Implementation Schedule for the Adaptive Management Program for the Existing Biological Opinions and CESA Authorizations for the Long-term Operation of the CVP and SWP and for CWF

Background

The California Department of Water Resources (DWR), U.S. Department of the Interior Bureau of Reclamation (Reclamation), California Department of Fish and Wildlife (DFW), U.S. Fish and Wildlife Service (Service), and National Marine Fisheries Service (NMFS) developed several documents to identify potential future costs associated with the implementation of the Adaptive Management Program (AMP) intended to support the existing 2008 Service Biological Opinion and the 2009 NMFS Biological Opinion and the California Endangered Species Act (CESA) authorizations for the Long-term Operation of the Central Valley Project (CVP) and the State Water Project (SWP), as well as in support of the implementation of the California WaterFix (CWF). These costs are conservative estimates intended to provide support for future planning, resource commitments, and decision-making for studies, projects, and monitoring requirements anticipated as a result of ongoing project operations and the operations of components included in the CWF.

Implementation Schedule Description

The cost breakdown documents in support of the AMP do not differentiate costs based on timing of implementation, nor does it take into consideration that some projects may have fixed durations and be completed within a specific timeframe. Therefore, the implementation schedule spreadsheet (attached), while not comprehensive and subject to revision based on science, resources, and information available during any given year of implementation, is intended to provide a depiction of AMP project implementation in 5-year increments beginning at the time of approval by the State Water Resources Control Board and lasting until after CWF facilities are operational. Not all projects listed within a five year increment will last the entire five years; instead, those projects would both begin and end within that 5-year implementation window.

The implementation schedule starts in late 2018/early 2019 based on the schedule tentatively anticipated in association with the State Water Resources Control Board's hearing and approval process for DWR and Reclamation's request for the change in the point of diversion in the Delta for CWF. Considering that the Board issues approval or findings in late 2018, the start date would be near the end of Federal fiscal year 2018 (ends September 30) or after the State's fiscal year 2019 budget is approved in June 2018. Therefore, it is reasonable that 2019 would be the start of any new programs or activities requiring additional funding sources.

Finally, much of what is presented in the schedule presumes that projects that are currently funded and with an anticipated agreement or contract end date would be completed within the first 5-year window between 2019 and 2024. With a few exceptions, such as SAIL or life cycle model development, programs or projects that are not currently funded but are identified in other framework or planning documents typically fall into the 2024-2029 or 2029+ level of implementation. SAIL and life cycle models for Delta Smelt, salmon, and sturgeon are considered a higher priority and are included as earlier implementation actions despite current lack of identified funding sources.

Sources of Funding

DWR and Reclamation commit to securing all required funding from a variety of sources for implementing the Adaptive Management Program, consistent with the Agreement For Implementation Of An Adaptive Management Program For Project Operations. Neither the implementation schedule nor the AMP identify specific funding sources for project implementation, and current funding is not a representation of future out-year funding for these efforts. While DWR and Reclamation fund the majority of current programs for science and monitoring in the Central Valley, this does not preclude the participation of other State or Federal agencies from seeking further funding for program implementation.

