG prior to any commitment of resources.

Figure 6 shows the process by which projects will be selected for implementation.

3.2 Action Selection Criteria

DFG and DWR will consider fish restoration actions pursuant to the process described herein, using the following criteria, without limitation:

- Aquatic habitat restoration actions in the Delta, Suisun Marsh, and Yolo Bypass will focus on restoration of intertidal and shallow subtidal habitats, primarily for the benefit of pelagic and salmonid fish species. Other habitats that will be considered are floodplain and open water. The acres of habitat restored or enhanced are expected to provide either direct or indirect benefits by enhancing spawning and rearing habitat for Covered Fish Species, and increasing primary and secondary productivity in the Delta or Suisun Marsh. These habitat actions are expected to mitigate for impacts that occur as a result of SWP Delta operations as described in the Biological Opinions and ITP, and support higher larval and juvenile fish survival and increased fitness of spawning adults by improving conditions for the production of forage species.

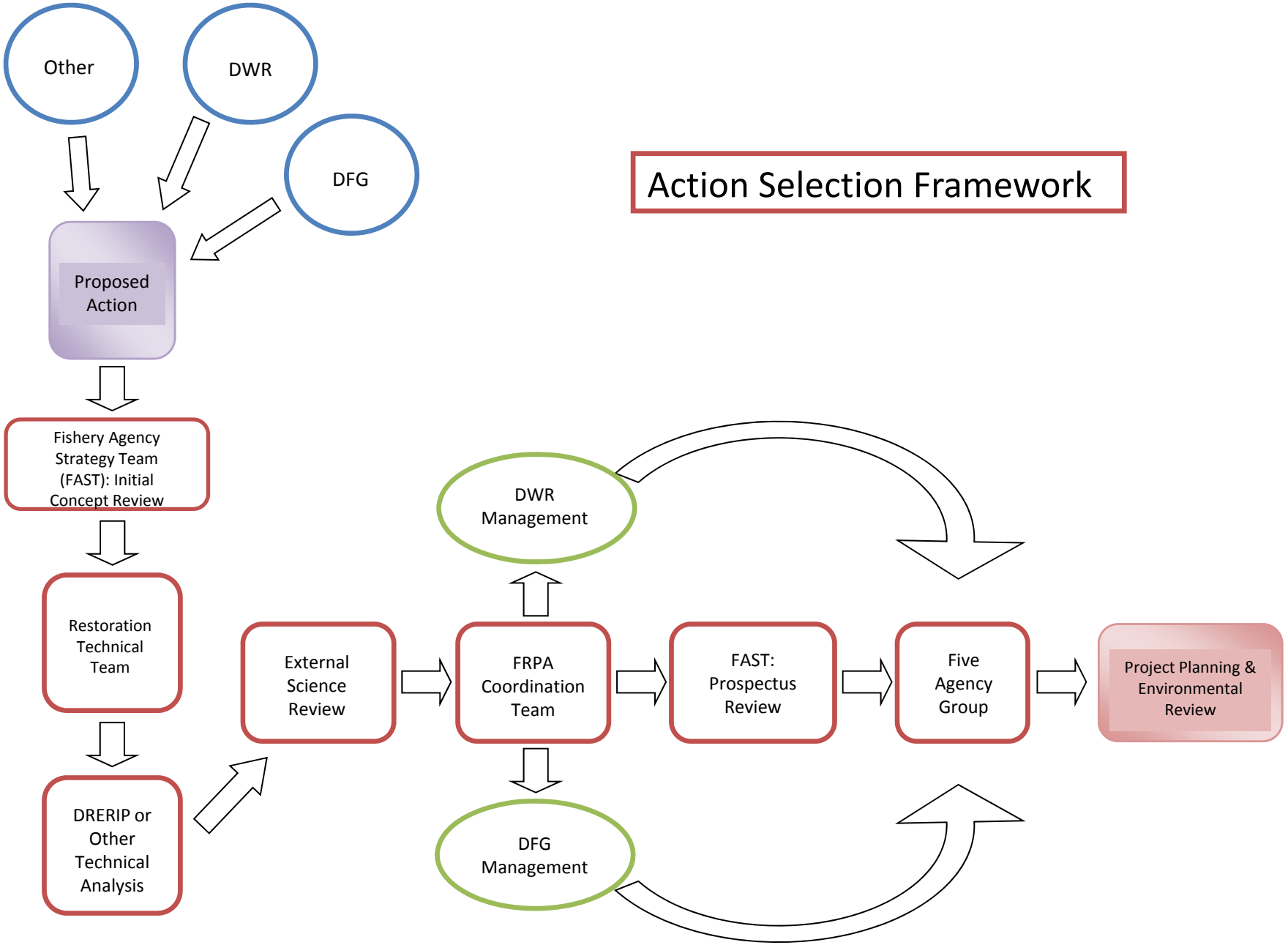

Figure 6. Framework for analyzing and selecting proposed actions for implementation

- In addition to the criteria listed above, mitigation actions primarily for the benefit of the salmonid fish species shall include:
    - restoration of habitat to provide upstream passage, and over- summering, and spawning and rearing habitat in Battle Creek,
    - barrier removal in the Yolo Bypass which improves access to suitable migratory pathways, and/or
    - restoration of functional stream geomorphology and floodplain in the Delta and Yolo Bypass which provides rearing habitat for emigrating juveniles. These actions are expected to increase available spawning habitat, improve over-summering adult survival, increase spawning success, and increase juvenile survival and fitness.

3.3 Action Acreage Crediting Evaluation

As part of their review of each restoration action, DFG and DWR, in coordination with USFWS and/or NMFS, will determine the amount of acreage to be credited to satisfy requirements of the Biological Opinions and the Longfin Smelt ITP and for credit under the BDCP in accordance with the BDCP Habitat Credit MOA. The amount of acreage credit will be based upon the criteria in Section 3.2 and the evaluation conducted in Section 3.1, unless this is superseded by the BDCP Habitat Credit MOA. The credit release schedule will be developed through the FAST process by the Fishery Agencies and the project-specific MOA will establish the amount of credit that will be given for the project.

For cost-share restoration actions, acreage credit will be pro-rated based on DWR's SWP funding contribution towards the implemented action and the monitoring and maintenance efforts over the life cycle of the project. If the action contains distinct elements, the credit will be based on the acreage of those elements and monitoring and maintenance costs to the extent funded by DWR SWP funds.

3.4 Review of Action Progress

DFG and DWR will monitor the effectiveness of the restoration actions towards meeting the criteria in Section 3.2 above, as follows:

- At years five, eight, and every subsequent five years or earlier if necessary, the results of restoration actions will be evaluated by an independent science panel or advisor as agreed to by DWR and DFG to determine if the restoration actions are meeting intended restoration criteria for the Covered Fish Species.

- DFG and DWR in coordination with Reclamation, USFWS and NMFS will review implementation of restoration actions after Year Four of the FRPA and each two years thereafter, to determine progress towards achieving the total amount of restoration acreage pursuant to FRPA Section F.3.2.a.

- If the evaluation as described in the first bullet above indicates that restoration actions are not performing to the criteria established in the restoration plan for the site, DWR and DFG, in coordination with USFWS and NMFS, will determine measures as necessary to address the problem based on an assessment of relevant technical data and scientific understandings. DWR will implement those measures and these costs will not be counted towards meeting the objectives of the Biological Opinions and Longfin Smelt ITP.

4.0 Monitoring and Reporting

The Biological Opinions and the ITP require a variety of monitoring and reporting associated with the fish habitat restoration requirements and related actions at both the overall habitat and site-specific project level. FRPA has no specific additional monitoring requirements, but does include additional reporting requirements for an annual program report and a report on the effectiveness of restoration actions at specified periods.

4.1 Required Monitoring Under the Biological Opinions and ITP

The Biological Opinions and the ITP require various monitoring associated with the habitat restoration efforts under FRPA. These include an overall monitoring program for the 8,000 acres to benefit delta smelt, post-project monitoring for juvenile salmonid habitat, and site-specific monitoring plans for the 800 acres to benefit longfin smelt.

The Delta Smelt Biological Opinion, RPA Component 4 states:

> "*An overall monitoring program shall be developed to focus on the effectiveness of the restoration actions and provided to the Service for review within six months of signature of this biological opinion. The applicant shall finalize the establishment of the funding for the restoration plan within 120 days of final approval of the restoration program by the Service.*"

DWR needs further clarification from the USFWS on this requirement before a monitoring program can be developed. Specifically, DWR needs guidance on how to develop a monitoring program to assess the effectiveness of the restoration projects before the restoration plans have been developed themselves.

The NMFS Salmonid Biological Opinion Action 1.6.2 states:

> "[An Enhancement Plan for Liberty Island/Lower Cache Slough] *shall be monitored for the subsequent five years, at a minimum, to evaluate the use of the area by juvenile salmonids and to measure changes in growth rates. Interim monitoring reports shall be submitted to NMFS annually, by September 30 each year, and a final monitoring report shall be submitted on September 30, 2015, or in the fifth year following implementation of enhancement*

actions. NMFS will determine at that time whether modification of the action or additional monitoring is necessary to achieve or confirm the desired results."

The required monitoring is post-project monitoring subsequent to implementation of habitat enhancement in the Liberty Island/Lower Cache Slough.

The ITP Condition 7 states:

"To improve overall habitat quality for longfin smelt in the Bay Delta Estuary, Permitee shall fund the acquisition, initial enhancement, restoration, long-term management, and long-term monitoring of 800 acres of inter-tidal and associated sub-tidal wetland habitat in a mesohaline part of the estuary…..The identification and development of the restoration sites, and the development of site-specific management and monitoring plans shall be appropriate to improve habitat conditions for longfin smelt and shall be submitted to DFG for review and approval. "

4.2 Monitoring Plan Implementation

Aquatic monitoring will focus on regional and site-specific habitat characteristics associated with the fish species of concern. Five categories of metrics will be evaluated: 1) physical and chemical, 2) vegetation, 3) fish, 4) food web, and 5) processes. Monitoring metrics will be relatively simple and measureable for a wide range of projects. Metrics will be measured both within the project location and in associated open waters adjacent to project locations. As much as possible, metrics will allow pre- and post-project comparison.

Monitoring plans will be developed as part of each restoration action, and will include both pre- and post- project monitoring requirements. These plans will be independently reviewed and evaluated by technical teams or a science panel. Monitoring will rely as much as possible on data from existing regional monitoring efforts under the Interagency Ecological Program (IEP). Additionally, site-specific monitoring data will be collected within each project site prior to restoration action. Expansion of long-term Delta-wide monitoring efforts will assist with the fulfillment of monitoring requirements (See Section 4.1).

Pre-project baseline monitoring will occur prior to project implementation, and will include sampling of any pre-existing aquatic habitats within the restoration area as well as sampling in aquatic habitats adjacent to project sites. Post-project monitoring will occur within each project site and in associated open waters. Data will be used for both adaptive management and long-term management purposes (See Section 4.4) with the goal of evaluating the success or failure of a particular action.

IEP has several long-term monitoring programs that collect data throughout the Delta and are discussed below. Monitoring from regions where restoration occurs can provide comparable pre- and post- project data. While the Suisun Marsh and Central Delta regions are well covered by existing monitoring, the Cache Slough region is largely excluded from current long-term

biological monitoring efforts. Although some programs have begun sampling in the Cache Slough Complex in recent years, there are no permanent long-term monitoring stations located in the Cache Slough Complex. FRPA staff will work with IEP to expand existing monitoring programs to establish permanent sampling sites in the Cache Slough region.

Existing monitoring programs that currently sample in, or could possibly be expanded to sample in, restoration regions include, but are not limited to:

- Continuous physical monitoring achieved by USGS and DWR's continuous monitoring stations recording stage, velocity, temperature, turbidity, and salinity. Additional stations could provide valuable information on the baseline hydrodynamics and changes caused by restoration projects;
- The Environmental Monitoring Program (DWR and DFG) that conducts monthly water quality, phytoplankton, zooplankton, and benthic sampling;
- Spring Kodiak Trawl, Summer Townet, and Fall Midwater Trawl surveys that sample juvenile and small bodied adult fish at least monthly;
- 20mm survey that samples late larval/early juvenile fish;
- Smelt larvae survey;
- USFWS Delta Juvenile Fishes Monitoring Program that conducts monthly beach seine and larval sampling;
- UC Davis Sampling Program in the Suisun Marsh; and
- DWR Yolo Bypass adult fish, juvenile fish, and lower trophic level sampling.

The five categories of metrics that will be evaluated are summarized in Table 2 (adapted from Ted Sommer, DWR unpublished report). Where possible, pre- and post-project comparisons will be made. Also, regional comparisons will be made (for example, between the Cache Slough region and the Central Delta region) to evaluate the cumulative impact of restoration actions within a region. Comparing metrics measured within restoration areas with measurements taken in adjacent main channels will provide information on the connectivity of restoration areas with adjacent habitats. Table 2 is a list of potential metrics that may be evaluated; however the actual metrics will be determined on a project-by-project basis.

4.3 Reporting Requirements

Section I of the FRPA Agreement describes the reporting requirements under FRPA, which include an annual program report and a report on the effectiveness of restoration actions at specified periods. Both are described below.

For annual reporting, DWR, in coordination with DFG, shall prepare an annual report on programs and projects being implemented under FRPA. The report will include financial reporting, the progress of each project towards meeting the intended restoration goals and implementation schedule, and the current status, constraints, and relative accrued benefits of those projects (See Appendix G).

Table 2. Potential metrics to be evaluated

Basic Approach

1. The metric should be relatively simple.
2. The metric should be measurable for a wide range of projects in the region
3. As much as possible, the metric should allow a pre- and post-project comparison.

Category	Metric	Pre- and Post- Project Comparison	Regional Comparison	Adjacent Channel Comparison	Comments
Physical and Chemical	Inundation regime	X			Gauges, ADCP's, model output
	Tidal excursion	X			Gauges, ADCP's, model output
	Residence time	X		X	ADCP's, modeling
	Temperature	X	X	X	Continuous loggers
	Turbidity, salinity	X	X	X	Continuous loggers
	DO	X	X	X	Continuous loggers, discrete sampling
	pH	X	X		
	Nitrogen (NH3, NH4, NO3)	X	X		Discrete sampling
	Chlorophyll a and/or b	X	X	X	Discrete sampling
	Pesticide levels	X	X	X	Discrete sampling
	MeHg	X	X	X	Bioaccumulation
Vegetation	Area of emergent vegetation by species	X	X		Aerial imagery & ground-truthing
	Area of SAV by species	X	X		Aerial imagery & ground-truthing
	Terrestrial habitat area by type	X			Aerial imagery & ground-truthing includes seasonal wetlands, agriculture, grasslands, riparian
Fish	Use of restored habitat	X		X	Can use a combination of sampling and telemetry methods. Sampling methods are dependent on the target species. Possible methods include: trawl, fyke, RSTR, gill net, seining, ichthyoplankton nets
	Number and size of fish by species	X	X	X	
	Growth		X		
	Residence time	X	X	X	
	Seasonal % alien	X			
Food Web	Chlorophyll a	X	X	X	Continuous, discrete
	Phytoplankton species	X	X	X	Discrete, includes *Microcystis*
	Primary production	X	X	X	DO or C14 method? Discrete
	Zooplankton species & density	X	X	X	Discrete
	Mesozooplankton species & density	X	X	X	Discrete Food Web
	Benthic invertebrate species & density	X	X		Discrete

Category	Metric	Pre- and Post- Project Comparison	Regional Comparison	Adjacent Channel Comparison	Comments
Food Web	Epiphytic invertebrate species & density	X	X		Discrete
	Fish diet composition		X		Discrete
Processes	Transport of Sediment	X	X		All of these would require combining the parameter measurements (above) with flow estimates. The use of transport models is also expected.
	Export of organic carbon	X	X		
	Loading of nitrogen by type	X	X		
	Loading of pesticides	X	X		
	Loading of MeHg	X	X		
	Export of phytoplankton	X	X		
	Export of zooplankton	X	X		

ADCP = Acoustic Doppler Current Profiles; DO = Dissolved Oxygen; MeHg = methylmercury; SAV = Submerged Aquatic Vegetation; RSTR = Rotary Screw Trap.

Periodic reporting on the effectiveness of restoration actions is required at year five and eight, and every five years subsequently. This is also discussed in Section 3.4, Review of Action Progress. DWR, in coordination with DFG, will review and jointly prepare a report on the effectiveness of restoration actions implemented under FRPA using monitoring data from the restoration actions implemented and current scientific understanding for the following purposes:

- To assess the effectiveness of restoration actions undertaken and funding provided in achieving the expected benefits to the fish species covered in the restoration plan;

- To evaluate the effectiveness of the restoration actions to collectively provide the expected benefits in relation to satisfying the obligations under the Delta Smelt Biological Opinion, the Salmon Biological Opinion, and the Longfin Smelt ITP.

The review of the restoration projects identified in FRPA will follow a process that will be developed by DWR, in cooperation with DFG, Reclamation, USFWS, and NMFS and may be included in the implementation agreement for the specific project. Based upon the results of this review, implementation may be altered according to the adaptive management principles identified in the ERP Stage 2 Conservation Strategy for the Delta and Suisun Marsh , or as may

be identified in the BDCP, or as may be developed by DWR in cooperation with DFG, Reclamation, USFWS, and NMFS.

4.4 Adaptive Management

This section describes key elements of the adaptive management strategy that relate to implementation of FRPA actions pursuant to the Biological Opinions and ITP. The adaptive management approach will be consistent with the BDCP and the Delta Stewardship Council's Delta Plan.

Principles for adaptive management

The BDCP Independent Science Advisors' Report on Adaptive Management describes the following principles for effective adaptive management:

- The scope and degree of reversibility of each proposed action (i.e., conservation measure) determines the form of adaptive management that can be applied (e.g., "active" or experimental adaptive management versus "passive" adaptive management).
- The knowledge base about the ecosystem is key to decisions about what to do and what to monitor, and includes all relevant information, not just that derived from project specific monitoring and analysis.
- Program goals should relate directly to the problems being addressed and provide the intent behind the conservation measures; objectives should correspond to measurable, predicted outcomes.
- Models should be used to formalize the knowledge base, develop expectations of future conditions and conservation outcomes that can be tested by monitoring and analysis, assess the likelihood of various outcomes, and identify tradeoffs among conservation measures.
- Monitoring should be targeted at specific mechanisms thought to underlie the restoration action, and must be integrated with an explicitly funded program for assessing the resulting data.
- Prioritization and sequencing of restoration actions should be assessed at multiple steps in the adaptive management cycle.
- Specifically targeted institutional arrangements are required to establish effective feedback mechanisms to inform decisions about whether to retain, modify, or replace a restoration action.
- A dedicated, highly skilled team is essential to assimilate knowledge from monitoring and technical studies and make recommendations to senior decision makers regarding programmatic changes.

An adaptive management plan will be developed for each restoration action. Adaptive management will begin with the project design phase, and continue through project implementation, evaluation, and any necessary modifications, as described in the nine-step

adaptive management framework outlined in the Delta Stewardship Council's draft Delta Plan. This framework for adaptive management identifies three main areas as follows:

- Plan (define the problem; establish goals and objectives; model linkages between objectives and proposed actions; select research, pilot, or full-scale action);
- Do (design implementation action; implement action and monitoring); and
- Evaluate and Respond (analyze, synthesize, and evaluate; communicate current understanding; adapt).

While a variety of actions will be funded by FRPA, the key element will be the restoration of aquatic habitat in the Delta and Suisun Marsh to mitigate for impacts to surface acres of aquatic habitat in the Delta determined by DFG and the Biological Opinions to have been impacted by SWP Delta operations. Other programs (*e.g.*, restoration at Dutch Slough and the BREACH III study at Liberty Island) have been designed to test various aspects of restoration techniques and ecosystem thresholds, and while not yet complete, the process of design has already helped focus on the importance of land/tidal elevation on the chances of success and the costs of restoration.

Several categories of uncertainties related to Delta tidal marsh ecosystems are described in Table 1 of the Dutch Slough Adaptive Management Plan. Where possible, an active adaptive management approach will be implemented to improve knowledge regarding these uncertainties. Monitoring and reporting for all projects will focus on the outcome of the conservation actions as follows:

- Do the target species spawn, rear, or forage in or around the created habitats?
- Is there tidal transport of nutrients and/or lower trophic productivity to the adjacent open water?
- Do invasive aquatic weeds or *Microsystis* invade the sites?
- Does the restored habitat support increased populations of exotic predatory fish species?
- Other questions specific to the individual project or methodology.

Where monitoring and reporting indicate negative outcomes of restoration actions, such as invasive weeds or exotic predatory fish species or do not meet project goals and objectives, corrective measures will be taken to meet the objectives of the restoration action.

5.0 Post-Project Maintenance

Plans for individual restoration projects shall include DWR funding sufficient to accomplish full implementation of restoration actions, including property transfer once restoration is deemed complete and maintenance of the action into perpetuity.

5.1 Property Transfer and Management Costs

Property ownership and management details will be set forth in subsequent project specific agreements, including a management plan as required under the USFWS Biological Opinion. These agreements will include assurances for sufficient funding through DWR's SWP operations and maintenance budget for perpetual operation and maintenance of the restoration project. Property acquired and restored pursuant to these agreements for which title is not held by DFG or the Delta Conservancy will be protected with a conservation easement in favor of an entity approved by DFG, USFWS or NMFS or with an acceptable alternative instrument. Such property will be protected by a separate agreement for each site on terms that provide DFG, USFWS, or NMFS sufficient access and rights, as appropriate, to monitor and/or operate and maintain the property in accordance with the approved restoration plan for the site. Condition 7.2 of the ITP contains additional requirements on the acquisition and transfer of lands.

5.2 Funding

Plans for individual restoration projects shall include DWR funding sufficient to accomplish full implementation of the action, which may include, but is not limited to, restoration planning, environmental review and documentation, permitting, interim management prior to restoration, restoration implementation, operation and maintenance activities, in perpetuity, pre- and post-project monitoring to evaluate project success in meeting the planned restoration objectives, and adaptive management. DWR funding will cover DFG incurred costs necessary to assist in planning and implementing the action.

6.0 References

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USFWS (U.S. Fish and Wildlife Service). 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). Reference No. 81420-2008-F-1481-5. January 2008.

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APPENDIX A. FISH RESTORATION PROGRAM AGREEMENT

AGREEMENT BETWEEN THE DEPARTMENT OF WATER RESOURCES AND THE DEPARTMENT OF FISH AND GAME REGARDING IMPLEMENTATION OF A FISH RESTORATION PROGRAM IN SATISFACTION OF FEDERAL BIOLOGICAL OPINIONS FOR STATE WATER PROJECT DELTA OPERATIONS

This Agreement is made on October 18, 2010 between the Department of Water Resources (DWR) and the Department of Fish and Game (DFG) regarding implementation of a fish restoration program through creation or restoration of fish habitat or other activities in satisfaction of requirements in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for Delta Smelt; the 2009 National Marine Fisheries Service (NMFS) Biological Opinion for Salmonids, Green Sturgeon and Killer Whales for the Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP); and the Longfin Smelt Incidental Take Permit for SWP operations, hereafter referred to as the "Fish Restoration Program."

RECITALS

A. On December 15, 2008, the USFWS issued a Biological Opinion on Delta Smelt and the Coordinated Operations of the CVP and SWP (Delta Smelt BiOp). The Delta Smelt BiOp includes a Reasonable and Prudent Alternative (RPA) requiring changes in CVP and SWP operations necessary to prevent jeopardy to the continued existence of delta smelt. By December 15, 2019, the Delta Smelt BiOp RPA, Component 4, requires that DWR complete a program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh and to develop management plans, monitoring, and financial assurances for the restoration sites developed in satisfaction of the RPA. (Delta Smelt BiOp p. 283-284; see also BiOp Attachment B, Action 6 further describing the RPA.) DWR desires, through this Agreement, to address procedures pursuant to which DFG will assist DWR in satisfying this requirement. A copy of the RPA Component 4, including Attachment B Action 6, is attached to this Agreement as Attachment 1.

B. On June 4, 2009, the NMFS issued a Biological Opinion on Salmonids, Green Sturgeon, and Killer Whales for the Long-term Operations of the CVP and SWP (Salmon BiOp). The Salmon BiOp includes a Reasonable and Prudent Alternative (RPA) requiring changes in CVP and SWP operations necessary to prevent jeopardy to the continued existence of winter-run Chinook salmon, spring-run Chinook salmon, steelhead, sturgeon, and killer whales. The Salmon BiOp RPA provides for mitigation through various actions by DWR and U.S. Bureau of Reclamation (Reclamation) to address impacts to salmonids. Actions that DWR desires to address through this Agreement are funding restoration actions on Battle Creek (Action I.2.6, Salmon BiOp p. 603) and restoring floodplain rearing habitat for

salmonids in the lower Sacramento River basin (e.g., Liberty Island/Lower Cache Slough) in cooperation with DFG, USFWS, NMFS, and the U.S. Army Corps (Action Suite I.6, Salmon BiOp p. 607-10). For Action I.6.1, if the 8,000 acres of tidal habitat in the Delta Smelt BiOp RPA Component 4 also provides suitable rearing habitat for salmonids, these acres may be used in partial satisfaction of Action I.6.1 (Salmon BiOp p. 609). DWR further desires, through this Agreement, to address procedures pursuant to which DFG will assist DWR in satisfying the requirements in the Salmon BiOp. A copy of the Salmon BiOp Actions I.2.6 and Suite I.6 are attached to this Agreement as Attachment 2.

C. On July 16, 2009, based upon a request from DWR, DFG found the Delta Smelt BiOp is consistent with the California Endangered Species Act (CESA) for the authorization of take of delta smelt by the SWP.

D. On September 3, 2009, based upon a request from DWR, DFG found the Salmon BiOp is consistent with CESA for the authorization of take of, winter-run Chinook salmon and spring-run Chinook salmon by the SWP. On May 26, 2010, DFG issued a replacement consistency determination for the Salmon BiOp.

E. On February 23, 2009, DWR received from DFG incidental take authorization of longfin smelt for the SWP operations pursuant to section 2081 of the Fish and Game Code (SWP Longfin Smelt Incidental Take Permit (ITP No. 2081-2009-001-3)). The SWP Longfin Smelt ITP Condition 7 requires that DWR improve the overall habitat quality for longfin smelt in the Bay Delta Estuary through acquisition, restoration, long-term management and monitoring of 800 acres of intertidal and associated subtidal wetland habitat in a mesohaline part of the estuary. (Longfin Smelt ITP p. 14-15, 17-18.) DFG and DWR intend that restoration of habitat in compliance with the Delta Smelt BiOp that also meets the criteria of the Longfin Smelt ITP will satisfy requirements of the ITP. A copy of the Longfin Smelt ITP Condition 7 is attached to this Agreement as Attachment 3.

F. On October 6, 2006, DWR and DFG, along with the California Natural Resources Agency, Reclamation, USFWS, NMFS, seven water agencies and other Delta water users, and four non-governmental organizations, signed the Bay Delta Conservation Plan (BDCP) Planning Agreement. The BDCP is anticipated to provide Federal Endangered Species Act (FESA) and CESA compliance for coordinated SWP and CVP operations in the Sacramento-San Joaquin River Delta through a Habitat Conservation Plan (FESA Section 10), Biological Opinions (FESA Section 7), and a Natural Community Conservation Plan (NCCP) (Fish and Game Code Section 2800 et seq.). Consistent with the NCCP Act, FESA and CESA, the Planning Agreement recognizes that the Agreement parties can elect to preserve, enhance, or restore, either by acquisition or other means, aquatic and associated riparian and floodplain habitat in the Planning Area that support native species of fish, wildlife, or natural communities prior to approval of the BDCP" and that "the Fishery Agencies agree to credit such resources toward the land and water acquisition or habitat protection, enhancement, and restoration requirements of the BDCP, as appropriate, provided

these resources are appropriately conserved, restored or enhanced, and managed and contribute to the BDCP's conservation strategy." (Planning Agreement Section 7.7.1, p. 18.) DFG and DWR intend that actions carried out to meet the requirements in the Delta Smelt BiOp, Salmon BiOp, and the Longfin Smelt ITP will also be credited towards satisfaction of the habitat restoration conservation measures of the BDCP.

G. On November 12, 2009, the Delta Reform Act (Act) was signed into law by Governor Schwarzenegger. The Act creates a new agency, the Delta Stewardship Council, to implement the coequal goals of providing a more reliable water supply and protecting, restoring and enhancing the Delta ecosystem. The Council is required to adopt a Delta Plan by January 1, 2012. The Act also designates the Delta Conservancy as the primary state agency for implementation of ecosystem restoration. DFG and DWR intend to communicate with the Delta Stewardship Council and the Delta Conservancy to ensure actions taken pursuant to this Agreement are consistent with the Act and the Delta Plan when it is adopted.

H. On December 30, 1986, DWR and DFG entered into the "Agreement Between The Department Of Water Resources And The Department Of Fish And Game To Offset Direct Losses In Relation To The Harvey O. Banks Delta Pumping Plant" (known as the "Delta Fish Agreement"). DWR and DFG intend to continue implementation of the Delta Fish Agreement. This Agreement is not intended to modify or otherwise affect the Delta Fish Agreement.

I. DWR and DFG intend through this Agreement to develop a fish restoration program by establishing the framework for selecting, funding, and implementing specific restoration projects, and management and funding plans for those same restoration projects. The commitment of specific funding for and implementation of the restoration actions or other activities will be made by DWR through execution of subsequent agreements with other entities, such as, if appropriate, DFG, USFWS, and NMFS. At the time of execution of this Agreement, the project proposals specifically identified for restoration required by the federal BiOps and the Longfin Smelt ITP are not well enough defined as to their location, specific land modification, or restoration requirements to provide meaningful information for environmental assessment. Therefore, at this time environmental analysis of any restoration proposals or other activities referred to in this Agreement would be premature. In addition, execution of this Agreement will not effectively preclude any alternatives or mitigation measures that CEQA would otherwise require to be considered, including the alternative of not going forward with a restoration proposal, if a project were to be found infeasible or to have unacceptable impacts on the environment such that other alternatives or mitigation may be considered. Thus, prior to project implementation, DWR and DFG commit through this Agreement to satisfy CEQA requirements for restoration proposals at the time when sufficient information is available for meaningful analysis of the restoration proposals or actions referred to herein.

Now therefore, in accordance with the Recitals and in consideration of the terms and conditions herein, DWR and DFG agree to the following:

A. Fish Restoration Program.

1. This Agreement commits DFG to work cooperatively with and assist DWR to establish the management and financial framework necessary to implement a fish restoration program that will satisfy DWR's obligations under the Delta Smelt BiOp RPA Component 4 identified above in Recital A, Salmon BiOp RPA Actions I.2.6 and Suite I.6 identified above in Recital B, and the Longfin Smelt ITP Condition 7 identified above in Recital E.

2. Consistent with the BDCP Planning Agreement, the restoration proposals or actions described above in section A.1 and established by this Agreement to cover impacts of SWP operations as described in the Delta Smelt BiOp, the Salmon BiOp, and the Longfin Smelt ITP will contribute to meeting the habitat acreage required of, and funded by, DWR for BDCP as tidal and associated subtidal habitat and other appropriate habitat acreage conservation measure targets identified in the BDCP. Prior to committing to any specific restoration actions, DWR, in cooperation with DFG, will submit the restoration proposals developed through this Agreement to USFWS and NMFS to obtain their review and written concurrence that the restoration proposals would satisfy requirements of their respective biological opinions and the BDCP for fish restoration.

3. Fish restoration requirements for the Delta Smelt BiOp RPA Component 4, Salmon BiOp RPA Actions I.2.6 and Suite I.6, and the Longfin Smelt ITP Condition 7 may be met by the following:

   a. Creation or restoration of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. Some potential actions and estimated funding to provide this restoration acreage are described in Attachment 4, "Proposed Agreement Commitments and Estimated Costs." Attachment 4 is not a final or binding list of actions and may be modified by DWR and DFG from time to time as additional information is developed.

   b. Implementation of Delta Smelt BiOp RPA Component 4 fish habitat restoration. Prior to committing to a specific project proposal or restoration action, DWR, in cooperation with DFG, shall submit the fish restoration proposal to USFWS to obtain USFWS review and written approval of the project proposal as satisfying the habitat restoration conditions required in the Delta Smelt BiOp.

   c. Implementation of Salmon BiOp RPA fish habitat restoration actions. Prior to committing to a specific project proposal or restoration action for salmon, DWR, in cooperation with DFG, shall submit the fish restoration proposal to NMFS to obtain NMFS review and written approval of the project proposal as

satisfying the habitat restoration conditions required in the Salmon BiOp. The restoration actions that satisfy the Delta Smelt BiOp may be accepted by NMFS in satisfying restoration obligations of Salmon BiOp RPA Action I.6.1.

d. Implementation of Longfin Smelt habitat restoration actions. The 800 acres of habitat restoration required in Condition 7 in the Longfin Smelt ITP will be satisfied upon DWR satisfying 800 acres of habitat restoration under the Delta Smelt BiOp in the mesohaline zone of the Delta (in Suisun Bay or Marsh) with hydrologic connectivity to open waters. Prior to committing to a specific project proposal or action, DFG and DWR shall agree in writing that the proposed project satisfies Condition 7 of the Longfin Smelt ITP.

4. The proposed fish restoration projects will be selected by DWR, with assistance from and in cooperation with DFG, after coordinating and obtaining appropriate approval from USFWS, and NMFS, and DFG, as provided in Section 3 above. Restoration plans for those selected habitat enhancement projects will be implemented through specific implementation agreements that provide for compliance with all permitting and regulatory requirements.

5. This Agreement shall not restrict DWR's right to delegate to, contract with, or carry out cooperative programs with other public agencies or appropriate entities to plan or implement all or any part of a habitat restoration action for purposes of satisfying the Delta Smelt BiOp, Salmon BiOp, or Longfin Smelt ITP. For purposes of this Agreement, implementation by such an entity will be deemed to be implementation by DWR and all crediting provisions of this Agreement shall be applicable to such restoration actions if implemented in accordance with this Agreement and a project specific implementation agreement as described in Section 4. To the extent that any activity covered by this Agreement is carried out by such an entity, DWR will ensure that the planning is carried out with DFG's participation and assistance as provided for herein.

B. Implementation Schedule. Without delay, and no later than twelve (12) months from the effective date of this Agreement, DWR, with assistance from DFG, shall develop a schedule for a fish restoration program through the creation or restoration of fish habitat or other activities (Implementation Schedule). The Implementation Schedule will identify restoration actions, estimated costs, targeted acreage, and a timeline for DWR's implementation of restoration proposals or actions for purposes of satisfying DWR's obligations under the Delta Smelt BiOp, Salmon BiOp, and Longfin Smelt ITP.

C. CEQA. DWR, and if applicable DFG or any other entity, will comply with CEQA prior to implementing the restoration projects called for under this Agreement. DWR will serve as lead agency and DFG as responsible agency unless circumstances require that a different lead agency and responsible agency be used. DWR will be responsible for all DWR and DFG costs associated with CEQA compliance of

restoration projects called for under this Agreement and as and provided under Section E below.

D. Identification, Monitoring, Evaluation, Review, and Approvals. DWR, with assistance from DFG and other entities, if appropriate, will develop a process for determining whether a proposed restoration project should be selected for purposes of satisfying DWR obligations under the Delta Smelt BiOp, the Salmon BiOp, and Longfin Smelt ITP and obtaining habitat restoration credit.

E. Funding. Plans for individual restoration projects shall include DWR funding sufficient to accomplish full implementation of the action, which may include, but is not limited to, restoration planning, environmental review and documentation, permitting, interim management prior to restoration, restoration implementation, operation and maintenance activities, and monitoring to evaluate project success in meeting the planned restoration objectives. DWR funding will cover DFG incurred costs necessary to assist in planning and implementing the action.

F. Commitments and Financing.

1. Starting in year one and continuing for each year thereafter DWR will provide funding for DFG staff to assist DWR in its planning activities and to monitor and review DWR's implementation of the activities described above in Section E, in this Section F, and in Section H below, as well as supporting operational decision-making associated with avoidance and minimization measures required under the Delta Smelt BiOp, Salmon BiOp, and Longfin Smelt ITP (See Attachment 4).

2. For meeting the objectives of this Agreement, DWR will fund DFG's staffing costs to assist DWR in planning and implementing restoration proposals including, but not limited to, tracking the Implementation Schedule, negotiating land transfer agreements, managing transferred lands, assessing and evaluating results, and helping develop adaptive management plans (See Attachment 4). DWR and DFG will mutually agree on the tasks and level of effort to be performed by DFG. DFG will submit a 3-year budget plan with tasks and costs annually to be reviewed, modified if necessary, and approved by DWR each year. The annual budget will also include detailed tasks conducted by DFG, staff hours and costs. DFG will also prepare timely quarterly reports to DWR on its tasks, staff hours and costs for review by DWR.

3. A phased approach will be used for funding and implementation of actions as set forth below:

3.1. Year One Commitments and Financing.

In order to immediately start to restore habitats needed to ensure sufficient production, spawning and rearing for fish species covered under the Delta Smelt

and Salmon BiOps and Longfin Smelt ITP, during Year One DWR will fund, plan, and implement to the extent practicable, those actions specified in Attachment 4, or equivalent actions, to the extent required to meet DWR's obligations under the BiOps and the ITP. The $12 million funding commitment towards Battle Creek restoration will be satisfied by a one-time up-front payment to Reclamation for this purpose when requested in writing by DFG.

3.2. Year Two through Ten Commitments and Financing.

In Years Two through Ten, or until all restoration actions required under the Delta Smelt and Salmon BiOps and Longfin Smelt ITP have been fully implemented, DWR and DFG will work together to initiate or continue implementation of the restoration actions. To accomplish this, DWR will:

a. Initiate or continue restoration or creation of a total of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. DWR intends to achieve this by securing and initiating implementation of 35% of the total acreage by year four, 60% by year six, 80% by year eight and 100% by year ten, or as otherwise provided by Section F.3.1. above, and diligently pursuing implementation to completion. DWR, USFWS, NMFS, and DFG may agree on other mitigation actions for meeting the required amount of acreage.

b. DWR and DFG recognize that the BDCP may become effective prior to the time when all restoration actions described in this Agreement have been completed. Therefore, this Agreement shall guide the planning for habitat restoration actions related to the existing Delta Smelt and Salmon BiOps and the Longfin Smelt ITP until the BDCP and its associated biological opinions and incidental take permits become effective, at which time DWR and DFG intend that this Agreement would terminate and the BDCP documents and the BDCP Implementation Agreement would guide all subsequent habitat restoration processes.

c. Should unforeseen circumstances arise that render the timely implementation of these restoration actions infeasible, DWR, DFG, USFWS, and NMFS will meet and determine how to address the delay and any potential effects of the delay.

G. Acreage Credit. DWR will receive acreage credit for fish habitat restoration upon securing acreage designated for restoration and initiating implementation of the restoration proposals or actions consistent with the obligations under the Delta Smelt BiOp, Salmon BiOp, and Longfin Smelt ITP and as defined by a credit memo agreed upon with USFWS, NMFS, or DFG, as appropriate, in advance of taking any restoration actions.

H. Property Transfer and Management Costs. Property ownership and management details will be set forth in subsequent project specific agreements which will include

assurances for sufficient funding through DWR's SWP operations and maintenance budget for perpetual operation and maintenance (O&M) of the restoration project. Property acquired and restored pursuant to this Agreement for which title is not held by DFG will be protected with a Conservation Easement in favor of an entity approved by DFG, USFWS or NMFS or with an acceptable alternative instrument. Such property will be protected by a separate agreement for each site on terms that provide DFG, USFWS, or NMFS sufficient access and rights, as appropriate, to monitor and/or operate and maintain the property in accordance with the approved restoration plan for the site.

I. Reporting.

1. DWR, in coordination with DFG, shall prepare an annual report on programs and projects being implemented under this Agreement. The report will include financial reporting, the progress of each project towards meeting the intended restoration goals and Implementation Schedule, and the current status, barriers, and relative accrued benefits of those projects.

2. At year 5 and 8, and every 5 years subsequently, DWR, in coordination with DFG, will review and jointly prepare a report on the restoration actions implemented under this Agreement using monitoring data from the restoration actions implemented and current scientific understanding for the following purposes:

   a. To assess the effectiveness of restoration actions undertaken and funding provided in achieving the expected benefits to the fish species covered in the restoration plan;

   b. To evaluate the effectiveness of the restoration actions to collectively provide the expected benefits in relation to satisfying the obligations under the Delta Smelt BiOp, the Salmon BiOp, and the Longfin Smelt ITP.

3. The review of the restoration projects identified in this Agreement will follow a process that will be developed by DWR, in cooperation with DFG, USFWS, and NMFS and may be included in the implementation agreement for the specific project. Based upon the results of this review, implementation may be altered according to the Adaptive Management principles identified in the ERP Stage 2 Conservation Strategy for Suisun Marsh and the Delta, or as may be identified in the BDCP, or as may be developed by DWR in cooperation with DFG, USFWS, and NMFS.

4. DWR, in coordination with DFG shall submit their joint reports to USFWS and NMFS.

J. Substantial Changes. Should substantial changes in the Delta or new scientific information result in modifications to the Delta Smelt BiOp, Salmon BiOp or Longfin Smelt ITP under circumstances where the BDCP has not become effective, DWR

and DFG will meet and confer to determine what changes to this Agreement, if any, should be made to reflect the terms of the modified BiOps and/or ITP.

K. Withdrawal. Either DWR or DFG may withdraw from this Agreement with 60 days written notice. Such withdrawal shall not affect any project specific agreements entered into between DWR, DFG and/or other entities pursuant to this Agreement prior to the date of withdrawal.

L. Dispute Resolution. In the event a dispute arises out of any term or condition of this Agreement, DFG and DWR shall meet as soon as possible to resolve the dispute. DFG and DWR shall then attempt to negotiate a resolution of such dispute. Notwithstanding the above provision, neither DFG nor DWR waive any rights or duties it may have pursuant to federal and state laws, rules, or regulations.

M. Amendments. This Agreement may be amended by mutual written agreement of DWR and DFG.

N. Headings. The paragraph headings in this Agreement have been inserted solely for convenience of reference and are not a part of this Agreement and shall have no effect upon its construction or interpretation.

O. Effective Date and Term. This Agreement shall become effective upon signatures below and shall continue except as otherwise provided herein.

Mark Cowin, Director
Department of Water Resources

Date: 10/18/2010

John McCamman, Director
Department of Fish and Game

Date: 10/18/2010

Approved as to legal form and sufficiency:

Cathy Crothers, Acting Chief Counsel
Department of Water Resources

Date: Oct. 14, 2010

Thomas Gibson, General Counsel
Department of Fish and Game

Date: Oct 18, 2010

Attachments Incorporated into this Agreement by the references above:

1. Delta Smelt BiOp RPA Component 4
2. Salmon BiOp RPA Actions I.2.6 and Suite I.6
3. Longfin Smelt ITP Condition 7
4. Proposed Agreement Commitments and Estimated Costs

ATTACHMENTS 1, 2, AND 3

water year was wet or above normal as defined by the Sacramento Basin 40-30-30 index, all inflow into CVP/SWP reservoirs in the Sacramento Basin shall be added to reservoir releases in November to provide an additional increment of outflow from the Delta to augment Delta outflow up to the fall X2 of 74 km for Wet WYs or 81 km for Above Normal WYs, respectively. In the event there is an increase in storage during any November this action applies, the increase in reservoir storage shall be released in December to augment the December outflow requirements in SWRCB D-1641.

Given the nature of this Action and to align its management more closely with the general plan described by the independent review team and developed by Walters (1997), the Service shall oversee and direct the implementation of a formal adaptive management process. The adaptive management process shall include the elements as described in Attachment B. This adaptive management program shall be reviewed and approved by the Service in addition to other studies that are required for delta smelt. In accordance with the adaptive management plan, the Service will review new scientific information when provided and may make changes to the action when the best available scientific information warrants. For example, there may be other ways to achieve the biological goals of this action, such as a Delta outflow target, that will be evaluated as part of the study. This action may be modified by the Service consistent with the intention of this action based on information provided by the adaptive management program in consideration of the needs of other listed species. Other CVP/SWP obligations may also be considered.

The adaptive management program shall have specific implementation deadlines. The creation of the delta smelt habitat study group, initial habitat conceptual model review, formulation of performance measures, implementation of performance evaluation, and peer review of the performance measures and evaluation that are described in steps (1) through (3) of Attachment B shall be completed before September 2009. Additional studies addressing elements of the habitat conceptual model shall be formulated as soon as possible, promptly implemented, and reported as soon as complete.

The Service shall conduct a comprehensive review of the outcomes of the Action and the effectiveness of the adaptive management program ten years from the signing of the biological opinion, or sooner if circumstances warrant. This review shall entail an independent peer review of the Action. The purposes of the review shall be to evaluate the overall benefits of the Action and to evaluate the effectiveness of the adaptive management program. At the end of 10 years or sooner, this action, based on the peer review and Service determination as to its efficacy shall either be continued, modified or terminated.

RPA Component 4: Habitat Restoration

This component of the RPA (Action 6 of Attachment B) is intended to provide benefits to delta smelt habitat to supplement the benefits resulting from the flow actions described above. DWR shall implement a program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. These actions

may require separate ESA consultations for their effects on federally listed species. The restoration efforts shall begin within 12 months of signature of this biological opinion and be completed by DWR (the applicant) within 10 years. The restoration sites and plans shall be reviewed and approved by the Service and be appropriate to improve habitat conditions for delta smelt. Management plans shall be developed for each restoration site with an endowment or other secure financial assurance and easement in place held by a third-party or DFG and approved by the Service. The endowment or other secure financial assurance shall be sufficient to fund the monitoring effort and operation and maintenance of the restoration site.

An overall monitoring program shall be developed to focus on the effectiveness of the restoration actions and provided to the Service for review within six months of signature of this biological opinion. The applicant shall finalize the establishment of the funding for the restoration plan within 120 days of final approval of the restoration program by the Service. There is a separate planning effort in Suisun Marsh where the Service is a co-lead with Reclamation on preparation of an Environmental Impact Statement. Restoration actions in Suisun Marsh shall be based on the Suisun Marsh Plan that is currently under development.

RPA Component 5: Monitoring and Reporting

Reclamation and DWR shall ensure that information is gathered and reported to ensure:
1) proper implementation of these actions,
2) that the physical results of these actions are achieved, and
3) that information is gathered to evaluate the effectiveness of these actions on the targeted life stages of delta smelt so that the actions can be refined, if needed.

Essential information to evaluate these actions (and the Incidental Take Statement) includes sampling of the FMWT, Spring Kodiak Trawl, 20-mm Survey, TNS and the Environmental Monitoring Program of the IEP. This information shall be provided to the Service within 14 days of collection. Additional monitoring and research will likely be required, as defined by the adaptive management process.

Information on salvage at Banks and Jones is both an essential trigger for some of these actions and an important performance measure of their effectiveness. In addition, information on OMR flows and concurrent measures of delta smelt distribution and salvage are essential to ensure that actions are implemented effectively. Such information shall be included in an annual report for the WY (October 1 to September 30) to the Service, provided no later than October 15 of each year, starting in 2010.

Reclamation shall implement the RPA based on performance standards, monitoring and evaluation of results from the actions undertaken and adaptive management as described in RPA component 3. RPA component 3 has a robust adaptive management component that requires a separate analysis apart from those required under this component. Some of the data needed for these performance measures are already being collected such as the FMWT abundances and salvage patterns. However, more information on the effect of

ACTION 6: HABITAT RESTORATION

Objective: To improve habitat conditions for delta smelt by enhancing food production and availability.

Action: A program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh shall be implemented. A monitoring program shall be developed to focus on the effectiveness of the restoration program.

Timing: The restoration efforts shall begin within 12 months of signature of this biological opinion and be completed within a 10 year period.

Background

The historic Delta was a tidal wetland-floodplain system including about 350,000 acres of tidal wetland. Almost all of the historic wetlands in the Delta have been lost due to conversion to agriculture and urban development. The Delta currently supports less than 10,000 acres of tidal wetland, all of which is small and fragmented. This conversion of the Delta's wetlands beginning in the mid-nineteenth century has resulted in a landscape dominated by agricultural lands intersected by deep and comparatively uniform tidal channels.