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	Assumed Years of Implementation		
Implementation Activity	**2019 - 2024**	**2024-2029**	**2029+**
1. Adaptive Management of Construction and Operations			
a. South Delta Facilities			
i. CVP, SWP Pumps, Clifton Court			
Clifton Court Forebay Predation Study	■		
Green Sturgeon Laboratory Studies	■		
Skinner Evaluations & Improvements Project	■		
ii. Head of Old River Barrier			
Head of Old River & Non-Physical Barrier Predator Fish Study			■
iii. South Delta Survival I/E			
Multivariate San Joaquin River Chinook Survival Investigation	■		
Salmon Survival Studies (DJFMP)	■	■	■
Salmonid Gap Analysis: Salmon Scoping Team	■	■	
Steelhead Survival Study	■		
iv. Salmon Entrainment			
Salmon Entrainment Placeholder	■	■	■
v. Smelt Entrainment			
Delta Smelt Entrainment; Grimaldo et al		■	
Methods Development for Environmental DNA Surveying of the Wild Delta Smelt Population	■		
Turbidity Transects (Boat-Based)	■	■	■
Delta Smelt and Longfin Smelt South Delta Abundance and Entrainment Monitoring	■	■	■
Smelt Entrainment Placeholder	■	■	■
Northbay Aqueduct Fish Screen Evaluation	■		
b. North Delta Diversion			
i. Fish Facilities Design and Monitoring			
Preconstruction			
Baseline Fish Surveys	■	■	
Baseline Predator Density and Distribution	■		
Deep Water Screens Study	■		
Reach-Specific Baseline Juvenile Salmonid Surivival Rates	■	■	
Refugia Field Study	■		
Site Locations Numerical Study	■		
Through Delta Pre-construction Juvenile CHNWR and CHNSR Survival Rates (Study 12)	■	■	
Postconstruction			
Predatory Density and Distribution (Study 9)			■
Evaluation of Screen Impingement (Study 7)			■
Screen Entrainment (Study 8)			■
Post-construction NDD Intake Reach Juveline Salmon Survival Rates (Study 10)			■
Post-construction DS and LFAS Surveys (Study 11)			■
Through Delta Post-construction Juvenile CHNWR and CHNSR Survival Rates (Study 12)			■
Monitoring Sacramento River Reverse Flows (Study 13)			■
Post-Construction Placeholder			■
ii. Salmon Survival (Out Migrating)			
iii. Migration (Adults Returning)	■	■	
c. North Barriers			
i. Delta Cross Channel			
DCC Placeholder			■
ii. Georgiana Slough			
2014 Georgiana Slough Barrier Study	■		
Salmon Protection Technology Study		■	
d. Flow Augmentation Studies (Seasonal)			
Fall Outflow for Delta Smelt	■		
FLOAT PWT Studies	■	■	■
2. Predation			
a. SWP Diversion - Predation			
CCF Predation Reduction Alternative(s) - Dredging In-Depth Study	■	■	■
CCF Predation Reduction Alternative(s) - Electrofishing (Interim Measure)		■	
CCF Predation Reduction Alternatives Analysis	■		
Release Site Predation Study	■		
b. CVP Diversion - Predation			
Multiple Release Sites. New Federal Fish Release Site - Delta	■	■	■
Multiple Release Sites. Replace the Antioch Fish Release Site	■	■	■
Pilot Research Effects of Predation on Juvenile Salmonids at the Delta Release Sites	■		
TFCF CO2 Injection System Design (two studies)	■		
c. North Delta Diversion Predation			
Predator Habitat Locations		■	■
d. Delta Habitat - Predation			
Linking Predation Mortality to Predator Density and Survival for Out-Migrating Chinook Salmon and Steelhead		■	
Predator Reduction Methods		■	
e. Tributary - Predation			
Linking Predation Mortality to Predator Density and Survival for Out-Migrating Chinook Salmon and Steelhead in the Sacramento River		■	
3. Restoration			
a. Passage and Rearing			
Clear Creek Adaptive Management		■	■
Managed Agricultural Floodplain Study (Knaggs Ranch)			
Yolo Bypass Fish Monitoring Program (YBFMP)	■	■	■
Putah Creek Placeholder			■
b. Food Web Support			
Drivers of Aquatic Habitat Quality - The Role of the Benthos	■	■	■
Liberty Island Fish Survey (DJFMP)	■	■	■
Nutrient and Food Resource Dynamics in Delta Aquatic Ecosystems	■	■	■
Physical and Biological Drivers of Fish Populations to Inform Management and Habitat Restoration Actions	■	■	■
Suisun Marsh Food Production	■	■	■
Upper Estuary Zooplankton Sampling	■	■	■
Yolo Bypass Productivity Export Studies	■	■	■
c. FRP Monitoring (8,000 acres)			
Tidal Wetland Monitoring Pilot Study	■		
Post-Construction Project Monitoring		■	■
d. Salmon Spawning Habitat			
Clear Creek Spawning Gravel Injection		■	
CVPIA Habitat Restoration Fish Monitoring	■	■	■
e. Salmon Resiliency Monitoring			
f. Delta Smelt Resiliency			
Effects of Aquatic Macrophyte Control on Delta Smelt Habitat (MAST)	■	■	
Suisun Salinity Gates Placeholders			■
g. Sediment Augmentation/Management			
Quantify Influence of Wind Waves on Sediment Dynamics in Liberty Island and Holland Tract	■		
Site Locations Lab Study	■	■	
Turbidity Dynamics and Suspended Sediment Transport	■		■
Understanding Aquatic Habitats in Suisun Bay: Monitoring Turbidity and Suspended Sediment Concentrations at Benicia	■	■	■
h. Delta Smelt Spawning Habitat			
Delta Smelt Spawning Habitat-Related Monitoring and Research Program	■	■	■
4. Compliance Monitoring for Construction			
Monitoring CWF Construction Activities	■	■	■