Delta smelt feed mainly on zooplankton throughout their life cycle (Nobriga and Herbold 2008) with the copepod Pseudodiaptomus forbesi being the dominant prey item for juvenile delta smelt in the summer (Lott 1998; Nobriga 2002; Hobbs et al. 2006). Diatoms form the base of the pelagic foodweb and primary consumers (e.g. copepods) appear to be food-limited in the Delta and Suisun (Muller-Solger et al. 2002; Sobczak et al. 2002). Pelagic productivity in the Delta and Suisun Bay has been declining for several decades with a steep decline following the introduction of the overbite clam in 1986 (Kimmerer and Orsi 1996). Histopathological evaluations have provided evidence that delta smelt have been food-limited during the summer months (Bennett 2005). This finding has been corroborated by recent work on juvenile delta smelt as part of ongoing studies on the POD. Moreover, recent studies suggest a statistical association between delta smelt survival and the biomass of copepods in the estuary (Kimmerer 2008).

Overall research in other estuaries has indicated that tidal wetlands are highly productive. Although definitive studies have not been done on the type and amount of productivity in freshwater tidal wetlands of the Delta, brackish tidal wetlands of Suisun Marsh are one of the most productive habitats in northern San Francisco Bay-Delta estuary (Sobczak et al. 2002). It is likely that restored freshwater tidal wetlands in the Delta would have higher productivity than the brackish wetlands of Suisun (Odum 1988). A large portion of the production in Suisun Marsh consists of high quality phytoplankton-derived carbon (Sobczak et al. 2002) that is an important food source for zooplankton and therefore can contribute to the base of the pelagic foodweb. Modeling suggests that the tidal wetlands of Suisun currently provide about 6 percent of the organic carbon to the pelagic habitats of Suisun Bay (Jassby et al. 1993). In addition, sampling in Liberty Island shows that these freshwater tidal habitats can be a source of high-quality phytoplankton that contribute to the pelagic food web downstream (Lehman et al. 2008). Thus, restoration of large amounts of intertidal habitat in the Delta and Suisun could enhance the ecosystem's pelagic productivity.

Justification:

Since it was introduced into the estuary in 1988, the zooplankton Pseudodiaptomus forbesi has been the dominant summertime prey for delta smelt (Lott 1998; Nobriga 2002; Hobbs et al. 2006). There is evidence suggesting that the co-occurrence of delta smelt and Pseudodiaptomus forbesi has a strong influence on the survival of young delta smelt from summer to fall (Miller 2007). The Effects Section indicates that

Pseudodiaptomus distribution may be vulnerable to effects of export facilities operations and therefore, the projects have a likely effect on the food supply available to delta smelt.

The near complete loss of tidal wetlands from the Delta threatens the persistence of delta smelt by reducing productivity at the base of the pelagic foodweb. Primary production in tidal wetlands of the Northern San Francisco estuary has been shown to support high zooplankton growth (Muller-Solger et al. 2002). This action should therefore enhance the foodweb on which delta smelt depend. This action is designed to increase high quality primary and secondary production in the Delta and Suisun Marsh through an increase in tidal wetlands. Exchange of water between the tidal wetlands and surrounding channels should distribute primary and secondary production from the wetlands to adjacent pelagic habitats where delta smelt occur. This exchange should be optimized through intertidal habitat restoration designed to incorporate extensive tidal channels supported an appropriately sized vegetated marsh plain which will provide the necessary tidal prism to maintain large tidal exchange.

New evidence indicates how tidal marsh may benefit delta smelt even if they do not occur extensively within the marsh itself. Specifically, monitoring suggests this species is taking advantage of recently-created tidal marsh and open water habitat in Liberty Island. The fact that delta smelt make heavy use of habitat in the Cache Slough complex has been evident in sampling by the DFG's Spring Kodiak trawl and 20 mm surveys (www.delta.dfg.ca.gov). The Spring Kodiak trawls show that delta smelt are present in channels of the Cache Slough complex during winter and spring; the collection of larval delta smelt in subsequent 20-mm surveys indicates that these adult delta smelt eventually spawn in the vicinity. In addition, the use of Cache Slough complex by delta smelt includes habitat on Liberty Island. The island flooded in 1998 and has evolved rapidly into a system of open-water and tidal marsh habitat. Recent sampling of Liberty Island by USFWS biologists (http://www.delta.dfg.ca.gov/jfmp/libertyisland.asp) revealed that delta smelt both spawn and rear in Liberty Island. Light traps collected relatively high numbers of larval delta smelt in several locations of Liberty Island during the 2003 spawning period for this species. Moreover, subsequent beach seine sampling showed that older delta smelt were present at all ten of their sampling stations during 2002-2004 and in all seasons of the year (USFWS, unpublished data). These results are particularly striking because they were from a period when delta smelt was at record low abundance. Collection of delta smelt from shallow inshore areas using seines indicates that the fish do not occupy deeper pelagic habitat exclusively. These results seem reasonable in light of the area's consistently high turbidity (Nobriga et al. 2005; DWR, unpublished data) and zooplankton abundance (e.g. Sommer et al. 2004), both of which are important habitat characteristics for delta smelt (Bennett 2005; Feyrer et al. 2007). In any case, these data suggest that freshwater tidal wetlands can be an important habitat type to delta smelt with proper design and location.

A monitoring program shall be developed to focus on the effectiveness of the restoration program. This program shall be reviewed and modified as new information becomes available.

on timely hydrologic and biological considerations. Important factors differ from year to year, and need to be considered in operations planning. They include the projected size of the winter-run year class (and thus the extent of habitat needed); timing and location of spawning and redds based on aerial surveys; the extent of the cold water pool, given air temperatures; and operation of the Temperature Control Device to provide optimal use of the cold water pool. Preparation of a draft plan also allows for iterative planning and feedback. Operations can be tailored each year to achieve the optimal approach to temperature management to maintain viable populations of anadromous fish, based on the best available information.

The Calfed Science Program peer review report on temperature management emphasized the importance of refining temperature management practices in the long term and included recommendations for doing so. The requirement to hire an independent contractor to recommend specific refinements to the procedures in this RPA responds to these recommendations.

Action I.2.5. Winter-Run Passage and Re-Introduction Program at Shasta Dam

See Fish Passage Program, Action V

Action I.2.6. Restore Battle Creek for Winter-Run, Spring-Run, and CV Steelhead

Objective: To partially compensate for unavoidable adverse effects of project operations by restoring winter-run and spring-run to the Battle Creek watershed. A second population of winter-run would reduce the risk of extinction of the species from lost resiliency and increased vulnerability to catastrophic events.

Description of Action: Reclamation shall direct discretionary funds to implement the Battle Creek Salmon and Steelhead Restoration Project. Phase 1A funding is currently allocated through various partners and scheduled to commence in Summer 2009 (Reclamation 2008c). DWR shall direct discretionary funds for Phase 1B and Phase 2, consistent with the proposed amended Delta Fish Agreement by December 31 of each year, Reclamation and DWR will submit a written report to NMFS on the status of the project, including phases completed, funds expended, effectiveness of project actions, additional actions planned (including a schedule for further actions), and additional funds needed. The Battle Creek Salmon and Steelhead Restoration Project shall be completed no later than 2019.

Rationale: Modeling projections in the BA show that adverse effects of ongoing project operations cannot be fully minimized. Severe temperature-related effects due to project operations will occur in some years. This RPA includes an exception procedure in anticipation of these occurrences (see Action I.2.2). Establishing additional populations of winter-run is critical to stabilize the high risk of extinction resulting from the proposed action on the only existing population of this species. $26 million has been identified for this project in the American Recovery and Reinvestment Act of 2009.

minimum flows for anadromous fish in critically dry years, in lieu of the current 5,000 cfs navigation criterion. Recommendations shall be made to NMFS by December 1, 2009. The recommendations will be implemented upon NMFS' concurrence.

In years other than critically dry years, the need for a variance from the 5,000 cfs navigation criterion will be considered during the process of developing the Keswick release schedules (Action I.2.2-4).

Rationale: In some circumstances, maintaining the Wilkins Slough navigation channel at 5,000 cfs may be a significant draw on Shasta reservoir levels and affect the summer cold water pool necessary to maintain suitable temperatures for winter-run egg incubation and emergence. Reclamation has stated that it is no longer necessary to maintain 5,000 cfs for navigation (CVP/SWP operations BA, page 2-39). Operating to a minimal flow level based on fish needs, rather than on outdated navigational requirements, will enhance the ability to use cold-water releases to maintain cooler summer temperatures in the Sacramento River.

Action I.5. Funding for CVPIA Anadromous Fish Screen Program (AFSP)

Objective: To reduce entrainment of juvenile anadromous fish from unscreened diversions.

Action: Reclamation shall screen priority diversions as identified in the CVPIA AFSP, consistent with previous funding levels for this program. In addition, Reclamation/CVPIA Program shall evaluate the potential to develop alternative screened intakes that allow diverters to withdraw water below surface levels required by the antiquated Wilkins Slough navigation requirement criterion of 5,000 cfs.

Rationale: Approximately ten percent of 129 CVP diversions listed in Appendix D-1 of the CVP/SWP operations BA are currently screened. Of these, most of the largest diversions (greater than 250 cfs) have already been screened; however, a large number of smaller diversions (less than 250 cfs) remain unscreened or do not meet NMFS fish screening criteria (NMFS 1997; *e.g.*, CVP and SWP Delta diversions, Rock Slough diversion). The AFSP has identified priorities for screening that is consistent with the needs of listed fish species. Screening will reduce the loss of listed fish in water diversion channels. In addition, if new fish screens can be extended to allow diversions below 5,000 cfs at Wilkins Slough, then cold water can be conserved during critically dry years at Shasta Reservoir for winter-run and spring-run life history needs.

Action Suite I.6: Sacramento River Basin Salmonid Rearing Habitat Improvements

Objective: To restore floodplain rearing habitat for juvenile winter-run, spring-run, and CV steelhead in the lower Sacramento River basin, to compensate for unavoidable adverse effects of project operations. This objective may be achieved at the Yolo Bypass, and/or through actions in other suitable areas of the lower Sacramento River.

The suite of actions includes near term and long-term actions. The near-term action (Action I.6.2) is ready to be implemented and can provide rearing benefits within two years of issuing this Opinion. The long-term actions (Actions I.6.1, I.6.3, and I.6.4) require additional planning and coordination over a five- to ten-year time frame.

These actions are consistent with Reclamation's broad authorities in CVPIA to develop and implement these types of restoration projects. When necessary to achieve the overall objectives of this action, Reclamation and DWR, in cooperation with other agencies and funding sources, including the Delta Fish Agreement and any amendments, shall: (1) apply for necessary permits; (2) seek to purchase land, easements, and/or water rights from willing sellers; (3) seek additional authority and/or funding from Congress or the California State Legislature, respectively; and (4) pursue a Memorandum of Agreement with the Corps.

Similar actions addressing rearing and fish passage are under consideration in the BDCP development process and may ultimately satisfy the requirements in Actions I.6 and I.7. BDCP is scheduled to be completed by December 31, 2010.

Action I.6.1. Restoration of Floodplain Rearing Habitat

Objective: To restore floodplain rearing habitat for juvenile winter-run, spring-run, and CV steelhead in the lower Sacramento River basin. This objective may be achieved at the Yolo Bypass, and/or through actions in other suitable areas of the lower Sacramento River.

Action: In cooperation with CDFG, USFWS, NMFS, and the Corps, Reclamation and DWR shall, to the maximum extent of their authorities (excluding condemnation authority), provide significantly increased acreage of seasonal floodplain rearing habitat, with biologically appropriate durations and magnitudes, from December through April, in the lower Sacramento River basin, on a return rate of approximately one to three years, depending on water year type. In the event that this action conflicts with Shasta Operations Actions I.2.1 to I.2.3, the Shasta Operations Actions shall prevail.

Implementation procedures: By December 31, 2011, Reclamation and DWR shall submit to NMFS a plan to implement this action. This plan should include an evaluation of options to: (1) restore juvenile rearing areas that provide seasonal inundation at appropriate intervals, such as areas identified in Appendix 2-C or by using the Sacramento River Ecological Flow Tool (ESSA/The Nature Conservancy 2009) or other habitat modeling tools; (2) increase inundation of publicly and privately owned suitable acreage within the Yolo Bypass; (3) modify operations of the Sacramento Weir (which is owned and operated by the Department of Water Resources) or Fremont Weir to increase rearing habitat; and (4) achieve the restoration objective through other operational or engineering solutions. An initial performance measure shall be 17,000-20,000 acres (excluding tidally-influenced areas), with appropriate frequency and duration. This measure is based on the work by Sommer *et al.* (2001, 2004) at Yolo Bypass and on recent analyses conducted for the BDCP process of

inundation levels at various river stages. (BDCP Integration Team 2009).[28] The plan may include a proposal to modify this performance measure, based on best available science or on a scientifically based adaptive management process patterned after Walters (1997).

This plan also shall include: (1) specific biological objectives, restoration actions, and locations; (2) specific operational criteria; (3) a timeline with key milestones, including restoration of significant acreage by December 31, 2013; (4) performance goals and associated monitoring, including habitat attributes, juvenile and adult metrics, and inundation depth and duration criteria; (5) specific actions to minimize stranding or migration barriers for juvenile salmon; and (6) identification of regulatory and legal constraints that may delay implementation, and a strategy to address those constraints. Reclamation and DWR shall, to the maximum extent of their authorities and in cooperation with other agencies and funding sources, implement the plan upon completion, and shall provide annual progress reports to NMFS. In the event that less than one half of the total acreage identified in the plan's performance goal is implemented by 2016, then Reclamation and DWR shall re-initiate consultation.

The USFWS' Delta smelt biological opinion includes an action to restore 8,000 acres of tidal habitat for the benefit of Delta smelt. If these 8,000 acres also provide suitable rearing habitat for salmonids, they may be used in partial satisfaction of the objective of this action.

This action is not intended to conflict with or replace habitat restoration planning in the BDCP process.

Rationale: Rearing and migration habitats for all anadromous fish species in the Sacramento basin are in short supply. Project operations limit the availability of such habitats by reducing the frequency and duration of seasonal over-bank flows as a result of flood management and storage operational criteria. Recent evaluations on the Yolo Bypass and Cosumnes River have shown that juvenile Chinook salmon grow faster when seasonal floodplain habitats are available (Sommer *et al.* 2001, 2005; Jeffres *et al.* 2008). Sommer *et al.* (2005) suggest these floodplain benefits are reflected in adult return rates. This action is intended to offset unavoidable adverse effects to rearing habitat and juvenile productivity of winter-run, spring-run, and CV steelhead in the Sacramento River basin, by increasing available habitat that is inundated with the frequency and duration of suitable floodplain rearing habitats during December through April.

In high flow years (*e.g.*, similar to 1998), this action can be achieved solely by inundation of the Yolo Bypass. In other years, this action may be accomplished by a combination of actions such as increasing the year-to-year inundation frequency of existing floodplains such as portions of the Yolo Bypass, by restoring rearing habitat attributes to suitable areas, through restoration or enhancement of intertidal areas such as Liberty Island, creation or re-establishment of side channels, and re-created floodplain terrace areas.

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[28] The analyses assumed a notch in the Fremont Weir.

Action I.6.2. Near-Term Actions at Liberty Island/Lower Cache Slough and Lower Yolo Bypass

Description of Action: By September 30, 2010, Reclamation and/or DWR shall take all necessary steps to ensure that an enhancement plan is completed and implemented for Liberty Island/Lower Cache Slough, as described in Appendix 2-C. This action shall be monitored for the subsequent five years, at a minimum, to evaluate the use of the area by juvenile salmonids and to measure changes in growth rates. Interim monitoring reports shall be submitted to NMFS annually, by September 30 each year, and a final monitoring report shall be submitted on September 30, 2015, or in the fifth year following implementation of enhancement actions. NMFS will determine at that time whether modification of the action or additional monitoring is necessary to achieve or confirm the desired results. This action shall be designed to avoid stranding or migration barriers for juvenile salmon.

Action I.6.3. Lower Putah Creek Enhancements

Description of Action: By December 31, 2015, Reclamation and/or DWR shall develop and implement Lower Putah Creek enhancements as described in Appendix 2-C, including stream realignment and floodplain restoration for fish passage improvement and multi-species habitat development on existing public lands. By September 1 of each year, Reclamation and/or DWR shall submit to NMFS a progress report towards the successful implementation of this action. This action shall not result in stranding or migration barriers for juvenile salmon.

Action I.6.4. Improvements to Lisbon Weir

Action: By December 31, 2015, Reclamation and/or DWR shall, to the maximum extent of their authorities, assure that improvements to the Lisbon Weir are made that are likely to achieve the fish and wildlife benefits described in Appendix 2-C. Improvements will include modification or replacement of Lisbon Weir, if necessary to achieve the desired benefits for fish. If neither Reclamation nor DWR has authority to make structural or operational modifications to the weir, they shall work with the owners and operators of the weir to make the desired improvements, including providing funding and technical assistance. By September 1 of each year, Reclamation and/or DWR shall submit to NMFS a report on progress toward the successful implementation of this action. Reclamation and DWR must assure that this action does not result in migration barriers or stranding of juvenile salmon.

Rationale for Actions I.6.2 to I.6.4: These actions have been fully vetted by CDFG and found to be necessary initial steps in improving rearing habitat for listed species in the lower Sacramento River basin. These improvements are necessary to off-set ongoing adverse effects of project operations, primary due to flood control operations. Additional descriptions of these actions are contained in the draft amendment to the Delta Fish Agreement (CVP/SWP operations BA appendix Y).

6.4 To ensure the minimization measures designed to minimize take of the Covered Species are effective, Permittee shall conduct inspection, maintenance and reporting on all of the fish screens at the NBA, RRDS, and Sherman Island diversions during November through June. Permittee shall submit a plan, within 3 months of Permit issuance, detailing the inspection, maintenance and reporting scope and schedule that cover the fish screen and any other components that may affect screening efficiency. After the plan is approved by DFG, the Permittee shall adhere to the maintenance, inspection and reporting schedule described in the plan. Effectiveness monitoring requirements for these facilities is described below in Condition 8.

7 Measures That Contribute to Full Mitigation

DFG has determined that permanent protection of inter-tidal and associated sub-tidal wetland habitat to enhance longfin smelt water habitat is necessary and required under CESA to fully mitigate the impacts of the taking on the Covered Species that will result with implementation of the Project. The following measures, when implemented in conjunction with the flow measures in Condition 5 above, will enhance the estuarine processes and open water habitat beneficial for longfin smelt and provide some additional habitat for longfin smelt in deeper areas. These measures, in conjunction with the flow measures which minimize and partially mitigate take, will fully mitigate take of longfin smelt from the proposed Project.

7.1 To improve overall habitat quality for longfin smelt in the Bay Delta Estuary, Permittee shall fund the acquisition, initial enhancement, restoration, long-term management, and long-term monitoring of 800 acres of inter-tidal and associated sub-tidal wetland habitat in a mesohaline part of the estuary. This condition is intended to provide benefits supplemental to the benefits resulting from the flow requirements described in Condition 5 above. The identification and development of the restoration sites, and development of site-specific management and monitoring plans shall be appropriate to improve habitat conditions for longfin smelt and shall be submitted to DFG for review and approval. The restoration efforts shall begin with the acquisition and planning for restoration of at least 160 acres within 2 years of issuance of this Permit. Subsequent restoration efforts shall restore at least 160 acres every 2 years and all restoration shall be completed by Permittee within 10 years. If longfin smelt are not listed by the Fish and Game Commission at the March 2009 meeting, the inter-tidal and sub-tidal wetland habitat restoration requirement shall be 20 acres for the period from February 23, 2009 to March 6, 2009 and shall be completed by December 31, 2010. These acreages are above and beyond any acres already under development or planned that are required for compliance with any existing CESA permits. Implementation of this may require separate CESA and CEQA consultations to evaluate, minimize and mitigate any restoration effects on other listed species

7.2 DFG's approval of the Mitigation Lands (Lands) must be obtained prior to acquisition and transfer by use of the Proposed Lands for Acquisition Form or by other means specified by DFG. As part of this Condition, Permittee shall:

7.2.1 Transfer fee title to the Lands, convey a conservation easement, or provide another mechanism approved by DFG over the Lands to DFG under terms approved by DFG. Alternatively, a conservation easement over the Lands may be conveyed to a DFG-approved non-profit organization qualified pursuant to California Government Code section 65965, with DFG named as a third party beneficiary under terms approved by DFG.

7.2.2 Provide a recent preliminary title report, initial Phase 1 report, and other necessary documents. All documents conveying the Lands and all conditions of title are subject to the approval of DFG, and, if applicable, the Department of General Services.

7.2.3 Reimburse DFG for reasonable expenses incurred during title and documentation review, expenses incurred from other state agency reviews, and overhead related to transfer of the Lands to DFG. DFG estimates that this Project will create an additional cost to DFG of no more than $3,000 for every fee title deed or easement processed.

7.3 All land acquired for the purposes of implementing this Condition shall be evaluated and all appropriative and riparian rights obtained with the land acquisition shall be recorded. All water rights obtained and not necessary for implementation of the long-term management and monitoring plan shall be transferred to in stream beneficial uses under Water Code Section 1707.

8. **Monitoring and Reporting:**

Permittee shall ensure that information is gathered and reported to ensure proper implementation of the Conditions of Approval of the Permit, that the intended physical results of these Conditions are achieved, and that appropriate and adequate information is gathered to evaluate the effectiveness of these actions on the targeted life stages of longfin smelt so that the actions can be refined, if needed.

8.1 Permittee shall fund its share of the Interagency Ecological Program to continue the following existing monitoring efforts, all of which are key to monitor the Covered Species response to Project operations and the Conditions of Approval of this Permit. These include sampling of the FMWT, Spring Kodiak Trawl, 20-mm Survey, Smelt Larval Survey, and Bay Study.

8.2 Permittee shall fund additional monitoring related to the extent of the incidental take of longfin smelt and the effectiveness of the minimization measures. Immediate needs include extension of the time period of the existing smelt larval

Permit. The Permittee shall continue to work and coordinate with DFG salvage staff to ensure as close to real time information sharing as feasible.

9 **Funding Assurance**

To the extent authorized under California law, Permittee shall fully fund all expenditures required to implement minimization and mitigation measures and to monitor compliance with and effectiveness of those measures, as well as all other related costs.

9.1 Permittee shall provide sufficient funding for perpetual management and monitoring activities on the required compensatory habitat lands (Lands) identified in Condition 7. To determine the amount sufficient to fund all monitoring efforts and the operations, maintenance and management on the Lands, the Permittee shall prepare a Property Analysis Record (PAR) or PAR-equivalent analysis prior to providing the funding for each approved Lands parcel. The Permittee shall submit to DFG for review and approval the results of the PAR or PAR-equivalent analysis. This analysis will be reviewed by the DFG to determine the appropriate first year management costs and long-term funding amount necessary for the in-perpetuity management of the Lands. As each parcel of the Lands is acquired and following DFG review and approval of the PAR, the funding shall be provided by Permittee.

9.2 Permittee may proceed with the Project before completing all of the required mitigation (including acquisition of Mitigation Lands), monitoring, and reporting activities only if Permittee ensures funding to complete those activities by providing funding assurance to DFG. Within 3 months after the effective date of this Permit, 20% of the funding assurance shall be provided. Additional 20% payment shall be provided at years 2, 4, 6 and 8. The funding assurance shall be provided in the form of a bond in the form of Attachment C or irrevocable stand-by letter of credit in the form of Attachment D or another form of funding assurance approved by the Director, demonstrating DWR's financial commitment through SWP secured funding sources. The funding assurance will be held by DFG or in a manner approved by DFG. The funding assurance shall allow DFG to draw on the principal sum if DFG, at its sole discretion, determines that Permittee has failed to comply with the Conditions 6, 7 and 8 of this Permit. The funding assurance (or any portion of such funding assurance then remaining) shall be released to the Permittee after all of the Permit Conditions have been met as evidenced by:

- Timely submission of all required reports;
- An on-site inspection by DFG; and
- Written approval from DFG.

Even if funding assurance is provided, the Permittee must complete the required acquisition, protection and transfer of all required Lands and record any required conservation easements no later than 10 years after the issuance of this Permit, as

specified in Condition 7. DFG may require the Permittee to provide additional Lands and/or additional funding to ensure the impacts of the taking are minimized and fully mitigated, as required by law, if the Permittee does not complete these requirements within the specified timeframe.

The funding assurance shall be in the amount of $2,400,000.00 based on the following estimated costs of implementing the Permit's mitigation, monitoring and reporting requirements. The Permittee shall notify the DFG upon furnishing each of the following financial assurances, or substantial equivalent approved by DFG:

a) Land acquisition costs for impacts to habitat, calculated at $1,500.00/acre for 800 acres: $1,200,000.00.

b) Costs of enhancing Lands, calculated at $250.00/acre for 800 acres: $200,000.00.

c) Endowment costs initially estimated at $1,000,000.00, or substantial equivalent approved by DFG.

Amendment:
This Permit may be amended without the concurrence of the Permittee if DFG determines that continued implementation of the Project under existing Permit conditions would jeopardize the continued existence of a Covered Species or that Project changes or changed biological conditions necessitate a Permit amendment to ensure that impacts to the Covered Species are minimized and fully mitigated. DFG may also amend the Permit at any time without the concurrence of the Permittee as required by law.

Stop-Work Order:
To prevent or remedy a potential violation of permit conditions, DFG will consult with Permittee to address the potential violation and will give Permittee a reasonable time to correct the potential violation and implement possible alternative actions before issuing a stop-work order. Director may issue Permittee a written stop-work order to suspend any activity covered by this Permit for an initial period of up to 25 days to prevent or remedy a violation of Permit conditions (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. Permittee shall comply with the stop-work order immediately upon receipt thereof. DFG may extend a stop-work order under this provision for a period not to exceed 25 additional days, upon written notice to the Permittee. DFG shall commence the formal suspension process pursuant to California Code of Regulations, Title 14, section 783.7 within five working days of issuing a stop-work order.

Compliance with Other Laws:
This Permit contains DFG's requirements for the Project pursuant to CESA. This permit does not necessarily create an entitlement to proceed with the Project. Permittee is responsible for complying with all other applicable state, federal, and local laws.

Proposed Agreement Commitments and Estimated Costs

Attachment 4

Restoration - Mitigation Actions [1]	Action Features	Anticipated Benefits	Status	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	TOTAL
SECTION A. Delta Smelt & Longfin Smelt Actions														
A1. Early Implementation Actions														
Cache Slough Complex a. Prospect Island b. Liberty Island	a. Up to 1316 acres. b. TBD based on enhancement of existing habitat over baseline conditions.	Habitat benefits for improved estuarine processes and function to support delta smelt, longfin smelt and other Fish Species.	In Progress											
A2. Additional Potential Mitigation Actions for In-Delta Acreage														
Actions in the Delta, Suisun Marsh, and Cache Slough Complex: a. Western Cache Slough Complex b. Little Holland Tract Restoration Project c. Eastern Egbert Tract Restoration Project d. Hill Slough West Tidal Marsh Restoration	a. Acres to be determined. b. Acres to be determined. c. Acres to be determined. d. 207-1100 acres	a. Food web, tidal processes, habitat. b. Tidal Processes, habitat, d. Habitat benefits for improved estuarine processes and function to support delta smelt, longfin smelt and other Fish Species.	Planning											
SECTION B. Anadromous Fish Actions														
B1. Early Implementation Actions														
Battle Creek Phase 2	Open 31.5 miles of spawning/rearing habitat	Winter/spring-run, Chinook, spawning/rearing	Planning	$12,000,000 One time-fixed cost										$12,000,000
B2. Additional Potential Anadromous Actions														
a. Lower Putah Creek Re-Alignment b. Lisbon Weir Improvements c. Tule Canal Connectivity d. Fremont Weir Fish Passage e. Yolo Bypass Floodplain Habitat f. Additional Listed Anadromous Fish Species Project Opportunities	Improved juvenile rearing, upstream passage for adult anadromous fish and downstream passage for juvenile anadromous species • Water Right purchase • Water/energy bypass purchase • Tributary restoration action • Fish passage improvements	a. Fall-run Chinook b. Passage – Chinook, sturgeon, splittail c. Passage – Chinook, sturgeon, splittail d. Passage – Chinook, sturgeon, splittail e. Spawning, rearing, and foodweb – splittail, Chinook, rearing f. TBD	Ongoing											
Section C Total Estimated costs														
				$20 Million[2]			$36 Million		$40 Million		$32 Million		$32 Million	$160 Million
SECTION D.														
DFG Staff Resources	Estimated Staff necessary to support mitigation activities. 8 PYs Total: 5 PY- Planning and Monitoring 3 PY- restoration habitat management planning & transfer agreements.	Facilitate implementation of mitigation actions.		$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$10,000,000
DWR Staff Resources	Estimated Staff necessary to support mitigation activities. Total 5 PYs New Positions.			$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$750,000	$7,500,000
YEARLY SUMMATION of COSTS				**$33,750,000**	**$1,750,000**	**$1,750,000**	**$37,750,000**	**$1,750,000**	**$41,750,000**	**$1,750,000**	**$33,750,000**	**$1,750,000**	**$31,750,000**	**$187,500,000**
Percent progress towards agreement mitigation acreage. To Be Determined (TBD).				**• TBD (up to 3000 acres)**	**TBD**	**TBD**	**35%**	**TBD**	**60%**	**TBD**	**80%**	**TBD**	**100%**	**100%**

[1] Delta Fish Agreement Actions that DWR will continue to implement include:
Delta Bay Enhanced Enforcement Project (DBEEP); Suisun Marsh Fish Screen Operations and Maintenance Project; Prospect Island Habitat Restoration Project; Spring-Run Warden Overtime Program; Deer Creek Water Exchange Program; Mill Creek Water Exchange Program; Butte Creek Fish Passage and Monitoring Program; San Joaquin River Maintenance Project- Tuolumne, Merced, Stanislaus Rivers Gravel and Habitat Maintenance; Tuolumne River Salmon Habitat- La Grange Gravel Project; Merced River Salmon Habitat- Wing Deflector Gravel Project; Merced River Salmon Habitat- Robinson Reach and Ratzlaff Reach; Merced River Hatchery; Hills Ferry Barrier San Joaquin Project; Upper Western Stone Project- Merced River Habitat Project.

[2] These funds are to be expended over the first three to five years, or as determined when the projects are fully designed. Estimated costs based on $20,000/acre to acquire and restore habitat, actual costs will vary.

APPENDIX B. REQUIRED ACTIONS OF THE FISH RESTORATION PROGRAM

Appendix B: Required Actions of the Fish Restoration Program Agreement

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
A1. Early Implementation Action: Cache Slough Complex: Prospect Island and Liberty Island Projects. Habitat benefits for improved estuarine processes and function to support delta smelt, longfin smelt and other Fish Species.	Attachment 4- FRPA- Proposed Agreement Commitments Table	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Prospect Island- 1. Up to 1316 acres. Liberty Island- 2. TBD based on enhancement of existing habitat over baseline conditions. Creation or restoration of 8000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. The 800 acres of habitat restoration required in Condition 7 in the Longfin Smelt ITP will be satisfied upon DWR satisfying 800 acres of habitat restoration under the Delta Smelt BiOp in the mesohaline zone of the Delta (in Suisun Bay or Marsh) with hydrologic connectivity to open waters. Prior to committing to a specific project proposal or action, DFG and DWR shall agree in writing that the proposed project satisfies both Condition 7 of the Longfin Smelt ITP and theDelta Smelt BiOp.	DWR & DFG: DWR Dennis McEwan Lead on Project. Aquistion of Prospect Island- January 2010/ MOU BETWEEN DFG and DWR REGARDING HABITAT CREDIT PRIOR TO THE ACQUISITON OF PROSPECT ISLAND PROPERTY- December 29, 2009
A2. Additional Potential Mitigation Actions for Acreage: Actions in the Delta, Suisun Marsh, and Cache Slough Complex: a. Western Cache Slough Complex, b. Little Holland Tract Restoration Project, c. Eastern Egbert Tract Restoration, d.Hill Slough West Tidal Marsh. (Benefits for: a. Food web, tidal processes, habitat/ b. Tidal Processes, habitat, d. Habitat benefits for improved estuarine processes and function to support delta smelt, longfin smelt and other Fish Species.)	Attachment 4- FRPA- Proposed Agreement Commitments Table	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Western Cache Slough, Little Holland Tract, Eastern Eggbert Tract- Acres to be determined. Hills Slough Project 207-1100 Acres estimated. (Benefits for these locations: Food web, tidal processes, habitat/ Habitat benefits for improved estuarine processes and function to support delta smelt, longfin smelt and other Fish Species.)	DWR &DFG- DWR Dennis McEwan Lead on Project/ CSC / Katie S.J. -Susiun Marsh Program Lead.
B1. Battle Creek Project Funding: One Time Funding Contribution from FRPA (limited*). DFG Project for Battle Creek- benefits Winter/spring-run, Chinook, spawning/rearing- Open 31.5 miles of spawning/rearing habitat. FRPA Amendment 1, signed on 11/15/10, clarifies that the funds required to go towards the Battle Creek Project, (per FRPA and the NMFS BiOp for salmon Action 1.2.6) will be paid for with a $12 million fixed cost, payable over two consecutive fiscal years.	Attachment 4- FRPA- Proposed Agreement Commitments Table & FRPA Amendment 1	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	DWR will pay the sum in two payments of approximately $6 million each, first to an escrow for the Wildlife Conservation Board (WCB) per direction of DFG during 1/2011, and then to the U.S. Bureau of Reclamation (USBR) after 7/1/2011. The $12 million sum that will go towards the Battle Creek Project will ensure that phase 1A & 2 are fully funded and that the project will be completed, thereby meeting DWR's obligation under NMFS BiOp Action 1.2.6. DWR has received written concurrence from NMFS that the $12 for Battle Creek will satisfy this requirement.	DWR & DFG & USBR : DWR Lead on Project- Stephani Spaar /USBR Lead on Project- Mary Marshall/ Randy Nelson - WCB-DFG Lead on Project Escrow Transfer
B2. Additional Potential Anadromous Actions a. Lower Putah Creek Re-Alignment; b. Lisbon Weir Improvements; c. Tule Canal Connectivity; d. Fremont Weir Fish Passage; e. Yolo Bypass Floodplain Habitat. Benefits include improved juvenille rearing, upstream passgae for adult and anadromous fish and downstream passage for juvenille anadromous fish species.	Attachment 4- FRPA- Proposed Agreement Commitments Table	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Possible Actions: Water Rights Purchases/ Water Exchamge or Bypass Program/ Tributary restoration Actions/ and Fish Passage Improvements.	DWR & DFG- DWR Dennis McEwan / (Marianne Kirkland) DFG- Fred Jurick

Appendix B: Required Actions of the Fish Restoration Program Agreement

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
Section 3a. Creation or restoration of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. Some potential actions and estimated funding to provide this restoration acreage are described in Attachment 4, "Proposed Agreement Commitments and Estimated Costs." Attachment 4 is not a final or binding list of actions and may be modified by DWR and DFG from time to time as additional information is developed.	Section A3. Page 4 FRPA	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Actions will be consistent with the requirements in the BiOps.	DWR &DFG- DWR Dennis McEwan Lead on Project
Section 3b. Implementation of Delta Smelt BiOp RPA Component 4 fish habitat restoration. Prior to committing to a specific project proposal or restoration action, DWR, in cooperation with DFG, shall submit the fish restoration proposal to USFWS to obtain USFWS review and written approval of the project proposal as satisfying the habitat restoration conditions required in the Delta Smelt BiOp.	Section A3. Page 4 FRPA	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Actions will be consistent with the requirements in the BiOps.	DWR &DFG- DWR Dennis McEwan Lead on Project
Section 3c. Implementation of Salmon BiOp RPA fish habitat restoration actions. Prior to committing to a specific project proposal or restoration action for salmon, DWR, in cooperation with DFG, shall submit the fish restoration proposal to NMFS to obtain NMFS review and written approval of the project proposal as satisfying the habitat restoration conditions required in the Salmon BiOp. The restoration actions that satisfy the Delta Smelt BiOp may be accepted by NMFS in satisfying restoration obligations of Salmon BiOp RPA Action I.6.1.	Section A3. Page 4 FRPA	Dates should be consistent with NMFS Salmon BiOp Requrirements.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Actions will be consistent with the requirements in the BiOps.	DWR & DFG- DWR Dennis McEwan / (Marianne Kirkland) DFG- Fred Jurick
Section 3d. d. Implementation of Longfin Smelt habitat restoration actions. The 800 acres of habitat restoration required in Condition 7 in the Longfin Smelt ITP will be satisfied upon DWR satisfying 800 acres of habitat restoration under the Delta Smelt BiOp in the mesohaline zone of the Delta (in Suisun Bay or Marsh) with hydrologic connectivity to open waters. Prior to committing to a specific project proposal or action, DFG and DWR shall agree in writing that the proposed project satisfies Condition 7 of the Longfin Smelt ITP.	Section A3. Page 4 FRPA	Dates should be consistent with Longfin Smelt ITP Requrirements.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	Actions will be consistent with the requirements in the ITP.	DWR &DFG- DWR Dennis McEwan Lead on Project
Implementation Schedule. DFG and DWR shall jointly develop an implementation plan schedule. The Implementation Schedule will identify restoration actions, costs, targeted acreage, and a timeline for DWR's implementation over the term of FRPA.	Section B: Page 5 FRPA		Due October 2011- Within 12 Months from the effective date of signature of FRPA. (October 18, 2010).	DWR-Fish Restoration Program section and DFG Water Branch will complete this task together.	DWR &DFG- DWR Dennis McEwan Lead on Project / DFG Lead - Fred Jurick
Section I Reporting- 1. DWR, in coordination with DFG, shall prepare an annual report on programs and projects being implemented under this Agreement. The report will include financial reporting, the progress of each project towards meeting the intended restoration goals and Implementation Schedule, and the current status, barriers, and relative accrued benefits of those projects.	Section I.: Page 8 FRPA.	December 15, 2019.	Within Ten Years from the effective date of signature of FRPA, on October 18, 2010. (October 18, 2020)	DWR-Fish Restoration Program section and DFG Water Branch will complete this annual reporting together and submit it to NMFS and USFWS (and also provide info to SWC). Annual Reporting: within 1 year from the effective date of this Amendment and every year thereafter.	DWR & DFG- DWR Dennis McEwan / DFG- Fred Jurick

Appendix B: Required Actions of the Fish Restoration Program Agreement

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
Section I. Reporting- 2. At year 5 and 8, and every 5 years subsequently, DWR, in coordination with DFG, will review and jointly prepare a report on the restoration actions implemented under this Agreement using monitoring data from the restoration actions implemented and current scientific understanding for the following purposes: a. To assess the effectiveness of restoration actions undertaken and funding provided in achieving the expected benefits to the fish species covered in the restoration plan; b. To evaluate the effectiveness of the restoration actions to collectively provide the expected benefits in relation to satisfying the obligations under the Delta Smelt BiOp, the Salmon BiOp, and the Longfin Smelt ITP.	Section I.: Page 8 FRPA.	At FRPA year 5 and 8, and every 5 years subsequently.	At FRPA year 5 and 8, and every 5 years subsequently	DWR-Fish Restoration Program section and DFG Water Branch will complete this annual reporting together and submit it to NMFS and USFWS (and also provide info to SWC). Five-year reporting: At year 5 and 8, and every 5 years subsequently.	DWR & DFG- DWR Dennis McEwan / DFG- Fred Jurick
DFG Staff Resources- Estimated Staff necessary to support mitigation activities. 8 PYs Total: 5 PY- Planning and Monitoring 3 PY- restoration habitat management planning & transfer agreements. Facilitate implementation of mitigation actions. Cost Estimate Budgetted- $1 Million/Year Annual SWC Cost.	Attachment 4- FRPA- Proposed Agreement Commitments Table	ASAP	Contract Start Date= July 1, 2011 --Estimated Cost for Ten Years from signature of FRPA (October 18, 2010).	DFG Interagency Contract with DWR fpr FRPA Staffing is being processed and has a start date of July 1, 2011. DFG needs to have an Interagency Contract (in order to "fill" their FRPA positions) between DWR-DFG for this Staff Cost and Task Work.	DWR &DFG- DWR Laura Flournoy Lead on Contract/ Dennis McEwan Program Contact & Invoices Oversight
RPA 4: Habitat Restoration - DWR shall implement a program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. Restoration Actions in the Suisun Marsh shall be based on the the Suisun Marsh Plan that is currently under development. RPA 4 and Attachment B-Action 6: The restoration effort shall begin within 12 Months of the signature of this biological opinion and shall be completed in a ten year period.	Delta Smelt BiOp- 283 and Attachment B Supplemental Information Action 6 page 379	December 15, 2009 – Begin restoration efforts. December 15, 2019 – Complete restoration.	None Specified. Interpretting that because we signed FRPA on October 18, 2010 that we would need to have 8,000 acres to be complete by October 18, 2020. (Ten Years)	Pg. 379 Action 6: The restoration effort shall BEGIN within 12 Months of the signature of this biological opinion and shall be completed in a ten year period. (December 15, 2009 – Begin restoration efforts/ December 15, 2019 – Complete restoration. ? or is it October 18, 2010 Begin/ October 18, 2020 ? Based on date of FRPA Signature)	**January 2009**- BCP Spring Finance Letter (FY 09/10) was approved for FRPA Program positions for DWR. **January 2010**- Prospect Island Aquistion by DWR with an MOU for Prospect between DFG & DWR completed December 29, 2009. (Restoration Actions in Suisun Marsh will be based on the Suisun Marsh Plan.)
RPA 4: Habitat Restoration-- Conservation Recommendations: The Service recommends that Reclamation and DWR develop and implement restoration measures consistent with the current Delta Native Species Recovery Plan.	Page 295-296- Conservation Recommendations Section- Item #1			We will be sure that consistency with other plans, including the Delta Native Species Recovery Plan occurs.	Restoration Actions in Suisun Marsh will be based on the Suisun Marsh Plan.
RPA 4: Habitat Restoration Management Plans - Management plans shall be developed for each restoration site with an endowment or other secure financial assurance and easement in place held by a third-party or DFG and approved by the Service. DWR shall finalize the establishment of the funding for the restoration plan. The applicant shall finalize the establishment of the funding for the restoration plan within 120 days of final approval of the restoration program by the Service.	Delta Smelt BiOp-284 and Attachment B Supplemental Information Action 6 page 379	284-4- Funding Establishment is due 120 days after approval by the Service.(SWP Funds)	284-4- Funding Establishment is due 120 days after approval by the Service.(SWP Funds)	We are interpretting that these Management Plans creation would be Post-Project after restoration. -We are also interpretting that this "within 120 days" part of the statement is confusion between the terms action, site, plan , and program in the text... and that for our purposes it actually applies to each Restoration action- not the entire FRPA Program.	We discussed this action with the Service and to date no clarification has been given, so we are going to go with our interpretation until/if we hear otherwise from the Service.

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
RPA 4: Habitat Restoration Monitoring Program.– An overall monitoring program shall be developed to focus on the effectiveness of the restoration actions and provided to the Service for review within six months of signature of the BiOp. Attachment B- Action 6: Justification- Develop a monitoring program to focus on the effectiveness of the restoration program. The program shall be reviewed and modified as new info becomes available.	Delta Smelt BiOp-284 and Attachment B Supplemental Information Action 6 page 379 and 381 (Justification Section)	5/51/2009		5/15/2009 was unrealistic. FRPA wasn't implemented (signed) unitl October 18, 2010- certiainly cant have a monitoring program, prior to having a program.	
Action I.2.6. Restore Battle Creek for Winter-Run, Spring-Run, and CV Steelhead - To partially compensate for unavoidable adverse effects of project operations by restoring winter-run and spring-run to the Battle Creek watershed. A second population of winter-run would reduce the risk of extinction of the species from lost reslilency and increased vulnerablility to catastrosphic events. DWR shall direct discretionary funds for Phase 1B and Phase 2, consistent with FRPA Amendment 1 *by December 31 of each year. (INCORRECT 12/31 Info).* Reclamation and DWR will submit a written report to NMFS on the status of the project.	Salmon BiOp-page 603		December 2019 - Complete project (This is incorrect).	December 2019 - Complete project (?) This is not correct, NMFS got this wrong- DWR submitted a letter stating such. FRPA lists a $12 million ONE-TIME contribution towards this action once signed. Funds to be given to Battle Creek Project effort through an interagency contract. USBR is the lead for this project, they are the responsible agency for the completion of the project. Compliant with the FRPA Amendment 1- DWR will provide the $12M in a fixed one time cost payment over two consecutive fiscal years. DWR is only required to provide the funding, and is not invloved or responsible for the work on the Battle Creek Project.	DWR is providing two Escrow Payments to WCB in FY 10/11 (1st- $1.608 M/ 2nd- $3.048 M), currently. DWR is working with BOR to provide est. $7.4M (for the remaining portion of the $12M) to the BOR for the Battle Creek Project in the form of an interagency contract with a contributed funds agreement as an exhibit to the contract.
Action I.6.1.In cooperation with CDFG, USFWS, NMFS, and the Corps, Reclamation and DWR shall, to the maximum extent of their authorities (excluding condemnation authority), provide significantly increased acreage of seasonal floodplain rearing habitat, with biologically appropriate durations and magnitudes, from December through April, in the lower Sacramento River basin, on a return rate of approximately one to three years, depending on water year type. Initial performance measure 17,000-20,000 acres of floodplain rearing habitat. Reclamation and DWR (OYBP) shall submit to NMFS a plan to implement the action: - restore juvenile rearing areas that provide seasonal inundation; - increase inundation of publicly and privately owned suitable acreage within Yolo Bypass; - modify operations of the Sac Weir or Fremont Weir; - An initial performance measure shall be 17,000 - 20,000 acres.	Salmon BiOp-page 608-609 (And NMFS "Amended 2009 RPAs" Document)	December 30, 2011 - Plan to implement action due. December 31, 2013 - Restoration of 'significant acreage'. December 31, 2016 - Restoration of more than one half of total acreage identified in performance goal.	DWR will partially fund and provide assistance for this action. Marianne Kirkland is lead and will be responsible for deadlines. The FRPA budget for Action Suite 1.6 Actions is a total of $1.5 M Annually.	Action I.6.1. To restore floodplain rearing habitat for juvenile winter-run, spring-run, and CV steelhead in the lower Sacramento River basin. This objective may be achieved at the Yolo Bypass, and/or through actions in other suitable areas of the lower Sacramento River.	USBR/DWR Project: DES - ESB Marianne Kirkland Lead on Project

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
Action I.6.2. Near-Term Actions at Liberty Island / Lower Cache Slough and Lower Yolo Bypass- By September 30, 2010, Reclamation and/or DWR shall take all necessary steps to ensure that an enhancement plan is completed and implemented for Liberty Island/Lower Cache Slough, as described in Appendix 2-C. - This action shall be monitored for the subsequent five years, at a minimum, to evaluate the use of the area by juvenile salmonids and to measure changes in growth rates. Interim monitoring reports shall be submitted to NMFS annually, by September 30 each year, and a final monitoring report shall be submitted on September 30, 2015, or in the fifth year following implementation of enhancement actions. -NMFS will determine at that time whether modification of the action or additional monitoring is necessary to achieve or confirm the desired results. This action shall be designed to avoid stranding or migration barriers for juvenile salmon.	Salmon BiOp- page 610	September 30, 2010- Complete and implement enhancement plan. Annually by September 30- Interim monitoring report due. September 30, 2015- Final monitoring report due.	DWR will partially fund and provide assistance for this action. FRPA team will be lead on Liberty/Lower Cache Slough projects. Marianne Kirkland is lead on Yolo Bypass projects and will be responsible for those deadlines.	FRPA may provide some funding for the LIberty Island Project needs through the project evaluation process with DFG and other responsible agencies- If agreed upon with DFG.	USBR/DWR- ESB Marianne Kirkland Lead on Projects in Yolo Bypass DES - FISH RESTORATION PROGRAM SECTION- Lead on Liberty /Lower Cache Slough Projects. Due date for this action is unrealistic. DWR is working with DFG to implement plan creation currently. The FRPA implementation strategy will be the enhancement plan for this action. The Appendix 2-C is an incorrect referrence, DWR has told NMFS this and they are supposed to give us clarification on the matter.
Action I.6.3. Lower Putah Creek Enhancements- By December 31, 2015, Reclamation and/or DWR shall develop and implement Lower Putah Creek enhancements as described in Appendix 2-C, including stream realignment and floodplain restoration for fish passage improvement and multi species habitat development on existing public lands. By September 1 of each year, Reclamation and/or DWR shall submit to NMFS a progress report towards the successful implementation of this action. This action shall not result in stranding or migration barriers for juvenile salmon.	Salmon BiOp- page 610	December 31, 2015 - Develop and implement enhancement plan. Annually by September 1 - Progress report due	DWR will partially fund and provide assistance for this action. Marianne Kirkland is lead and will be responsible for deadlines. The FRPA budget for Action Suite 1.6 Actions is a total of $1.5 M Annually.	FRPA may provide some funding for the Project needs through the project evaluation process with DFG and other responsible agencies- If agreed upon with DFG.	USBR/DWR Project: DES - ESB Marianne Kirkland Lead on Project
Action I.6.4. Improvements to Lisbon Weir- By December 31, 2015, Reclamation and/or DWR shall, to the maximum extent of their authorities, assure that improvements to the Lisbon Weir are made that are likely to achieve the fish and wildlife benefits described in Appendix 2-C. Improvements will include modification or replacement of Lisbon Weir, if necessary to achieve the desired benefits for fish. If neither Reclamation nor DWR has authority to make structural or operational modifications to the weir, they shall work with the owners and operators of the weir to make the desired improvements, including providing funding and technical assistance. By September 1 of each year, Reclamation and/or DWR shall submit to NMFS a report on progress toward the successful implementation of this action. Reclamation and DWR must assure that this action does not result in migration barriers or stranding of juvenile salmon.	Salmon BiOp- page 610	December 31, 2015 - Develop and implement enhancement plan. Annually by September 1 - Progress report due	DWR will partially fund and provide assistance for this action. Marianne Kirkland is lead and will be responsible for deadlines. The FRPA budget for Action Suite 1.6 Actions is a total of $1.5 M Annually.	FRPA may provide some funding for the Project needs through the project evaluation process with DFG and other responsible agencies- If agreed upon with DFG.	USBR/DWR Project: DES - ESB Marianne Kirkland Lead on Project