5. Core Monitoring			
a. Status and Trends			
i. Abundance, Distribution, Condition			
Sacramento Basin Steelhead Salmon Study	■		
20mm Delta Smelt Survey (20mm)	■	■	■
Adult Striped Bass Population Estimates			■
Adult sturgeon population estimates			■
Bay Shrimp and Crab Abundance and Distribution Surveys (Bay Study)			■
Central Valley Juvenile Salmon and Steelhead Monitoring (Knights Landing)	■	■	■
Directed Field Collections	■	■	■
Enhanced Delta Smelt Monitoring (EDSM)	■	■	■
Estimating Abundance of Juvenile Winter-run Chinook Salmon Entering and Exiting the Delta (SAIL)	■	■	■
Estimating effective population size and long term-monitoring of Delta Smelt	■	■	■
Estuarine and Marine Fish Abundance and Distribution Survey (Bay Study)	■	■	■
Evaluation of Natural Marking in Delta Smelt	■		
Expanded Bay-Delta Monitoring Task 3		■	
Extracting Better Information From Long-term Monitoring Data: estimating occupancy and abundance of near-shore fishes in the Sacramento-San Joaquin River Delta			■
Fall Midwater Trawl Survey (FMWT)	■	■	■
Fish Diet and Condition		■	
Juvenile Salmon Emigration Real Time Monitoring (DJFMP)	■	■	■
Juvenile Salmon Monitoring (DJFMP)	■	■	■
Mossdale Spring Trawl (Mossdale)	■	■	■
Pilot Delta Littoral Habitat Fish Study			■
Resident Fish Survey (DJFMP)	■	■	■
Rotary Screw Trap Surveys on the American River		■	
SAIL - Salmon Abundance - Trawl Efficiencies at Chipps & Sacramento	■		
SAIL - Salmon Fish Condition - Delta Rearing & Growth	■		
SAIL - Salmon Fish Condition - Pathogen	■		
SAIL - Salmon Fish Condition - Stress Markers, Infection & Predation Risk	■		
SAIL - Sturgeon Life Stage Surveys - Increased Sampling in Adult Surveys	■		
SAIL - Sturgeon Life Stage Surveys - Increased Sampling in IEP Juvenile Surveys	■		
SAIL - Sturgeon Tissue Analysis - Pectoral Fin Ray Analysis	■		
Smelt Larva Survey (SLS)	■	■	■
Spring Kodiak Trawl (SKT)	■	■	■
Summer Townet Survey (STN)	■	■	■
UCD Suisun Marsh Fish Monitoring		■	
Sturgeon Monitoring and Associated Applied Research Concept Proposal		■	
Delta Smelt Modeling & Monitoring Project - Monitoring and Analysis Component	■	■	■
ii. Genetics			
Central Valley Salmonid Coordinated Genetic Monitoring	■	■	■
SAIL - Sturgeon Tissue Analysis - Green Sturgeon Genetics	■		
SAIL - Salmon Diversity - Genetic Diversity & Reproductive Success using Parentage Tagging	■		
SAIL - Sturgeon Tissue Analysis - White Sturgeon Genetics	■		
iii. Use (Otolith)			
Reconstructing Juvenile Salmon Growth, Condition, and Delta Habitat Use in the 2014-15 Drought and Beyond	■		
SAIL - Salmon Diversity - Juvenile Outmigration Strategies and Success in Using Adult Otoliths	■		
iv. Outflow			
Bay Salinity Monitoring	■	■	■
Delta Flow Measurement and Database Management	■	■	■
Operation of Thermograph Stations	■	■	■
Flow Profiling Field Study (FFTT)	■		■
v. Water/Habitat Quality			
Drivers of aquatic habitat quality: Physical attributes and dynamics of the Deep Water Ship Channel.	■		
Drivers of aquatic habitat quality: Water transport and constituent flux in Little Holland Tract.	■		
Environmental Monitoring Program	■	■	■
San Joaquin River Dissolved Oxygen Monitoring	■	■	■
Understanding aquatic habitats in the Sacramento River and North Delta: Nutrients and physics as drivers of production and aquatic habitat conditions.	■		
WIIN TBD Tasks Placeholder	■		
vi. Contaminants			
Lower Clear Creek Aquatic Habitat and Mercury Abatement Program			■
b. Institutional Capacity			
i. Acoustic Array			
SAIL - Salmon Survival & Movement -Real time Acoustic Telemetry Network wotj Water Quality Monitoring	■	■	■
SAIL - Sturgeon Telemetry - Maintenance of Core Acoustic Receiver Array	■		
SAIL - Sturgeon Telemetry - Open Source Access for Telemetry Detection Data	■		
ii. FCCL/Delta Smelt Conservation Hatchery			
Delta Smelt Refuge Population and Culture Facility Renovation and Expansion			■
Delta Smelt Research and Refuge Population Monitoring	■	■	■
iii. Data Access			
Data Access Placeholder		■	■
6. Reintroduction Study			
a. Salmon			
i. Battle Creek			
ii. Rim Dams			
Evaluation of juvenile salmon colonization in tributaries to Shasta Reservoir, California	■		
iii. San Joaquin			
San Joaquin River Restoration Program (Fisheries Monitoring)	■	■	■
7. Tributary Monitoring			
a. American River			
American River Screw Traps	■	■	■
American River Steelhead Spawning Survey	■	■	■
American River Stranding Survey	■	■	■
American River Chinook Escapement	■	■	■
b. Stanislaus River			
Stanislaus River Monitoring	■	■	■
c. Sacramento River			
Adult Salmonid Escapement Monitoring in Battle Creek.	■	■	■
Adult Spring Chinook Escapement Monitoring in Clear Creek.	■	■	■
Adult Steelhead and Late-fall Chinook Escapement Monitoring in Clear Creek	■	■	■
Assessment of salmonid rearing habitat and growth rates in the Upper Sacramento River watershed above Lake Shasta		■	
Juvenile Spring Run and Steelhead Production Monitoring in Battle Creek.	■	■	■
Juvenile Spring-Run and Steelhead Production Monitoring in Clear Creek	■	■	■
Operation of Segregation Weir in Clear Creek	■	■	■
Red Bluff Diversion Dam Rotary Trap Juvenile Monitoring Project.	■	■	■
Sacramento River Basin Salmonid Monitoring	■	■	■
Survey the Lower American River for stranded or isolated juvenile salmonids and/or redds following flow reductions.	■	■	■
Tracking migration and survival in juvenile winter run Chinook salmon in the Sacramento River and Delta over drought years	■		
i. Temperature			
Sacramento River Temperature Management Decision Support Tools	■		
d. Multi-River			
Central Valley Chinook Salmon In-river Escapement Monitoring Plan	■	■	■
Comprehensive Monitoring Plan for Steelhead (Oncorhynchus mykiss)			■
8. Salmon Hatcheries			
i. Genetic Support			
ii. Constant Fractional Marking			
Coleman Nat. Fish Hatchery Late-Fall-Run Production Tagging	■	■	■
Constant Fractional Marking/Tagging Program for Coleman and Nimbus Fish Hatcheries Chinook Salmon	■	■	■