PERMIT REQUIRED FRPA ACTIONS	REFERENCE #	PERMIT DUE	FRPA DUE DATE	COMMENTS	STATUS
Action I.7. Reduce Migratory Delays and Loss of Salmon, Steelhead, and Sturgeon at Fremont Weir and Other Structures in the Yolo Bypass. By December 31, 2011, as part of the plan described in Action I.6.1, Reclamation and/or DWR shall submit a plan to NMFS to provide for high quality, reliable migratory passage for Sacramento Basin adult and juvenile anadromous fishes through the Yolo Bypass. By June 30, 2011, Reclamation and/or DWR shall obtain NMFS concurrence and, to the maximum extent of their authorities, and in cooperation with other agencies and funding sources, begin implementation of the plan, including any physical modifications. By September 30, 2009, Reclamation shall request in writing that the Corps take necessary steps to alter Fremont Weir and/or any other facilities or operations requirements of the Sacramento River Flood Control Project or Yolo Bypass facility in order to provide fish passage and shall offer to enter into a Memorandum of Understanding, interagency agreement, or other similar mechanism, to provide technical assistance and funding for the necessary work. By June 30, 2010, Reclamation shall provide a written report to NMFS on the status of its efforts to complete this action, in cooperation with the Corps, including milestones and timelines to complete passage improvements. Reclamation and/or DWR shall assess the performance of improved passage and flows through the bypass, to include an adult component for salmonids and sturgeon (i.e., at a minimum, acoustic receivers placed at the head and tail of the bypass to detect use by adults).	Salmon BiOp- page 611 (And NMFS "Amended 2009 RPAs" Document)	September 30, 2009 - USBR requests assistance from USACE. June 30, 2010 - USBR status report to NMFS due December 30, 2011 - Develop plan. June 30, 2012 - Begin implementation of plan.	DWR may possibly fund and provide assistance for this action, this has yet to be determined. Marianne Kirkland is lead and will be responsible for deadlines.	Reduce migratory delays and loss of adult and juvenile winter-run, spring-run, CV steelhead and Southern DPS of green sturgeon at Fremont Weir and other structures in the Yolo Bypass.	USBR/DWR Project: DES - ESB Marianne Kirkland Lead on Project
DWR requested a 2081 (Fish and Game Code) Incidental Take Permit (ITP) from DFG for longfin smelt, based partially on the information included in the FRPA as it will be implemented, to also provide benefits to longfin smelt as one of the Fish Species addressed by the FRPA (Note in FRPA context 'Fish Species' = delta smelt, longfin smelt, winter-run and spring-run Salmon).	Longfin Smelt - 2081 Request. Page 21 Section 7.1		DWR and DFG must implement the FRPA in order to comply with the terms of the longfin smelt ITP given to DWR. Need to establish 160 Acres of habitat for Longfin Smelt by February 23,2011 and 160 acres every two	DWR received the Incidental Take Permit for longfin smelt on February 23, 2009, and it expires on December 31, 2018. (ITP Permit # 2081-2009-001-03). Permit Requirements for DFG Incidental Take Permit 2081-2009-001-03 for Longfin Smelt Condition 7.1. Acquisition, initial enhancement, restoration, long-term management and long-term monitoring of 800 acres of inter-tidal and associated sub-tidal wetland habitat in the mesohaline zone of the Delta (in Suisun Bay or Marsh) with hydrologic	We received the ITP from DFG for Longfin Smelt (which is based on the min. 8,000 acres of mitigation in the Delta and Suisun Marsh as laid out in the FRPA).
On July 31at DWR requested a 2080.1 (Fish and Game Code) CESA Consistency Determination from DFG for winter-run and spring-run salmon, which was based on the information included in the NMFS Salmon BiOp, which includes the FRPA actions for winter-run and spring-run salmon.	Winter-Run and Spring-Run Salmon- 2080.1 Request		DWR and DFG must implement the FRPA and comply with the OCAP NMFS Salmon Biological Opinion to meet the terms of this 2081 Consistency Determination.	DWR received the CESA Consistency Determination from DFG for winter-run and spring-run salmon on September 3, 2009. (Section 2080.1 Tracking # 2080-2009-011-00).	We received the CESA C.D. from DFG for Winter-Run and Spring-Run Salmon, (which is based on the NMFS Salmon BiOp and the min. 8,000 acres of mitigation in the Delta and Suisun Marsh as laid out in the FRPA).
DWR requested a 2080.1 (Fish and Game Code) CESA Consistency Determination (C.D.) from DFG for delta smelt (State and Federally Listed), based on the information included in the BiOp RPA 4 (=FRPA).	Delta Smelt- 2080.1 Request		DWR and DFG must implement the FRPA and comply with the OCAP USFWS Delta Smelt Biological Opinion to meet the terms of this 2081 Consistency Determination.	DWR received the CESA Consitency Determination from DFG for delta smelt on July 16, 2009. (Section 2080.1-Tracking # 2080-2009-007-00)	We received the CESA C.D. from DFG for Delta Smelt (which is based on the USFWS Delta Smelt BiOp and the min. 8,000 acres of mitigation in the Delta and Suisun Marsh as laid out in the FRPA).

APPENDIX C. MEMORANDUM OF AGREEMENT REGARDING THE EARLY IMPLEMENTATION OF HABITAT PROJECTS FOR THE CENTRAL VALLEY PROJECT AND STATE WATER PROJECT COORDINATED OPERATIONS AND BAY DELTA CONSERVATION PLAN (BDCP HABITAT CREDIT MOA)

MEMORANDUM OF AGREEMENT
REGARDING
THE EARLY IMPLEMENTATION OF HABITAT PROJECTS
FOR THE CENTRAL VALLEY PROJECT AND STATE WATER PROJECT COORDINATED OPERATIONS and BAY DELTA CONSERVATION PLAN

I. PURPOSE

This Memorandum of Agreement ("MOA") sets forth the agreement of the parties regarding the process of identifying and evaluating Habitat Projects that are intended to contribute to the habitat protection, enhancement, and restoration acreage requirements for operations of the State Water Project ("SWP")under the federal and state Endangered Species Acts and for operations of the Central Valley Project ("CVP") under the federal Endangered Species Act. This process is intended to provide assurance that acquisition and restoration of landsfor such Habitat Projects prior to implementation of the Bay Delta Conservation Plan ("BDCP") will be credited toward meeting the restoration acreage objectives in the BDCP Conservation Strategy.

II. PARTIES

A. This MOA is entered into as of the effective date by and among the California Department of Water Resources("DWR"), the United States Bureau of Reclamation ("Reclamation") the State and Federal Contractors Water Agency ("SFCWA"), collectively "the Water Agencies," and the California Department of Fish and Game ("DFG"), the United States Fish and Wildlife Service("USFWS"), and the National Marine Fisheries Service("NMFS"), collectively "the Fishery Agencies."

B. It is anticipated that individual water agency members of the SFCWA may implement Habitat Projects. In this event, such agencies may become a Water Agency by executing this MOA.

III. DEFINITIONS

A. "Bay Delta Conservation Plan" and "BDCP" mean the joint habitat conservation plan and natural community conservation plan prepared in accordance with the Planning Agreement and to be submitted for approval under Section 10 of the federal Endangered Species Act and section 2820 of the California Fish and Game Code.

B. "BDCP Conservation Strategy" means the actions detailed in the November 18, 2010 draft Chapter 3 of the BDCP, as may be revised in subsequent drafts and a final Chapter 3.

C. "Credit" and "Credits" meanthe acreage and linear mileage contributions of particular HabitatProjects toward meeting the requirements of the Delta Smelt Biological Opinion, the Salmonids Biological Opinion, the Longfin ITP, and the BDCP conservation strategy; in this MOA, use of the verb "to credit" means to recognize and provide Credits.

D. "Delta Smelt Biological Opinion" means the biological opinion issued by USFWS on December 15, 2008 and any subsequent biological opinion issued by USFWS on the CVP and SWPoperations.

E. "Fishery Agency" and "Fishery Agencies" means USFWS, NMFS, and DFG, individually and collectively.

F. "Fishery Agency Strategy Team" or "FAST" means a review team composed of technical level representatives from each Fishery Agency and Reclamation that will work with the Proponent Water Agency to review and assist in planning Habitat Projects and provide guidance to the Water Agency on the expected benefits of proposed Habitat Projects in meeting theRestoration Objectives.

G. "Habitat Projects" means projects that, once developed and implemented, are expected to provide valuable conservation benefits and contribute to the Restoration Objectives of the Longfin ITP and the BDCP Conservation Strategy, and will contribute towards completion of actions included in the Reasonable and Prudent Alternatives for the Delta Smelt Biological Opinion and the Salmonids Biological Opinion.

H. "Longfin ITP" means the Incidental Take Permit issued by DFG on February 23, 2009 for the SWP with respect to longfin smelt, pursuant to Fish and Game Code Section 2081.

I. "Planning Agreement" means the Planning Agreement regarding the Bay Delta Conservation Plan dated October 6, 2006, as amended in 2009, by DWR, Reclamation, USFWS, NMFS, DFG, and several other entities.

J. "Proponent Water Agency" means a Water Agency or other agency that is proposing to implement a particular Habitat Project.

K. "Prospectus" means information on a proposed Habitat Project provided to the Fishery Agency Strategy Team ("FAST") for the purposes of defining the type and amount of Credit the Habitat Project would yield if implemented as planned.

L. "Restoration Objectives" means the acreage and linear mileage objectives and/or requirements for habitat protection, conservation, enhancement, and/or restoration contained in the Delta Smelt Biological Opinion, the Salmonids Biological Opinion, the Longfin ITP, and the BDCP Conservation Strategy or actions regarding habitat restoration included in the Reasonable and Prudent Alternatives for the Delta Smelt Biological Opinion and the Salmonids Biological Opinion.

M. "Salmonids Biological Opinion" means the biological opinion issued by NMFS on June 4, 2009 and any subsequent biological opinion issued by NMFS on the CVP and SWP operations.

N. "Water Agency" and "Water Agencies" means DWR, Reclamation, SFCWA, and a member of SFCWA that has executed this MOU, individually and collectively.

IV. RECITALS

A. Whereas: The USFWS Biological Opinion of December 15, 2008 on the continued long-term coordinated operations of theCVP and SWP with respect to delta smelt ("Delta Smelt Biological Opinion"), the NMFS Biological Opinion of June 4, 2009 on the CVP and SWP operations with respect to salmonid species ("Salmonids Biological Opinion"), and the California Department of Fish and Game ("DFG") Incidental TakePermit of February 23, 2009 for the SWP with respect to longfin smelt ("Longfin ITP"), eachhave requirements for habitat preservation, enhancement, and restoration programs, which the Habitat Projects are anticipated to help fulfill.

B. Whereas: The 2006 Planning Agreement regarding theBDCP states in Section 7.7.1:

> The Parties may elect to preserve, enhance or restore, either by acquisition or other means, aquatic and associated riparian and floodplain habitat in the Planning Area that support native species of fish, wildlife or natural communities prior to approval of the BDCP. The Parties will confer with the Fishery Agencies regarding potential resources to be protected. The Fishery Agencies agree to credit such resources toward the land and water acquisition or habitat protection, enhancement, and restoration requirements of the BDCP, as appropriate, provided these resources are appropriately conserved, restored or enhanced, and managed to contribute to the BDCP's conservation strategy.

C. Whereas: The parties desire to implement Habitat Projects, which will require substantial time, funding, staffing, and other resources. The Water Agencies will contribute resources for Habitat Projects provided that the Water Agencies are authorized to undertake the action, and that there is reasonable certainty that Habitat Projects implemented by the Water Agencies before approval of the BDCP will be creditedtoward the requirements of the Delta Smelt Biological Opinion, the Salmonids Biological Opinion, and the Longfin ITP, as appropriate, and toward applicable BDCP requirements upon approval of the BDCP.

D. Whereas: This MOA reflects the parties' agreement regarding the process by which the parties will work cooperatively to identify Habitat Projects that may result in one or more of the following actions:1)The USFWS will credit Habitat Projects toward the Restoration Objectives of the Delta Smelt Biological Opinion; 2) NMFS will credit Habitat Projects toward the Restoration Objectives of the Salmonids Biological Opinion; 3) DFG will credit Habitat Projects toward the Restoration Objectives of the LongfinITP; and 4) USFWS, NMFS, and DFG agree that the Habitat Projects will contribute to the habitat protection, enhancement, and Restoration Objectives of the BDCP Conservation Strategy.

E. Whereas: Development of BDCP goals and objectives is ongoing, and refinement of conservation measures in response to the final BDCP goals and objectives may further define habitat functions and expected outcomes needed to comply with the terms of the BDCP. Therefore, the parties agree that contribution of an individual HabitatProject toward the BDCP Conservation Strategy may need to be re-evaluated to better identify the expected outcomes of the project for the final BDCP.

V. HABITAT CREDITING PROCESS

A. Overview of the FAST.

1. Upon execution of this MOA, the Fishery Agencies will form the FAST for the purpose of providing review and guidance to the Water Agencies in the planning, development, and implementation of specific Habitat Projects. Upon its formation, the FAST will establish an organizational structure, procedures, and review timelines consistent with this MOA.

2. The FAST shall be composed of at least one technicallevel representativefrom each Fishery Agency and Reclamation, who shall coordinate and organize the participation of additional technical staff from within their respectiveorganization as appropriate. The FAST shall designate one representativeas the primary contact person for coordination with the Water Agencies. As appropriate, the FAST shall also coordinate the participation of other regulatory agencies, such as the U.S. Army Corps of Engineers and the appropriate Regional Water Quality Control Board, with the FAST on a case-by-case basis.

B. Initial Concept Review. At the request of aProponent Water Agency, the FAST shall convene to provide an initial concept review of proposed Habitat Projects. The Water Agency's request for initial concept review will be accompanied with sufficient relevant information on a proposed Habitat Project or Projects to allow the FAST to make an initial assessment on whether the project may be likely to contribute to the Restoration Objectives;an initial assessment on the specific types and amounts of habitatCredits the

Habitat Project is likely to yield; recommendations for adjustments, refinements, or alternatives that should be explored; and recommendations for studies that should be pursued;and identify potential issues with affected local government sponsored Habitat Conservation Plans (HCPs) or Natural Community Conservation Planning (NCCP) programs.The FAST's assessment and recommendations will be provided in writing within a reasonable time.

C. Early Technical Assistance. Following initial concept review for a Habitat Project, the Proponent Water Agency may request early technical assistance of the FAST in the planning and development of the proposed Habitat Project. The FAST will provide such assistance in the form of participation on planning teams, review of technical reports, attendance and guidance at project status meetings, site visits, and other assistance as requested and appropriate, as resources allow.

D. Prospectus Review.

1. At an appropriate time in the development of a specific Habitat Project, the Proponent Water Agency will provide to the FAST a "Prospectus" for the purpose of describing the type and amount of Credit the Proponent Water Agency believes the proposed project would yield. The Prospectus should include:

a. Site Information - Habitat surveys, project designs, and other information, such as environmental planning documents and permitting documentation,evidence of coordination with local government and consistency with locally sponsored HCPs or NCCP programs, if available, relevant to the type and amount of habitat to be created, restored, enhancedand/or preserved;

b. Conservation Strategy - The existing conservation strategy or other framework that identifies regional conservation goals, objectives and criteria and how the project fits within the strategy and/or framework;

c. Site specific Agreement – A proposed agreement to govern the establishment, operation, and management of the proposed Habitat Project;

d. Perpetual Conservation Mechanism – The instrument by which the Proposed Habitat Project site will be protected in perpetuity;

e. Conservation, Restoration and Long-term Management Plan– A proposed long-term management plan that has the primary goal of maintaining the Project habitat for the intended species and natural community conservation objectives; and

f. Funding – Information showing that sufficient funding will be provided to implement the Habitat Project and its long-term management plan.

2. At a mutually acceptable time thereafter, the FASTshall convene a meeting with the Proponent Water Agency to review the prospectus information and determine the type and amount of habitat protection, enhancement and restoration Credit that the Habitat Project would likely yield toward the Restoration Objectives if implemented as planned. The FASTshall make its determination based on the information provided and any other relevant information and in accordance with applicable state and federal law and each Fishery Agencies' written policies and guidelines.If the FAST lacks sufficient information to makeits recommendation, the FAST shall identify and request from the Proponent Water Agency the specific information needed to make its recommendation.

3. The FASTwill prepare and submit to the Fishery Agencies a memorandum describing its recommendation concerning the type and amount of habitat Credit and a proposed Credit release schedule for the Habitat Project under review. For restoration projects pursued as mitigation for a project impact, the documentation memo will refer to Credits as mitigation Credits, except as provided in E.3., below. The Fishery Agencies will review the FAST recommendations and will forward their determination to the Proponent Water Agency. A mechanism will be developed by the FAST to track accumulatedCredits.

E. Habitat Crediting

1. BDCP Crediting - Following approval of the BDCP,Credits that have been determined for restoration projects, as described in D. 3, shall also be applied toward the requirements of the BDCP,where consistent with the BDCP Conservation Strategy and consistent with the Credit release schedule. Such additional Credit shall also be applicable toward requirements of the Section 7 biological opinions prepared by USFWS and NMFS for purposesof the BDCP, and the findings made by DFG in its approval of the BDCP under the Fish and Game Code.

2. Current or Future Biological Opinion Crediting - Based on the determination of the type and amount of habitat Credit made in D.3. above, USFWS is expected to apply the agreed upon types and amounts of habitat Credits of the Habitat Projects toward the requirements of the Delta Smelt Biological Opinion or applicable requirements of any subsequent biological opinion then effective, NMFS is expected to apply the agreed upon habitat Credits of the Habitat Projects toward the requirements of the Salmonids Biological Opinion or applicable requirements of any subsequent biological opinion then effective, and DFG is expected to apply the agreed upon habitat Credits of the

Restoration Projects toward the Longfin ITP or applicable requirements of any subsequent Fish and Game Code 2081Permit for the SWP.

3. Specific Project Mitigation - If, and to the extent that, any HabitatProject is used to mitigate the impacts of specific projects, actions, or activities that are not BDCP covered activities, the project will not count toward the mitigation requirements or conservation objectives of the BDCP.

4. Specific Habitat Projects -For Habitat Projects that are being pursued in whole or in part through FloodSAFE and the CALFED Ecosystem Restoration Program, the Fishery Agencies will consider, on a case-by-case basis, whether theconservation outcomes of specific projects will be applied toward applicable conservation objectives of BDCP upon approval of BDCP, provided thatthe same habitat credit is not attributable to more than one program or project authorized under the federal and state Endangered Species Act (for example, BDCP and a Biological Opinion on a separate levee repair project).

VI. MISCELLANEOUS

A. Relationship to BDCP. The parties anticipate that upon approval of the BDCP, the BDCP Implementing Agreement and other related agreements will provide the mechanism and procedures for the planning, funding, implementation, development, and management of Habitat Projects that implement the BDCP Conservation Strategy. This MOA is not intended to define the procedures for the BDCP and in the event of inconsistencies between this MOA and the subsequent BDCP and related agreements, the BDCP and related agreements shall control.

B. Compliance with Laws. The agency or organization implementing the Habitat Project shall comply with all applicable laws, including, but not limited to, state and federal environmental laws.

C. Preservation of Rights and Authorities. All provisions of this MOA are intended and will be interpreted to be consistent with all applicable provisions of state and federal law. The parties recognize that each party to this MOA has specific statutory and regulatory authority and responsibilities, and that actions of these public agencies must be consistent with applicable procedural and substantive requirements. Nothing in this MOA is intended to, nor will have the effect of, constraining or limiting any public entity in carrying out its statutory responsibilities. Nothing in this MOA constitutes an admission by any party as to the proper interpretation of any provision of law, nor is anything in this MOA intended to, nor will it have the effect of, waiving or limiting any public entity's rights and remedies under any applicable law.

D. Modification. This MOA may be modified upon written agreement of all signatories. Modification may be proposed by one or more signatories. Proposals for modification will be circulated to all signatories for a 20-working day period of review. Approval of such proposals will be indicated by written acceptance by each signatory, which may be executed in counterparts.

E. Party Withdrawal. Any party may withdraw from participation in this MOA upon written notice to the other parties. The MOA shall remain in effect as to the remaining parties, provided the purpose of the MOA is not frustrated by the withdrawal of the particular party.

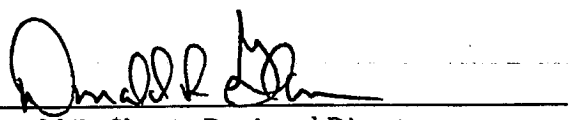
F. Term of the MOA. This MOA shall become effective on the last date of execution by DFG, DWR, NMFS, Reclamation, USFWS, and SFCWA, and will remain in effect until terminated by mutual agreement of the parties.

G. Funding. Nothing in this MOA may be construed to obligate Reclamation, USFWS, NMFS, or the United States to any current or future expenditure of resources in advance of the availability of appropriations from Congress. No liability shall accrue to the United States for failure to perform any obligation under this MOA in the event that funds are not appropriated or allotted. This MOA does not commit any party to funding of Habitat Projects or actions described in this MOA, including any funding that may be necessary for a party to carry out provisions of this MOA. Funding for a party's participation in actions to implement the process described by the MOA shall be borne by that party.

H. Execution in Counterparts. This MOA may be executed in counterparts.

IN WITNESS WHEREOF, the parties hereto executed this MOA on the date(s) indicated below.

United States Bureau of Reclamation

By: 

Donald R. Glaser, Regional Director

Date: 9/15/11

United States ~~Fish and~~ Wildlife Service

By: _____
Ren Lohoefener
Regional Director, Pacific Southwest Region

Date: 9/30/2011

National Marine Fisheries Service

By: _____
Rodney R. McInnis
Regional Administrator, Southwest Region

Date: _____

Department of Fish and Game

By: _____
~~John McCamman~~, Director
CHUCK BONHAM)

Date: _____

Department of Water Resources

By: _____
Mark W. Cowin, Director

Date: _____

State and Federal Contractors Water Agency

By: _____
Byron Buck, Executive Director

Date: _____

United States Fish and Wildlife Service

By: _____
Ren Lohoefener
Regional Director, Pacific Southwest Region

Date: _____

National Marine Fisheries Service

By: Rodney R McInnis
Rodney R. McInnis
Regional Administrator, Southwest Region

Date: 9-20-11

Department of Fish and Game

By: _____
~~John McCamman~~, Director
Chuck Bonham,

Date: _____

Department of Water Resources

By: _____
Mark W. Cowin, Director

Date: 9/16/2011

State and Federal Contractors Water Agency

By: _____
Byron Buck, Executive Director

Date: _____

United States Fish and Wildlife Service

By: _____
Ren Lohoefener
Regional Director, Pacific Southwest Region

Date: _____

National Marine Fisheries Service

By: _____
Rodney R. McInnis
Regional Administrator, Southwest Region

Date: _____

Department of Fish and Game

By: _____
~~John McCamman~~, Director
Chuck Bonham,

Date: _____

Department of Water Resources

By: _____
Mark W. Cowin, Director

Date: 9/6/2011

State and Federal Contractors Water Agency

By: _____
Byron Buck, Executive Director

Date: _____

United States Fish and Wildlife Service

By: _____
Ren Lohoefener
Regional Director, Pacific Southwest Region

Date: _____

National Marine Fisheries Service

By: _____
Rodney R. McInnis
Regional Administrator, Southwest Region

Date: _____

Department of Fish and Game

By: _____
Charlton H. Bonham, Director

Date: 9.14.11

Department of Water Resources

By: _____
Mark W. Cowin, Director

Date: _____

State and Federal Contractors Water Agency

By: _____
Byron Buck, Executive Director

Date: _____

United States Fish and Wildlife Service

By: _____
Ren Lohoefener
Regional Director, Pacific Southwest Region

Date: _____

National Marine Fisheries Service

By: _____
Rodney R. McInnis
Regional Administrator, Southwest Region

Date: _____

Department of Fish and Game

By: _____
~~John McCamman~~, Director
CHUCK BONHAM

Date: _____

Department of Water Resources

By: _____
Mark W. Cowin, Director

Date: _____

State and Federal Contractors Water Agency

By: _____
~~B~~yron Buck, Executive Director

Date: 9/13/11

APPENDIX D. WATER RESOURCES ENGINEERING MEMORANDUM (WREM 65) AND SWPAO PROJECT CHARTER

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES

WATER RESOURCES ENGINEERING MEMORANDUM NO. 65a

TO: SWP Program Managers DATE: October 4, 2011

FROM: Carl A. Torgersen
Acting Deputy Director

SUBJECT: State Water Project Program Initiation and Management

This memorandum supersedes Water Resources Engineering Memorandum No. 65, dated March 20, 2006.

PURPOSE

This memorandum sets forth standardized documentation and processes to initiate, authorize, administer, and manage new and legacy programs, projects, and activities funded by the State Water Project (SWP) in a consistent and professional manner.

The processes ensure that upper management has the information necessary to make an informed decision as to whether work should commence, continue, or end. In addition, the processes dovetail into the SWP budget process.

DISCUSSION

The Department of Water Resources (DWR) is responsible for ensuring the reliability of SWP deliveries to its 29 contracting agencies. Doing so requires capital improvements, facilities enlargements, replacements, renovations, and continuous maintenance. The three processes described below will be used to authorize all SWP-funded projects.

Detailed procedures have been developed to support the processes and are available at http://aquanet.water.ca.gov/swpao/swp-pim.

Process	Types of SWP-Related Projects
No. 1	1. Extraordinary projects within existing SWP programs. 2. Major replacement and renovation projects within existing SWP programs. 3. Capitalized projects within existing SWP programs.
No. 2	1. Major additions to or enlargements of SWP facilities, outside the scope of existing SWP programs. 2. Other proposed projects that include SWP funding, outside the scope of existing SWP programs.
No. 3	Emergency projects

DOCUMENTATION

The documentation required to initiate and authorize a SWP-funded project are a trigger, charter, resources agreement, and project management plan (depending on complexity of the project). The documentation required to initiate and authorize a SWP-funded program are a trigger, charter, program component statement, and a program management plan (depending on complexity of the program).

DEFINITIONS

Trigger: A documented request or legislative/regulatory mandate to initiate SWP-related work under the direction of DWR personnel. The trigger document should include a specific description of the work to be performed, the time constraints, and the fund source to use upon the approval of the request.

Charter: A standardized document that describes a proposed activity at a high level but in sufficient detail that a management decision can be made whether to initiate preliminary work on the activity. A charter includes a program/project objective, purpose, background, scope, critical success factors, assumptions and constraints, risks, dependencies, deliverables, milestones, team members, funding, and financing information. It is the responsibility of the program manager to ensure the charter is kept up to date during the life of the project.

Resources Agreement: This document serves as an agreement between the program manager and the cost center manager(s) doing the work. It includes a scope of work, target dates, a list of participants and cost objects to be used to charge work as well as prior, current and future year(s) dollars and hours. The document also identifies the project and program managers who are assigned to the activity. This document replaces the 1498, 1498a, and project detail.

Project Management Plan (PMP): A standardized document which provides a scope of work, schedule, and cost estimate. It discusses quality management, staffing requirements, communications management, risk management, and procurement management. It also identifies the Project Manager; specifies reporting relationships and the participant roles and responsibilities; sources of funding and the SAP cost objects; Funds Centers to which all project costs are allocated; the business and fiscal process requirements to set up the administration of the project; and the monitoring, change control and reporting policies, and procedures. The PMP shall also include the project's status amongst current SWP priorities, and an assessment of potential impacts to DWR's planned programs resulting from the project's implementation or failure to be implemented.

The Program Manager has the discretion to require a PMP that utilizes the *project* and *job* level breakdown. The PMP is a dynamic document maintained by the Project Manager throughout the life of the project. Upon the completion of each project, the PMP shall include a critique in the PMP that summarizes project successes and recommendations for improvements.

Program Management Plan (PGMP): May be used when there are two or more interdependent projects under the same program that require coordination or share the same resources (i.e., budget, staff). The contents of the PGMP may be similar to a project management plan but with a broader program focus. It is a living document that may be amended over the life of the program by the Program Manager. The Program Manager has the discretion to develop a PGMP when needed.

Program Component Statement (PCS): The authorizing document for funding a program and the key monitoring and control document. It is a dynamic document to be maintained by the Program Manager throughout the life of the program. It includes a description of the program component with any authorizing or enacting legislation, a resources section showing specific funding sources (i.e. O&M bond fund, capital revenue bond financing, etc.) for the estimated, budgeted and proposed years, an explanation of any changes between the budget and proposed year, a section to list full time employees (FTEs) and dollars for participation of cost center partners and descriptions of work programs for the budgeted and proposed years.

Program: A portfolio of *projects* or *business activities* that generally benefit from a consolidated approach to achieve a set of defined business objectives. The life of a program may be quite extended; however, it is characterized by the completion of the projects or the business activities under its responsibility.

A typical SWP improvement program may consist of one or more staged projects, or, one or more projects having a unique business objective. The planning, design, and construction of a new or modified facility would typically be regarded as stages or phases within a project; although, depending on the magnitude, complexity, and/or the organizational makeup of the program, consideration may be given to separating the planning, design, and construction activities into individual projects. The Program Manager has the discretion to recommend a management structure that provides the most efficient means to monitor and control the program activities.

Program Manager: The person managing the portfolio of projects or business activities within a program and is responsible for the planning, organizing, leading, and controlling the work. The Program Manager may also be the Project Manager for one or more projects within the same program.

Project: The carefully planned and organized set of jobs to accomplish a specific, one time effort. Projects have a specific scope, schedule, budget, and defined end product.

Project Coordinator: The person designated at the Program Manager's discretion, to coordinate with the Project Manager. This role is typically used when the Project Manager resides outside the Program Manager's division/office.

Participant Coordinator: The person designated as the point of contact for coordinating work assigned to the cost center(s) within their division/office. This role is used when the participant division/office cost center(s) reside outside of the Project Manager's division/office.

Project Manager: The person is the focal point for the project and responsible for creating an environment in which the project team can be successful. This includes but is not limited to planning, organizing, leading, controlling, and reporting progress, schedule and costs, and ensuring that activities are in compliance with all environmental, regulatory, and code requirements, and that the job 'deliverables' are in accordance with the project scope. They are responsible for developing and implementing the *Project Management Plan,* when required. The Project Manager is under the authority and direction of the Program Manager.

Job: The lowest quantifiable level of work that has a specific scope, schedule, budget, and defined end product(s).

Job Manager: The person responsible for delivering the end product(s) within the planned schedule and budget. The Job Manager is under the authority and direction of the Project Manager.

Capitalized Projects: Projects that qualify for capitalized funding as defined in the most current version of Accounting Systems Bulletin No. 83, "Guidelines for Classifying and Financing Costs Chargeable to the State Water Project."

Extraordinary Projects: Projects which do not qualify for capitalizing or funding from the Working Capital Replacement Fund and which are beyond the scope of normal maintenance activities under the Facilities O&M program components.

Replacement and Renovation Projects: Projects which are accomplished with annualized funds from the Replacement Fund and are specifically listed on the Replacement Accounting System Master Replacement List.

Business Activities: The work performed in an ongoing or a continuous basis to support the business objectives defined by the program. The Program Manager is responsible for developing a plan to fund the projects in the program and budget and schedule resources, and monitor performance of the business activities or program management plan.

IMPLEMENTATION

This policy will be implemented immediately.

Signature on file with MAO

Carl A. Torgersen
Acting Deputy Director

SWP PROJECT CHARTER

(Enter Project Title)

Version _____

ID: _____ - _____ - _____ - _____ - _____

1.1 Management Structure & Approval:

PROJECT MANAGER:	SIGNATURE	DATE
PROGRAM MANAGER:	SIGNATURE	DATE
PROGRAM CONTROL OFFICE:	SIGNATURE	DATE
STATE WATER PROJECT ANALYSIS OFFICE:	SIGNATURE	DATE
DIVISION CHIEF:	SIGNATURE	DATE
SWP DEPUTY DIRECTOR:	SIGNATURE	DATE
OTHER DWR EXECUTIVE:	SIGNATURE	DATE

In addition to a Resource Agreement, is a Project Management Plan Required? ☐ Yes ☐ No

1.2 Revision Summary:

1.3 Project Objective Statement:

1.4 Project Purpose and Background:

1.5 Project Scope:

1.6 Critical Success Factors:

1.6.1 Assumptions and Constraints:

1.6.2 Risks:

1.6.3 Dependencies:

1.7 Project Deliverables:

1.8 Milestone Schedule ID: _____ - _____ - _____ - _____ - _____

Milestone	Planned	Actual

1.9 Project Participants: [i.e., Branch Level, Job Manager]

Participating Organizations	Role

1.10 Project Financing:

Funding Source(s)	Fund Description	Total Dollars
State Water Project		
Federal		
G.O. Bond/State General Fund		
Other:		
Total Estimated Project Cost		**$0**

1.11 SWP Funding Information:

	Description	Number
Functional Area		
Funds Center		
Fund		
Reach/Feature		
Recreation Component? ☐ Yes ☐ No ☐ Joint ☐ Specific ☐ None		

APPENDIX E. PERMITS LIKELY TO BE REQUIRED FOR NEAR TERM ACTIONS

APPENDIX E: Permits Likely to be Required for Near Term Actions

(The list below is not all-inclusive. Other permits not listed may be required.)

Streambed Alteration Agreement (DFG)
Endangered Species Act Take (NMFS)
Endangered Species Act Take (USFWS)
California Endangered Species Act Take (DFG)
Section 404 (USACE)
Section 408 (USACE)
Section 401 (USACE/CVRWQCB)
Central Valley Flood Protection Board Encroachment (CVFPB)
State Lands Commission Lease (SLC)
Cultural Resources Certification (SHPO)
Scientific Collecting Permit (DFG)
Applicable County permits

APPENDIX F. DESCRIPTION OF NEAR TERM ACTIONS

APPENDIX F: Description of Near Term Actions

Prospect Island Tidal Habitat Restoration

Project Location. Prospect Island is the most easterly feature of the Cache Slough Complex. The island is bounded by the Sacramento River Deep Water Ship Channel to the west, the remnants of Little Holland Tract to the north, Miner Slough to the east, and the confluence of the Ship Channel and Miner Slough to the south. Total acreage of the island is 1684 acres.
Project Components. The Prospect Island Tidal Marsh Restoration project entails permanently breaching the levees on Prospect Island to restore up to 1320 acres of open water, tidal marsh, mudflats, and shaded riverine aquatic habitat. This would provide spawning and rearing habitat for delta smelt and Sacramento splittail, and rearing and migration habitat for winter-run Chinook salmon. Upland areas in the northern part of the island would accommodate new marsh formation when sea levels rise.

This island offers a unique opportunity for restoration due to minimal subsidence, which has left elevations in the island interior ranging from +1 to –5 feet msl. Therefore, when flooded, water depths would be suitable for supporting tidal wetlands including marsh, mudflats, and shallow water habitats. These habitats are relatively rare in the Delta, and the opportunities for restoring them are limited.

The Cache Slough area, in which Prospect Island is located, has become an important focus for restoration activities in the north Delta to increase and improve the overall habitat for delta smelt. This area has the highest feasibility of tidal marsh restoration in all of the Delta due to the least subsidence, proximity to the highest Delta sediment supply, connection to extensive lowland grasslands, and proximity to Yolo Bypass, the Sacramento River, and the Suisun Marsh. Because the most prevalent population of delta smelt occurs in this region of the Delta, monitoring of species and system response to the project is necessary to manage changes.

Liberty Island/Lower Cache Slough Enhancement Plan

Project Location. Liberty Island lies within the Yolo Bypass and is part of the Cache Slough Complex. It spans Yolo and Solano Counties and covers approximately 5200 acres, the majority of which are under water. The island is bounded by sloughs and remnant perimeter levees: Shag Slough on the west, a “stair step” channel that separates it from mainland Yolo Bypass to the north, Liberty Cut and Prospect Slough to the east, and Cache Slough to the south.

Project Components. The Liberty Island/Lower Cache Slough enhancement plan will detail actions to preserve and enhance habitat, and will establish a monitoring plan to evaluate the use of the area by juvenile salmonids.

Liberty Island is ideal for tidal wetland enhancement due to the minimal subsidence that has occurred on the island, with typical interior island elevations ranging from 5 feet in the north to -10 feet or deeper in the south. The entire island is ringed with deteriorated levees that have

numerous breaches. Within the ten years that the island has been flooded, over 800 acres of freshwater tidal marsh have developed, without any human intervention, management, or funding. Enhancement options might range from making more numerous breaches and allowing subsequent floods and tidal action to bring about the development of slough and island features, to giving tidal marsh channels a head start by excavating starter channels. Naturally forming or created meandering sloughs could improve habitat quality, improve native fish access, and help prevent stranding. Filling agricultural delivery and drainage ditches and leveling the existing road bisecting the property are also possible actions.

Little Holland Tract

Project Location. Little Holland Tract is in the southern portion of the Yolo Bypass, bounded by the Stairstep Channel on the north, Liberty Island on the west and the Deep Water Ship Channel on the East. Consisting of approximately 1640 acres, it is currently owned by the United States Army Corps of Engineers.

Project Components. The levee separating Little Holland Tract from the Toe Drain in the Yolo Bypass failed in 1983 and the tract has been open to tidal influence since that time. Little Holland Tract has reverted to a mixture of tidally influenced emergent wetlands, mudflats, and riparian habitat. The southern half of the tract, which is lower in elevation than the northern half, is almost always under water. Similar to Liberty Island, Little Holland Tract has undergone remarkable restoration since its levee failure to the exclusive credit of natural processes. Nevertheless, the opportunity exists to restore or enhance historic wetlands on Little Holland Tract, bring it under more protective ownership, and create a monitoring and land management plan.

Lindsey Slough Freshwater Tidal Marsh Enhancement

Project Location. This project is located in the Calhoun Cut Ecological Reserve, on the northwest edge of the Delta, just to the west of the confluence of Lindsey Slough, Barker Slough, and Calhoun Cut within the Cache Slough tidal drainage. The property is owned by California Department of Fish and Game.

Project Components. Calhoun Cut, constructed in 1913, is a 13-foot deep shipping channel in Lindsey Slough. Calhoun Cut effectively cut-off tidal flow into two historical channels of Lindsay Slough, which is in DFG's Calhoun Cut Ecological Reserve. The project construct breaches in the north and south embankments, breach a causeway and excavate a starter channel to restore tidal flows into the historical Lindsey Slough channels. The purpose of this project is to benefit native species and improve water quality by restoring connected freshwater tidal marsh and riparian communities, along with other significant wetland habitat. Performance objectives will be monitored to ensure the project minimizes impacts on surrounding land uses. If flow objectives in the historic Lindsey Slough are not met, the project will pursue a blockage in Calhoun Cut.

Lower Yolo Restoration Project

Project Location. The Lower Yolo Restoration Project is located on the northwestern edge of the Delta at the southern end of the Yolo Bypass near Cache Slough in Yolo County. The site encompasses two contiguous parcels: Yolo Ranch (3496 acres) and Yolo Flyway 16 Farms (430 acres) located along the historic wetland-upland edge of the Yolo Basin.

Project Components. This action entails breaching levees along the Stairstep Channelto return tidal action to approximately one half of the 3,400 acre Yolo Ranch to restore tidal marsh-open water habitat and upland and riparian habitats. Yolo Ranch was acquired by Westlands Water District 2007 with the intention of creating tidal marsh and open water to benefit delta smelt and the delta food web. This area is currently being used for farming and grazing.

The primary goals of the project are to enhance regional food web productivity in support of delta smelt recovery and to provide rearing habitats for outmigrating salmonids utilizing the Yolo Bypass. The secondary goals are to support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail, and to restore ecosystem functions of the Delta freshwater tidal marsh/ floodplain/lowland grassland interfaces.

Hill Slough Tidal Marsh Restoration

Project Location. The Hill Slough Restoration Project site is approximately 950 acres located within the DFG Hill Slough Wildlife Management Area, just outside of Suisun City limits in Solano County, California. The site is bounded by State Route 12 and a tidal moat to the north, a maintained tidal channel (Whispering Bay) and Suisun Slough to the west, Hill Slough to the south, and McCoy Creek to the east. (DFG 2011b).

Project Components. The Hill Slough Restoration Project will restore tidal wetlands and moist grassland habitat to approximately 200-1100 acres of diked seasonal and perennial wetlands in northern Suisun Marsh (CDFG 2005). Restoration will re-introduce tidal action to the site, restoring a transition of perennial aquatic habitat in the deepest areas, low intertidal marsh, high intertidal marsh, and lowland alluvial habitat. The restored habitat will provide rearing and productivity for delta smelt and Sacramento splittail, and rearing habitat for Chinook salmon. The desired outcome is a self-sustaining marsh ecosystem created through restoration of natural hydraulic and sedimentation processes and reliance on natural abiotic and biotic successional processes.

The project site is a former tidal brackish marsh and lowland alluvial habitat along the northern edge of Suisun Marsh that currently supports nontidal, seasonally ponded and perennial wetlands, and non-native grasslands. The restoration site is currently diked and drained.

The Hill Slough Restoration Project will restore a mosaic of wetland types including seasonal wetlands, tidal marsh, and subtidal and open water habitat. The purpose of the project is to restore natural hydrologic processes within a significant portion of the project area, thereby

promoting restoration of ecological processes and functions, which will aid in the recovery of listed plant and wildlife species while contributing to primary productivity in the estuary.

Meins Landing

Project Location. Meins Landing is in eastern Suisun Marsh adjacent to the Montezuma Slough.

Project Components. The long-term restoration goal of the project is to develop a multi-species habitat enhancement project, which will provide habitat for marsh-dependent sensitive plant and animal species, including the endangered salt marsh harvest mouse. The property is currently operated as a duck club and managed wetland.

Rush Ranch

Project Location. Rush Ranch Open Space Preserve (2070 acres) located along the northern edge of the Suisun Marsh. The restoration project would focus on a 70 acre diked marsh situated in the northwest corner of Rush Ranch.

Project Components. Since the 1990's, the diked marsh has fallen into disrepair and is now subsided and overgrown with emergent vegetation. Restoration efforts would likely breach the levee to return the marsh to daily tidal inundation and restore natural patterns of sedimentation, marsh plain and channel evolution. Restoration of this area would allow a fully connected transitional zone and connect existing tidal marsh to the north and south.

Overlook Club

Project Location. DWR is currently evaluating the acquisition and restoration of Overlook Club in Suisun Marsh (Property 322). This property, located in Northeastern Suisun Marsh within the Nurse/Denverton Slough Complex, is currently privately owned and managed as diked wetlands for waterfowl. Adjacent habitat includes upland ecotone, broad fringing tidal marshes, and shallow open waters in Little Honker Bay. Relatively high native fish abundance in this region has been documented, and may be related to structural habitat diversity and enhanced primary, and secondary productivity associated with existing tidal marsh and shallow open water habitat.

A wetland restoration feasibility assessment for Overlook Club is in progress, and indicates that tidal marsh restoration at this site would provide benefits to listed native fish species as called for in both the Anadromous Fish and Delta Smelt biological opinions and Longfin smelt Incidental Take Permit.

Project Components. This site is particularly well suited for restoration to tidal marsh, as it includes 160 acres of diked wetlands that are minimally subsided, and remnant tidal channels are intact. Restoration will require minimal landscape modification and has the potential for establishing broad tidal connectivity with the shallow open waters of Little Honker Bay.

Yolo Bypass Conservation Actions

Project Location. These projects will be undertaken in the Yolo Bypass, a 58,000-acre area historical floodplain west of the Sacramento River. The Yolo Bypass extends from Cache Creek and the Fremont Weir at its northern/upstream end to the Cache Slough Complex at its southern/downstream end.

Project Components. The CALFED ERP Implementing Agency Managers and DWR, in consultation with the Yolo Bypass Interagency Working Group, made recommendations for aquatic restoration activities within the Yolo Bypass (CDFG et al. 2007). Five potential restoration opportunities were identified that will improve conditions for native fish species and enhance populations and recovery efforts. This 5-step sequential restoration plan includes:

1. Lower Putah Creek Re-Alignment
2. Lisbon Weir Improvements
3. Additional Multi-species Floodplain Habitat Development
4. Tule Canal Conductivity
5. Fremont Weir Fish Passage

These activities were incorporated into the National Marine Fisheries Service's 2009 anadromous fish biological opinion (NMFS Biological Opinion).

The first step would be to evaluate and develop a plan for the realignment and restoration of lower Putah Creek. This realignment has the potential of creating 130 to 300 acres of shallow water habitat that would help to improve salmonid immigration and emigration to and from Putah Creek, and increase and enhance aquatic and other habitat for other native species. Lisbon Weir restoration would include modification and replacement of the weir to provide better fisheries management opportunities in Putah Creek and the Toe Drain, while improving reliability and reducing maintenance. Expansion of existing shallow water multi-species habitat is proposed to take place through excavation of a low shelf along the Toe Drain and creating small-scale set-back levees. Tule Canal connectivity restoration includes areas between Fremont Weir, the Fremont Weir scour ponds, and the Toe Drain to help reduce stranding of adult and juvenile fish. In addition, other barriers (road crossings, agricultural impoundments) will be identified and evaluated to reduce the impact on habitat connectivity, immigration, and emigration of fish species that use the Yolo Bypass. Lastly, evaluating the feasibility and appropriateness of providing fish passage improvements in and along the Fremont Weir will take place.

In addition to the above, the NMFS Biological Opinion requires a significant increase in acreage of seasonal floodplain rearing habitat in the Bypass. This would likely be accomplished by modifying Fremont and or Sacramento weirs to allow more frequent flooding of the Bypass.

These actions would provide the following benefits:

1. Increase inundation frequency.
2. Improve quality and availability of juvenile salmonid rearing and migration habitat.
3. Improve quality and availability of splittail spawning and rearing habitat.
4. Improve primary production exports to the lower Sacramento River and Delta.
5. Provide for improved salmon and splittail access to Putah Creek.
6. Improve fish passage at Fremont weir.
7. Improve migratory and resident bird habitats.

Battle Creek Salmon and Steelhead Restoration Project

Project Location. The Battle Creek Salmon and Steelhead Restoration project is located in Shasta and Tehama Counties near the town of Manton, California. The upper project limit on North Fork Battle Creek is the natural fish barrier above North Battle Creek Feeder Diversion Dam. The upper project limit on South Fork Battle Creek is the natural fish barrier above South Diversion Dam. The lower project limit is 9 miles upstream of the confluence of Battle Creek and the Sacramento River at a location just below the confluence of Coleman Powerhouse tailrace channel and the mainstem of Battle Creek. Restoration efforts would occur at the hydroelectric project sites along North Fork and South Fork Battle Creek and their tributaries.

Project Components. The purpose of the Battle Creek Salmon and Steelhead Restoration project is to restore approximately 42 miles of habitat in Battle Creek and an additional 6 miles of habitat in its tributaries while minimizing the loss of clean and renewable energy produced by the Battle Creek Hydroelectric Project (Jones & Stokes Associates 2005). The restoration project includes the installation of fish screens and ladders at three diversion dams, the removal of five other diversion dams, and an increase in streamflows by reducing diversions. Habitat restoration would enable safe passage for naturally produced salmonids, including winter-run and spring-run Chinook and Central Valley steelhead, and would facilitate their recovery in the Sacramento River and its tributaries.