Spring Chinook Tagging Program (Feather River Marking / Tagging, Non FERC)			
Coded Wire Tagging of Naturally Produced Salmon (Feather River Marking / Tagging, Non FERC)			
Otolith Thermal Marking Program (Discontinued) (Feather River Marking / Tagging, Non FERC)			
9. Life Cycle and Modeling			
3D Flow Modeling of Selected Sections on the Sacramento River for Fish Bypass Projects			
Application of Enhanced PTM to Drought Operations Planning WY15 and Model Validation			
Gear Efficiency			
Implementing the individual based model, inSALMO, on the upper Sacramento River			
Investigation of the Distribution and Abundance of Longfin Smelt in the SFE			
Life Cycle modeling in support of the long term operations of Central Valley Project and the Bay Delta Conservation Plan			
Sacramento River Salmonid Passage Model for Data Assessment in Real Time			
SAIL - Salmon Data Access - Open Source Data & Model			
SAIL -Sturgeon Population Modeling - Population & Harvest Modeling			
Statistical Support (DJFMP)- Delta Smelt Life Cycle Model			
Delta Smelt Modeling & Monitoring Project - Life Cycle Modeling Component			
10. Decision Support			
California Central Valley			
a. Synthesis			
Longfin Smelt Conceptual Model and Synthesis (MAST)			
Synthesis of Ecological Resilience to Recent and Historic Droughts (MAST)			
Future Synthesis for Adaptive Management			
b. Program Management			
CSAMP/CAMT Program Administration & Facilitation Support			
IEP Oversight and Coordination			
FRP Program Management			
CVPIA Program Management			
Interagency Implementation Coordination Group			
San Joaquin Restoration Program			
FCCL Program Management			
American River Program Management			
c. Independent Science Review			
Examples, Delta Smelt Surveys: LaTour Study (AECOM), IEP SAG			