APPENDIX G. ANNUAL REPORT TEMPLATE

APPENDIX G: Annual Report Template

DWR's FRPA Annual Report Template

PROJECT NAME:					**Report #**		
Organization:					***Report Date:***		
Address line 1:		***Contact:***			***Reporting Period:***		
Address line 2:			***Email:***			***Phone:***	
City:		***State:***		***Zip:***		***Fax:***	

Summary of Work Completed To Date *(See sample table below)*

Work Items for Review: *The table should number and list all items included for review, as they are included in the Biological Opinions, ITP, or FRPA. The information provided should be cumulative from the start of the project. The table should provide an at-a-glance status of the project work items.*

Due Date: *Annual Report due date.*

%Of Work Complete: *Cumulative percentage of work complete to date. Include the progress of each action towards meeting the intended restoration goals and implementation schedule.*

Date Submitted: *For items for review that are submitted more than once (i.e., progress reports), please leave previous submittal dates on the table so that there is a list of dates within the box. If a draft item for review is submitted, write "draft" after the date.*

Task Title	Deliverable	Due Date	% Of Work Complete	Date Submitted
i.e. I.a. Work with DWR and Fishery Agencies to identify critical fisheries information gaps and special investigation needs. Work with DWR to design and conduct studies.	i.e. Work with DWR as needed to develop a list of critical information gaps and approaches to conducting relevant studies and investigations. Conduct investigations as needed.	(mm/dd/yy)	(__%)	(mm/dd/yy)
i.e. 1.2.6. Battle Creek funds	i.e. Provided $6M contribution to DFG WCB Escrow account	June 2010	50%	June 30, 2010

List of Items for Review

(Include only the items for review, by sub-item number, listed on the Table of Items for Review in Exhibit A)

- ____
- ____

Progress Report Narrative

Introduction

(Provide a brief one or two sentence introduction or summary of the report (e.g., "During the reporting period, project activities focused on completing…," etc.)

Summary of Activities

(List each sub-item from the Table of Items for Review in every progress report. However, limit narrative descriptions to work performed during the reporting period. Provide, by sub-item number, a brief description of milestones, current status, constraints, and relative accrued benefits of each project during the reporting period.

Item 1 - Project Administration (Cumulative ___% complete)

(Describe at sub-item level activities, problems, successes, milestones OR "No work performed this period" OR "Complete")

Item 2 - _____ (Cumulative ___% complete**)**

(Describe at sub-item level activities, problems, successes, milestones OR "No work performed this period" OR "Complete")

(Continue with all items for review)

APPENDIX H. CONFLICT RESOLUTION FORM

Appendix H. Fish Restoration Program Agreement Issue-Resolution Form

General:

				Date:	Today
				Revision:	A
Title:	Insert title			Unique ID:	TBD
Type:	Environmental	Status:	Under Review	Date Resolved:	1/1/11 A
Area:	Programmatic (FRPA)	Location:	Custom		
Impact:	Scope: Low	Schedule:	High	Cost:	None

Resolution Status:		Received:	Completed:	Action Requested / Taken:
Currently With:	Coord. & Mgmt Team	Date	Date	Approve
Created by:	Me		Date	Draft Routed for Comment
Working-level Team		Date	Date	Prepare Recommendation
Coordination & Management Team		Date	Date	Concur
Policy Team		Date	Date	Approve
Sponsor		Date	Date	No Action Required

Description:

Define the problem

Impact:

Describe what is likely to happen if this issue is not resolved

Appendix H. Fish Restoration Program Agreement Issue-Resolution Form

Recommended Action:
Desired outcome

Working Resolution:	**Date Adopted:**
This will be used in the interim - until a final resolution is approved. A working resolution needs concurrence before using it as the basis to move the project forward.	

Final Resolution:	**Date Adopted for Use:**
The approved direction. If different from the working resolution, the team will have to confirm the project to match the final resolution.	

DRAFT – NOT FOR DISTRIBUTION – FOR DISCUSSION PURPOSES ONLY 2008 FWS BiOp Delta Smelt Crediting Decision Model

Please confer with the FAST and refer to the *2008 FWS BiOp Delta Smelt Crediting Decision Model Guidelines* when determining project scores.

Where is the project located?

Choose one location. Identify appropriate location value. Maximum possible one point in this category with the option to get up to two points if the project is occurring in a priority area for delta smelt (i.e. Suisun Marsh, Cache Slough Complex, or West Delta). Place location value in box 1.

Suisun Marsh	Cache Slough Complex	West Delta	North Delta	Central Delta	East Delta	South Delta	Yolo Bypass
2 –Within the central and eastern portions of Suisun **1** – Along the western portion of Suisun	**2** –Within the Cache Slough Complex boundary	**2** – Along the corridor from Suisun Marsh to Cache Slough Complex **1** – Waterways feeding into the corridor between Suisun Marsh and Cache Slough Complex	**1** –Locations closer to the arc connecting Cache Slough Complex, the confluence, and Suisun Marsh **0.5** – Areas further away from the confluence.	**1** – In close proximity to the arc between Cache Slough Complex, the confluence, and Suisun Marsh **0.5** – Areas further away from the arc.	**0.5** – Within the East Delta boundary	**No** credits	**No** credits

1. ☐

What are the benefits to delta smelt?

All benefit categories are additive and will be used when considering the overall score. Identify appropriate value. Maximum possible four points. Place values in their corresponding boxes (2-4).

Improved Rearing Habitat	Improved Spawning Habitat	Food Web Support
2 – Provides high order marsh adjacent channels; energetic; turbid cool low salinity water over a diverse landscape for capturing prey and decreased predation; accessible to delta smelt for direct use. **1** – Increased the overall available rearing habitat; moderately accessible to delta smelt for direct use. **0** – No improved or protected rearing. **Enter value in box 2.**	**1** – Sandy beaches with appropriate water velocities and depths to maintain the habitat and is accessible to delta smelt for direct use. Must have appropriate water quality conditions for delta smelt. **0** – No spawning habitat improved or protected. **Enter value in box 3.**	**1** –Supports local aquatic food web production. **0** – No enhanced food web benefits. **Enter value in box 4.**

2. ☐
3. ☐
4. ☐

Protection, Restoration, Creation, and/or Enhancement?

These two categories are additive. Maximum possible five points. Place values in their corresponding boxes (5 and 6).

Definitions

Protect – Maintenance or retention of existing habitat with specific resource function(s) for delta smelt. This term usually implies legal protection of the habitat, for example a parcel of land protected under a conservation easement.

Restore – Undertaking actions that re-establish tidal marsh habitat in a location where it had been reclaimed, while meeting established reserve design criteria.

Create - To establish habitat or a natural community in an area that did not previously support it.

Enhance – Manipulation of existing habitat to heighten, intensify, or improve a specific resource function(s). Enhancement results in a gain of selected resource function(s), but may also lead to a decline in other resource function(s). The improvement of an existing degraded habitat. Improving the function of habitat that has been degraded or lost, typically due to human actions.

Protect (i.e. land acquisition)	Restore, Create and/or Enhance
2 – The conserved land will be protected in fee title and under a conservation easement. **0** – The project applicant did not provide the funding for land acquisition (fee title) or place the conservation easement on the land. This will typically apply to projects that have undergone previous conservation planning efforts and may have involved federal grant funding, where no credits can be given for the purchase of the land. **Enter value in box 5.**	**3** – Conversion of low quality habitat to very high quality habitat. **2.5** – Conversion of moderate quality habitat to very high quality habitat. **2** – Conversion of moderate-high quality habitat to very high quality habitat. **1.5** – Conversion of high quality habitat to very high quality habitat. **0** – No restoration, creation, or enhancement actions were performed. **Enter value in box 6.**

5. ☐
6. ☐

Place respective score in the numbered boxes. Add scores up to determine total score. Divide by 10, which are the total available points from the decision tree to determine the ratio for the project.

Project Score

☐ (1) + ☐ (2) + ☐ (3) + ☐ (4) + ☐ (5) + ☐ (6) = ☐ (Total) / 10 = ☐ to 1 Ratio*

*The credited acreages are not to exceed the total restored, created, or enhanced acreages (1:1 ratio).

Last Updated 10/28/2013

2008 FWS BiOp Delta Smelt Crediting Decision Model Guidelines

Last Updated 10/28/2013

This guiding document is meant to accompany the *2008 FWS BiOp Delta Smelt Crediting Decision Model* (decision model) and to be used to assist in determining scores and provide rationales for delta smelt habitat criteria identified within the branches of the decision model. Both documents will serve as living documents for determining credits towards fulfilling the 8,000 acres of intertidal and subtidal marsh identified in *RPA Component 4: Habitat Restoration* of the *2008 Coordinated Operations of the Central Valley Project and State Water Project Biological Opinion* (2008 FWS BiOp). Information presented in the *2008 FWS BiOp Delta Smelt Crediting Decision Model* and this document are based on our best understanding of delta smelt at this point in time and will be updated as needed into the future. The values and weight of the various components in the decision model can adapt over time during the implementation of the tidal marsh restoration. Any new updates to theses document will be transmitted to the project proponents during the Fish Agency Strategy Team (FAST) coordination process.

This crediting system is meant to reduce the struggles with determining 2008 FWS BiOp delta smelt credits during the development of the crediting prospectus stage. As projects started coming to the FAST, it was apparent early on that there was a need for a systematic crediting system to be in place based on the uniqueness, complexity, and diversity of the individual restoration projects specific to implementing the 8,000 acres of tidal marsh in the 2008 FWS BiOp. There are currently limited methods and approaches available for determining increases in habitat value from existing conditions that can be translated into credits for a project. This crediting system is envisioned to streamline the process by reducing the time invested in developing a crediting scheme for every project that is presented to the FAST for credit consideration. Rather every project would use this decision model, in coordination with the FAST, to determine credits for a given project.

The context below provides guidance to the various levels within the decision model. Please refer to these sections when filling out the scores in the decision model.

Where is the project located?

Location – Choose one location from the provided options. Use Figure 1 for general delineations of the locations identified in the decision model. Maximum possible one point in this category with the option

to get up to two points if the project is occurring in a priority area for delta smelt (i.e. Suisun Marsh, Cache Slough Complex, or West Delta). Suisun Marsh, Cache Slough Complex, and West Delta can score up to two points to incentivize restoration to occur in areas where delta smelt are predominantly abundant and of higher priority for restoration opportunities for delta smelt habitat.

Delta smelt are endemic to (native and restricted to) the San Francisco Bay and Sacramento-San Joaquin Delta Estuary (Delta) in California, found only from the San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties (Moyle 2002, p. 227). For purposes of the 2008 FWS BiOp, delta smelt conservation is limited to the Delta and Suisun Marsh as indicated on page 283 of the 2008 FWS Biological Opinion. Sampling within the Central Delta, East Delta, and North Delta areas have indicated presence of delta smelt. However, due to lower occurrences of delta smelt within these locations, lower priority is given. Historically the South Delta may have been within the species range of occurrence, however, as of more recently it has not served as primary habitat for the species. Although the South Delta may serve as habitat for other native Delta fish species, it is not a focal area for delta smelt conservation. No delta smelt credits will be given for South Delta restoration projects under the 2008 FWS BiOp. Yolo Bypass conservation, like the South Delta, is driven by the needs of other Delta fish species. No delta smelt credits will be given for Yolo Bypass projects (outside of the Delta) at this time.

Below is taken from the decision model to determine project location score.

Suisun Marsh

2 –Within the central and eastern portions of Suisun

1 – Along the western portion of Suisun

Cache Slough Complex

2 –Within the Cache Slough Complex boundary

West Delta

2 – Along the corridor from Suisun Marsh to Cache Slough Complex

1 – Waterways feeding into the corridor between Suisun Marsh and Cache Slough Complex

North Delta

1 –Locations closer to the arc connecting Cache Slough Complex, the confluence, and Suisun Marsh

0.5 – Areas further away from the confluence.

Central Delta

1 – In close proximity to the arc between Cache Slough Complex, the confluence, and Suisun Marsh

0.5 – Areas further away from the arc.

East Delta

0.5 – Within the East Delta boundary

South Delta

0 Credits

Yolo Bypass (outside the Delta)

0 Credits

What are the benefits to delta smelt from the project?

Improved rearing (and foraging) habitat – Maximum possible two points.

Improving useable habitat for delta smelt rearing is valuable to improving their habitat conditions. There is a desire to create rearing habitat near areas where we know delta smelt are known to occur to expand their use of habitat. With the aim being, to have rearing habitat in close proximity or near areas where food web production is made available to delta smelt.

Two points given to projects that improve rearing habitat that provide: high order tidal marsh adjacent channels; energetic habitat; turbid cool low salinity water over a diverse landscape; and habitat that is accessible to delta smelt for use.

One point given to projects that create, restore, or enhance more rearing habitat to what is currently available, however, the habitat may only be moderately accessible to delta smelt to use, either due to proximity of known occurrences or by restoration design. For instance levees or other man-made or environmental barriers may prevent a project from scoring the maximum amount of points in this category.

Improved spawning habitat – Maximum possible one point.

One point will be given for those projects that protect, create, restore, or enhance sandy beach spawning habitat with appropriate water quality, velocities, and depths for delta smelt. Water velocities should be appropriate for maintaining the sandy habitat anticipated to provide spawning habitat for delta smelt. Given the need to still learn more about the type of habitat delta smelt use for spawning, focus should be on protecting existing spawning habitat from future modification to ensure the habitat stays conserved in perpetuity.

Food web support – Maximum possible one point.

One point will be given to projects that provide food web production off of the project site for delta smelt. One point will be given to those projects that support local food web production.

Protection, restoration, creation, and/or enhancement?

Definitions

> **Protect** – Maintenance or retention of existing habitat with specific resource function(s) for covered species. This term usually implies legal protection of the habitat, for example a parcel of land protected under a conservation easement.
>
> **Restore** – Returning a site to its natural/historic habitat type with the same or similar functions. Undertaking actions that establish tidal marsh habitat in a location that historically supported the habitat, but which had been removed typically as a result of human actions.
>
> **Create** - To establish habitat or a natural community in an area that did not previously support it.
>
> **Enhance** – Manipulation of existing habitat to heighten, intensify, or improve a specific resource function(s). Enhancement results in a gain of selected resource function(s), but may also lead to a decline in other resource function(s). The improvement of an existing degraded habitat. Improving the function of habitat that has been degraded or lost, typically due to human actions.

Protect (i.e. land acquisition) – Maximum possible two points.

Two points will be given for those projects where the conserved land is protected in fee title and placed under a conservation easement.

No points will be given for those projects where the project applicant did not provide the funding for acquisition (fee title) or place the conservation easement on the land. This will typically apply to existing projects that have undergone previous conservation planning efforts and may had federal grant funding, where no credits can be given for the purchase of the land.

Restoration, creation, and/or enhancement **–** Maximum possible three points.

3 – Conversion of low quality habitat to very high quality habitat.

Example: Bringing tidal excursion to dry land. The project would provide tides to previously claimed habitat. For instance, what were once wetlands that are now being cultivated for agricultural harvesting that through the project would to be converted to tidal marsh.

Example: Performing earth work of dry land to bring tidal waters onto the project site.

2.5 – Conversion of moderate quality habitat to very high quality habitat.

Example: Infrequently inundated seasonal wetlands that through the project will experience greater tidal excursion.

Example: Removal of aquatic invasive species that will allow for native vegetation to reclaim the site. Active management may be required to maintain the habitat quality.

2 – Conversion of moderate-high quality habitat to very high quality habitat.

Example: Increasing the variation of tidal marsh habitat within an area. The site becomes more energetic with high order channels.

1.5 – Conversion of high quality habitat to very high quality habitat.

Example: Increasing edge habitat within a site.

Example: Screening unscreened diversions on a project site to meet a 0.2 fps approach velocity, often referred to as delta smelt criteria. **0** – No restoration, creation, or enhancement actions were performed.

The credited acreages are not to exceed the total restored acreages (1:1 ratio).

Very high quality habitat may include the following:

- Secure lands, in fee-title or through conservation easements, suitable for restoring tidal natural communities and protect sufficient adjacent uplands to accommodate the future upslope establishment of tidal emergent natural community with sea level rise, and to provide upland habitat and refugia for native wildlife.
- Restore tidal emergent wetlands using techniques and methods that accomplish the following goals:
    - Reestablish tidal connectivity to reclaimed lands and reintroduce tidal exchange to currently former tidelands.
    - Restore and create sinuous and high-density dendritic channel networks within the restored marsh plains.
    - Restore tributary stream functions to establish more natural patterns of sediment transport, which would increase turbidity and thus improve spawning conditions for delta smelt.
    - Create habitat for covered species dependent on tidal marsh natural communities.
- Design levee and dike breaches to maximize the development of tidal marsh plain and create hydrodynamic conditions that disfavor nonnative predatory fish.
- Develop and implement measures to minimize the potential for methylation of mercury in restored tidal marsh communities.
- General methods and techniques that may be used during implementation:
    - Restore natural remnant meandering tidal channels.
    - Excavate channels to encourage the development of sinuous, high-density dendritic channel networks with restored marsh plain.
    - Modify ditches, cuts, and levees to encourage more natural tidal circulation and better flood conveyance based on local hydrology.
    - Prior to levee breaching, re-contour the ground surface to maximize the extent of surface elevation suitable for establishment of tidal marsh vegetation (marsh plain) by scalping higher elevation land to provide fill for placement on subsided lands to raise surface elevations (taking into consideration that the surface sediment in higher elevation land that is seasonally inundated can be a significant source for zooplankton and aquatic invertebrates, and scalping may temporarily remove that resource).

- Prior to breaching, import dredge or fill and place it in shallowly subsided areas to raise ground surface elevations to a level suitable for establishment of tidal marsh vegetation (marsh plain).
- Prior to breaching, cultivate stands of tules through flood irrigation for sufficiently long periods to raise subsided ground surface to elevations suitable to support marsh plain; breach levees when target elevations are achieved.

Scoring Examples

2 + 2 + 1 + 1 + 2 + 3 = 11 / 10 = 1.1 to 1 ratio, however, no more than 1:1 credit can be given. So 1:1 becomes the ratio used for determining acreage credits.

Resulting in 500 credits (500 X 1.0) for 500 acres of restored habitat in Suisun Marsh.

1 + 1 + 0 + 1 + 2 + 3 = 8 / 10 = 0.8 to 1 ratio

Resulting in 400 credits (500 X 0.8) for 500 acres of restored habitat in Central Delta.

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Delta Smelt Background Information

Rearing (and foraging) habitat

Delta smelt feed primarily on small planktonic (free-floating) crustaceans, and occasionally on insect larvae (Moyle 2002, p. 228). Historically, the main prey of delta smelt was the copepod *Eurytemora affinis* and the mysid shrimp *Neomysis mercedis*. The slightly larger copepod *Pseudodiaptomus forbesi* has replaced *E. affinis* as a major prey source of delta smelt since its introduction into the San Francisco Bay-Delta. Two other copepod species, *Limnoithona tetraspina* and *Acartiella sinenisi*, have become abundant since their introduction to the San Francisco Bay-Delta in the mid-1990s. Delta smelt eat these introduced copepods, but *P. forbesi* remains a dominant prey item (Baxter *et al.* 2008, p. 22). The diets of larval delta smelt are limited to larval copepods (Nobriga 2002, p. 156). Delta smelt are thought to require a turbid environment for efficient, successful foraging and avoid predators (Feyrer et al. 2007, p. 731). Temperature also affects delta smelt distribution. Delta smelt tolerate temperatures <7.5 to >25.4 ^{o}C (<45.5 to >77.7 °F) (Swanson 2000, p. 387), however warmer water temperatures >25 ^{o}C (77 °F) restrict their distribution more than colder water temperatures (Nobriga and Herbold 2008, p. 12).

Spawning habitat

Larvae are generally most abundant in the Delta from mid-April through May (Bennett 2005, p. 13). Sampling of larval delta smelt in the Bay-Delta in 1989 and 1990 suggested that spawning occurred in the Sacramento River; in Georgiana, Prospect, Beaver, Hog, and Sycamore sloughs; in the San Joaquin River adjacent to Bradford Island and Fisherman's Cut; and possibly other areas (Wang 1991). However, in recent years, the densest concentrations of both spawners and larvae have been recorded in the Cache Slough/Sacramento Deepwater Ship Channel complex in the North Delta. Delta smelt spawning also occurs in Napa River, Suisun Bay and Suisun Marsh during wetter years (Sweetnam 1999; Wang 1991; Hobbs *et al.* 2007). Early stage larval delta smelt have also been recorded in Montezuma Slough near Suisun Bay (Wang 1986).

Although spawning has not been observed in the wild, spawning location and timing has been inferred from the collection of larvae in sloughs and shallow water edge-waters of channels in the upper Delta and in Montezuma Slough near Suisun Bay (Wang 1991, pp. 11-12). Delta smelt of all sizes are found in the main channels of the Delta and Suisun Marsh and the open waters of the Suisun Bay where the waters are well oxygenated and temperatures are usually less than 25 ° C (77 ° F) in the summer (Nobriga *et al.* 2008, pp. 9-11). After several weeks of development, larval surveys indicate that larvae

move downstream until they reach nursery habitat in the "low salinity zone" (LSZ) where the salinity ranges from approximately .5 to 7 parts per thousand (ppt) (Moyle 2002, p. 228; Dege and Brown 2004, pp. 57–58). Juvenile smelt rear and grow in the LSZ for several months, where they are found in relatively shallow open water (Dege and Brown 2004, pp. 56–58). When X2 is located downstream of the confluence at 80 km, the area of suitable habitat is increased encompassing the areas of Suisun and Grizzly Bays (Feyrer et al.2007, p. 24). In winters with high Delta outflow, the spawning range of delta smelt shifts west to include the Napa River (Hobbs et al. 2007, p. 524). Fish inhabiting Suisun Marsh and the Sacramento-San Joaquin River confluence may also spawn near their rearing habitat when water quality conditions enable them (i.e., when flows increase and fresher water moves over these seasonally brackish rearing habitats). In September or October, delta smelt reach adulthood and begin a gradual migration back into freshwater areas where spawning is thought to occur.

Food web support

Introduced species have altered the Delta food web and may have played a role in the decline of delta smelt (Nobriga 1998, p. 20). The overbite clam (*Corbula amurensis*) is a nonnative species that became abundant in the Delta in the late 1980s. Starting in about 1987 to 1988, declines were observed in the abundance of phytoplankton (Alpine and Cloern 1992, p. 951) and the copepod *Eurytemora affinis.* These declines have been attributed to grazing by the overbite clam (Kimmerer *et al.* 1994, p. 86). The overbite clam competes with delta smelt for copepod nauplii (Nobriga and Herbold 2008, p. 23). It is unknown how intensively overbite clam grazing and delta smelt directly compete for food, but overbite clam consumption of shared prey resources does have other ecosystem consequences that appear to have affected delta smelt indirectly. It is believed that these changes in the estuarine food web negatively influence pelagic fish abundance, including delta smelt abundance. Recent studies suggest that summer food limitation remains a major stressor on Delta smelt (Nobriga 1998).

Copepods (*E. affinis*, *Psuedodiaptomus forbesi*), a major prey item for delta smelt, have declined in abundance in the Delta since the 1970s (Kimmerer and Orsi 1996, p. 409). *Limnoithona tetraspina* (no common name) is a nonnative copepod that began increasing in numbers in the delta in the mid-1990s – about the same time that the delta smelt's preferred prey copepod, *P. forbesi*, began declining (Bennett 2005, p. 18). *L. tetraspina* is now the most abundant copepod species in the low salinity zone (Bouley and Kimmerer 2006, p. 219), and is likely an inferior prey species for delta smelt because of its smaller size and superior predator avoidance abilities when compared to *P. forbesi* (Bennett 2005, p. 18).

It has been hypothesized that delta smelt are adversely affected by competition from other introduced fish species that use overlapping habitats, including Mississippi silversides, (Bennett 2005, pp. 49, 50) striped bass, and wakasagi (Sweetnam 1999). Laboratory studies show that delta smelt growth is inhibited when reared with Mississippi silversides (Bennett 2005). Delta smelt and Mississippi silversides have similar morphology, diet, and lifespan, but silversides have a broader diet, and a generally wider ecological niche, a pattern that could give it a competitive advantage over delta smelt. However, there is no empirical evidence to support the conclusion that competition between these species is a factor that influences the abundance of delta smelt in the wild (Bennett 2005, p. 50).

Egeria densa and other non-native submerged aquatic vegetation (e.g., *Myriophyllum spicatum*) can affect delta smelt in direct and indirect ways. Directly, submerged aquatic vegetation can overwhelm littoral habitats (inter-tidal shoals and beaches) where delta smelt may spawn, making them unsuitable for spawning. Indirectly, submerged aquatic vegetation decreases turbidity by trapping suspended sediment, which has contributed to a decrease in both juvenile and adult smelt habitat quality (Feyrer *et al.* 2007; Nobriga *et al.* 2008). Increased water clarity may delay feeding and may also make delta smelt more susceptible to predation pressure.

In summary, we find that introduced species including the overbite clam have altered the Delta food web and constitute a significant threat to delta smelt. It is likely that this threat will increase in the future with the ongoing risk of new species being introduced to the Delta.

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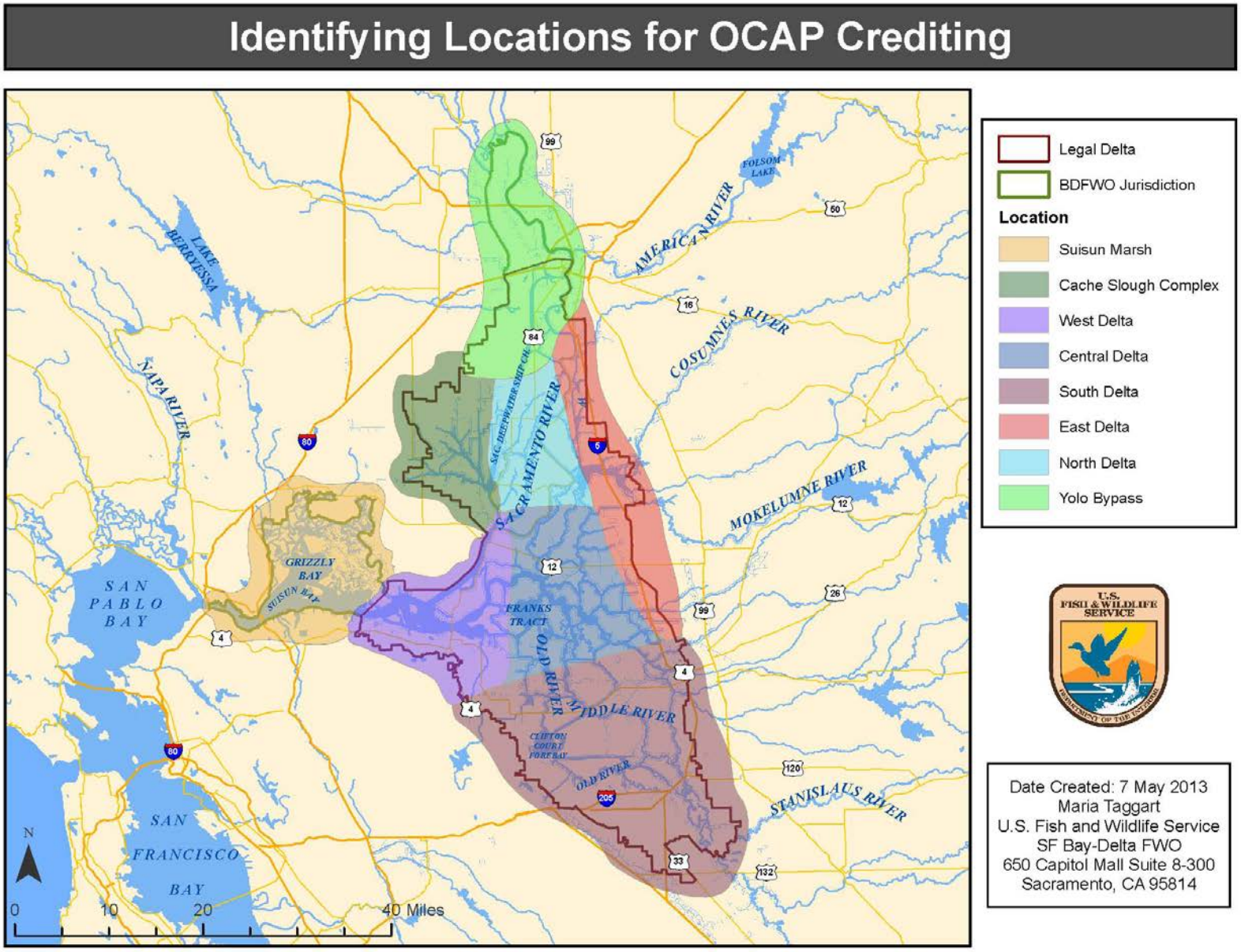


Figure 1. Boundaries for determining where projects lie within the location category in the decision model.

Attachment 5: List of Acronyms and Terms

20 mm	20 mm Delta Smelt Survey
°C	degrees Celsius
Additional 100 TAF Block	Block of 100 TAF of water to supplement Delta outflow described in Condition of Approval 8.19
AF	acre-feet
AMP	Adaptive Management Plan
AMT	Adaptive Management Team
AN	above normal water year
ASR	Annual Status Report
AT	acoustic tag
AT-CWT	paired acoustic tagged-coded-wire tagged releases
Banks Pumping Plant	Harvey O. Banks Pumping Plant
Bay-Delta Plan	Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
Bay Study or SFBS	San Francisco Bay Study
BiOp	Biological Opinion
BN	below normal water year
BSPP	Barker Slough Pumping Plant
CA	California Aqueduct
Cal. Code Regs.	California Code of Regulations
CCF	Clifton Court Forebay
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CHNFR	Central Valley fall-run Chinook salmon ESU, *Oncorhynchus tshawytscha*
CHNSR	Central Valley spring-run Chinook salmon ESU, *Oncorhynchus tshawytscha*
CHNWR	Sacramento River winter-run Chinook ESU, *Oncorhynchus tshawytscha*
cm	centimeter(s)
COA	Coordinated Operation Agreement between the Federal Government and the State of California
CSAMP	Collaborative Science and Adaptive Management Program
CVP	Central Valley Project

CVP Contractors	entities that hold water supply contracts with the CVP
CWT	coded-wire tag
D	dry water year
D-1641	SWRCB Water Rights Decision 1641
DCC	Delta Cross Channel
DCI	Delta-Mendota Canal/California Aqueduct Intertie
Delta	Sacramento-San Joaquin Delta
DJFMP	Delta Juvenile Fish Monitoring Program
DMC	Delta Mendota Canal
DPS	Distinct Population Segment
DS	Delta smelt, *Hypomesus transpacificus*
DWR	California Department of Water Resources
EDSM	Enhanced Delta Smelt Monitoring Program
EIR	Environmental Impact Report
EMP	Environmental Monitoring Program
EPTM	Enhanced Particle Tracking Model
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FCCL	UC Davis Fish Conservation and Culture Laboratory
FEIR	Final Environmental Impact Report
FLaSH	Synthesis of Studies in the Fall Low-Salinity Zone of the San Francisco Estuary, September-December 2011
FMWT	Fall Midwater Trawl
FMWT Index	Fall Midwater Trawl Longfin Smelt Index
ft	foot (feet)
ft/s	foot (feet) per second
GIS	Geographic Information System
GYSO	Goodyear Slough Outfall
HAB	harmful algal bloom
HM	Habitat Management
IEP	Interagency Ecological Program
ITP	Incidental Take Permit
ITS	Incidental Take Statement
Jones Pumping Plant	C.W. Bill Jones Pumping Plant
JPE	Juvenile Production Estimate
JPI	Juvenile Production Index
JPOD	Joint Point of Diversion
km	kilometer(s)
LCM	life cycle model

LFS	longfin smelt, *Spirinchus thaleichthys*
m	meter(s)
MAF	million acre-feet
MIDS	Morrow Island Distribution System
mm	millimeter(s)
MMRP	Mitigation Monitoring and Reporting Program
mph	miles per hour
M&I	municipal and industrial
NBA	North Bay Aqueduct
NFH	National Fish Hatchery
NGO	non-governmental organization
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
NWIS	National Weather Information System
OBI	Old River at Bacon Island
OMR	Old and Middle River
OMR Flex	operations to increase exports to capture peak flows in the Delta during storm-related events
PAR	Property Analysis Record
Permittee	California Department of Water Resources
PBT	Parentage Based Tag
PIT	passive integrated transponder
ppm	parts per million
ppt	parts per thousand
Project	Long-Term Operation of the State Water Project
PSL	pre-screen loss
QA/QC	quality assurance/quality control
QWEST	net flow on the San Joaquin River at Jersey Point
Reclamation	United States Bureau of Reclamation
RM	river mile
RRDS	Roaring River Distribution System
RST	rotary screw trap
RVERS	Rio Vista Estuarine Research Station
RWIS	Reclamation Weather Information System
SacPAS	Central Valley Prediction and Assessment of Salmon
salvage facilities	John E. Skinner Delta Fish Protective Facility and Tracy Fish Collection Facility
SDM	structured decision-making

SFBS or Bay Study	San Francisco Bay Study
SHOWR	Shasta Operations for Winter-run Chinook Salmon
Skinner Fish Facility	John E. Skinner Delta Fish Protective Facility
SKT	Spring Kodiak Trawl
SLS	Smelt Larval Survey
SMPA	Suisun Marsh Preservation Agreement
SMSCG	Suisun Marsh Salinity Control Gates
SMT	IEP Science Management Team
Spring Outflow Block	Block of water, up to 150 TAF, to supplement Delta outflow described in Condition of Approval 8.18
STARS Model	Survival, Travel Time, and Routing Simulation Model
STN	Summer Townet Survey
subd.	subdivision
Summer-Fall Action	Delta smelt summer-fall habitat action
SVI	Sacramento Valley Index
SWP	State Water Project
SWP Contractors	Public water agencies that hold long-term water service contracts with the SWP
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TBP	South Delta Temporary Barrier Project
tit.	title
Tracy Fish Facility	Tracy Fish Collection Facility
UCD or UC Davis	University of California, Davis
USACE	United States Army Corp of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WOMT	Water Operations Management Team
X2	two parts per thousand salinity isohaline location in km from the Golden Gate Bridge
YBFMP	Yolo Bypass Fish Monitoring Program

Chinook Salmon Loss Estimation
for
Skinner Delta Fish Protective Facility and Tracy Fish Collection Facility

7/9/2018

I. Introduction

Estimates of salmon loss are based on fish salvage and operational data collected at the John E. Skinner Delta Fish Protective Facility (Skinner) and the Tracy Fish Collection Facility (Tracy). Loss calculations utilize estimates based on DFG studies of screening efficiency, handling and trucking mortality due to operation of the Skinner facility, and pre-screening losses occurring in Clifton Court Forebay (CCF) and the intake channel.

II. Loss Estimation

There are 4 essential components of loss estimation: salvage, pre-screen loss (predation), screen (louver) efficiency, and handling and trucking loss. Losses are estimated from the time salmon enter Clifton Court Forebay (at Skinner) or across the trash racks (at Tracy) to the time they are released back into the Delta. Salmon are lost in two ways before they are collected in the facility: 1) they might be eaten by predatory fish, or 2) they might pass through the louvers and then exported along with Delta water. Once collected, fish loss occurs when some fish die in the process of being handled or trucked.

A. Salvage Estimation

The first step in estimating loss is to estimate fish salvage. Salvage is estimated from samples (counts) of fish collected at least every two hours while water is being pumped.

SALVAGE = Observed number of fish x (Total minutes pumping ÷ Count length)

Exceptions: If the fish is observed in a predator removal, then SALVAGE = Observed number of fish x 1. Count length is also adjusted for time that the secondary is shut down and no salvage took place
If the fish is observed during a special study, then SALVAGE = 0.

Example: 1 salmon in count * (120 min. pumping / 10 min. count length) ⟶ SALVAGE = 12

B. Entrainment Estimation

The number of fish that are entrained into the facilities is estimated in two steps. First we estimate how many fish encountered the screens, the second step is to estimate how many fish entered the facility.

1. Encounter Estimation

We have already estimated how many salmon were collected (salvage), but since the screens are not 100% efficient, we know some fish passed through and were lost. Estimating the number of fish encountering the screens depends on fish size. Efficiency is generally higher for fish < 100 mm than for fish > 100 mm. The fish's ability to avoid the louvers and enter the bypass also depends on the water velocity through the louvers. For small fish, higher velocities will make it more difficult for them to avoid the louvers and will increase the likelihood that they will pass through the louvers and will be lost. The number of fish encountering the screens (ENCOUNT) is calculated by dividing the salvage (SALVAGE) by the screen efficiency (EFF).

If Length < 101 mm ⟶ ENCOUNT = SALVAGE/EFF1;
If Length > 100 mm ⟶ ENCOUNT = SALVAGE/EFF2;

EFF1 = 0.630 + (0.0494 * (Primary Channel Flow /(Primary Channel Depth * Width)))
EFF2 = 0.568 + (0.0579 * (Primary Channel Flow /(Primary Channel Depth * Width)))

Note: Channel width at Skinner depends on the number of bays open. As the pumping rate changes, bays are opened and closed to maintain primary channel approach velocities and bypass ratios within established criteria. Channel width at Tracy is fixed (84 ft).

2. Entrainment Estimation

The number of fish entrained (ENTRAIN) is calculated by dividing the number of fish encountering the screens (ENCOUNT) by the proportion of fish assumed to survive the journey to the louvers (1 – P). The pre-screen loss rate (P) is the rate of loss to entrained salmon during movement from the radial gates (Skinner) or trash racks (Tracy) to the louvers. The pre-screen loss at Skinner is based on an average of measured pre-screen loss rates in CCF for chinook salmon (75%). The pre-screen loss rate at Tracy is an agreed-upon value (15%).

ENTRAIN = ENCOUNT / (1 – P)

For Skinner: P = 0.75
For Tracy: P = 0.15

C. Live Release Estimation

We then estimate the number of salvaged fish that will survive the process of being transferred from the holding tanks to the truck and transported back to the Delta. This estimate is based on studies with salmon at the Skinner facility and depends on salmon length. Mortality during the transport process has been referred to as handling and trucking loss. For salmon less than or equal to 100 mm, mortality is assumed to be 2% and for salmon larger than 100 mm, mortality is assumed to be 0.

If length < 101 mm ⟶ RELEASE = SALVAGE x (1 – 0.02)
If length > 100 mm ⟶ RELEASE = SALVAGE

Note: Trucking and handling loss is combined into a single rate (2% for smaller fish).

D. System Loss Estimation

The final step in loss estimation is to subtract the estimated number of fish released alive from the estimated number of fish entrained.

LOSS = ENTRAIN – RELEASE

Exceptions:
If the fish is observed in a Skinner predator removal, then LOSS = SALVAGE x 4.33
If the fish is observed in a Tracy predator removal, then LOSS = SALVAGE x 0.569
If the fish is observed in a special study, then LOSS = 0
If a Non Clipped salmon is accidentally killed and not released, then 1 is added to the loss number to account for the lost salmon

III. Loss Calculation Examples:

A. Skinner:

1 salmon observed in count * (120 min. pumping / 10 count length) ⟶ Salvage = 12, but some fish went through louvers and were not salvaged, so...

If < 101 mm, # fish encountering screens = 12 / (0.63 + (0.0494 * (2260 cfs / 20 ft.* 106 ft))) = 17.6

But, most of the salmon were eaten before they got to the louvers, so... # fish entrained = 17.6 / (1-.75) = 70.4

But, we were able to release some of these fish back into the delta alive, so if fish < 100 mm... # fish released = 12 * (1 – .02) = 11.8

So, loss is the number of fish entrained minus the number of fish released alive... # fish lost = 70.4 - 11.8 = 58.6

B. Tracy:

1 salmon observed in count * (120 min. pumping / 10 count length) ⟶ Salvage = 12, but some fish went through louvers and were not salvaged, so...

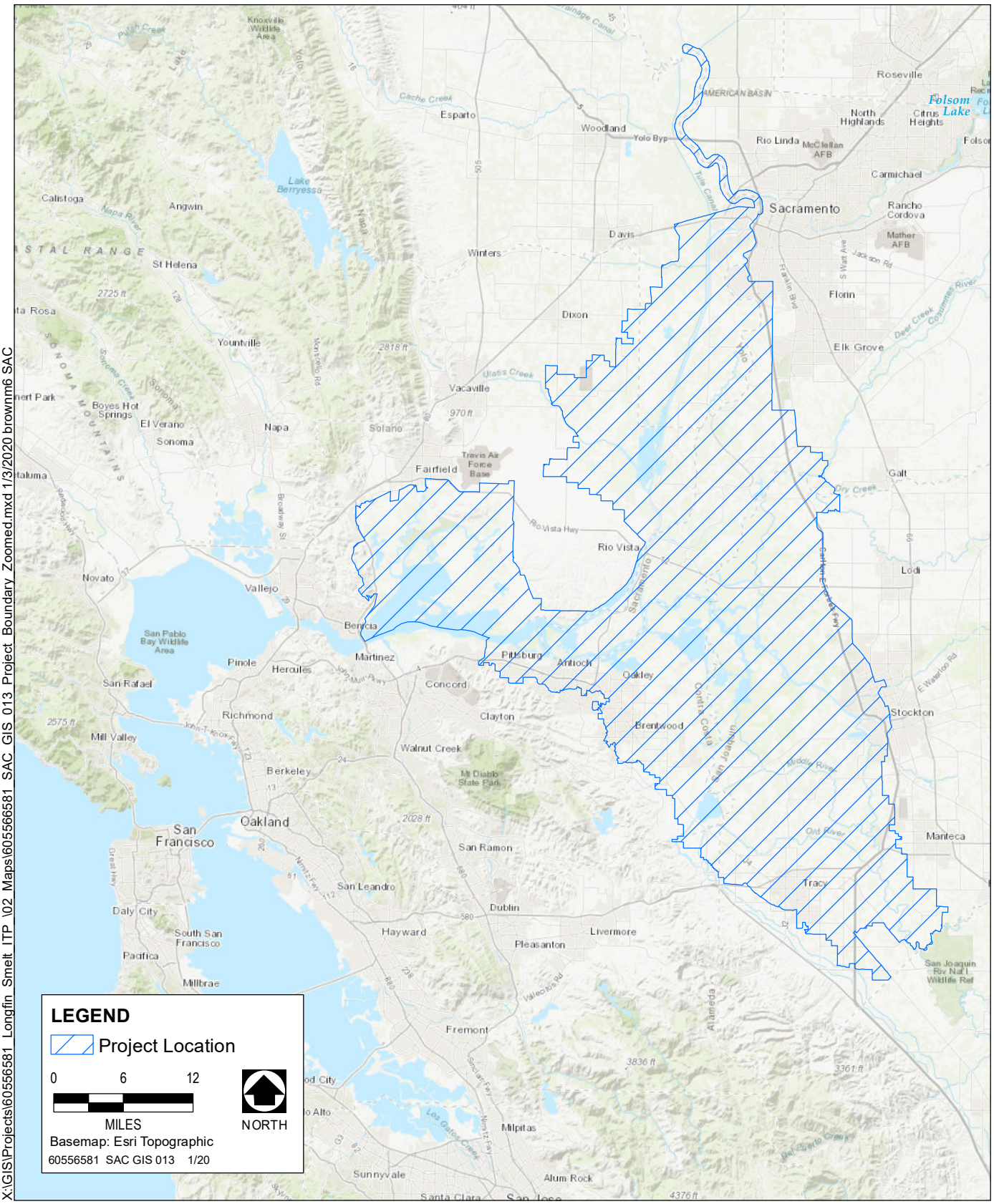
If < 101 mm, # fish encountering screens = 12 / (0.63 + (0.0494 * 2806 cfs / (16.7 ft.* 84 ft))) = 16.4

But, most of the salmon were eaten before they got to the louvers, so... # fish entrained = 16.4 / (1-.15) = 19.3

But, we were able to release some of these fish back into the delta alive, so if fish < 100 mm... # fish released = 12 * (1 – .02) = 11.8

So, loss is the number of fish entrained minus the number of fish released alive... # fish lost = 19.3 - 11.8 = 7.5

Figure 1A

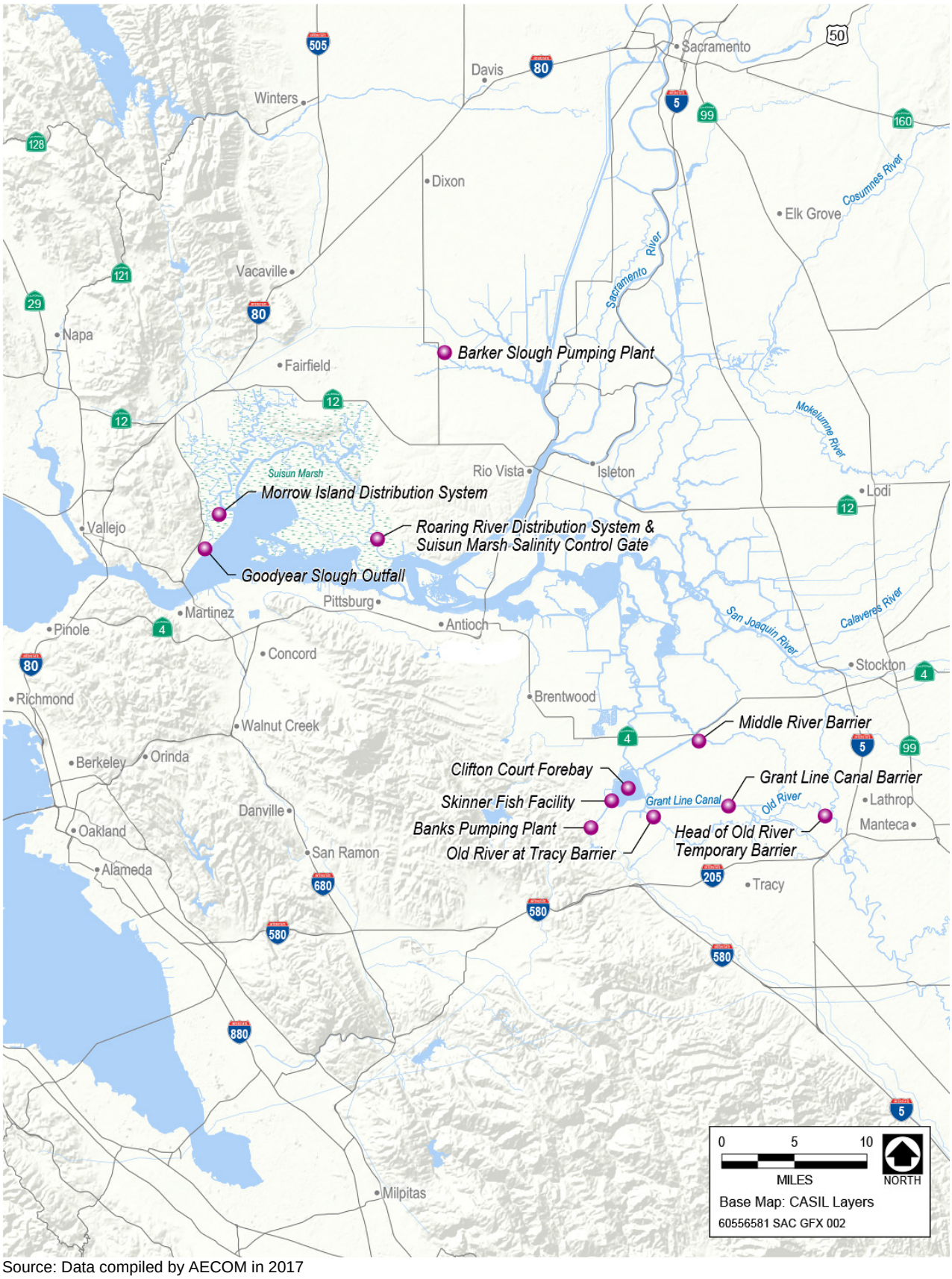


X:\GIS\Projects\60556581_Longfin_Smelt_ITP_\02_Maps\60556581_SAC_GIS_013_Project_Boundary_Zoomed.mxd 1/3/2020 brownm6 SAC

Source: California Department of Fish and Wildlife

Project Location

AECOM



Source: Data compiled by AECOM in 2017

Figure 1-5. State Water Project Facilities within the Project Location