South Delta IMPROVEMENTS PROGRAM EIS/EIR

Volume I: Chapters 1–5

Environmental Impact Statement/ Environmental Impact Report

Final

California Department of Water Resources

U.S. Department of the Interior, Bureau of Reclamation

U.S. Department of the Interior, Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

California Department of Water Resources

The mission of the California Department of Water Resources is to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

South Delta Improvements Program
Final Environmental Impact Statement/ Environmental Impact Report

Volume I: Chapters 1–5

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Acronyms and Abbreviations

µg/l	micrograms per liter
µS/cm	microSiemens per centimeter
1978 Delta Plan	Water Quality Control Plan for the Sacramento–San Joaquin Delta and Suisun Marsh
1991 Delta Plan	1991 Delta Water Quality Control Plan for Salinity, Temperature and Dissolved Oxygen
ACE	Altamont Commuter Express
ACHP	Advisory Council on Historic Preservation
af	acre-feet
af/day	acre-feet per day
AFRP	Anadromous Fish Restoration Program
AG-40	Permanent Agricultural Intensive Land Use Zone, minimum parcel size 40 acres
AG-80	Permanent Agricultural Extensive Land Use Zone, minimum parcel size 80 acres
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
APE	area of potential effects
ASIP	Action Specific Implementation Plan
ASTM	American Society for Testing and Material
AU-20	Agriculture–Urban Reserve, minimum parcel size 20 acres
Authority	California Bay-Delta Authority
B.P.	years before present
BA	biological assessment
BAAQMD	Bay Area Air Quality Management District
BART	San Francisco Bay Area Rapid Transit District
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin River Delta
Bay-Delta Estuary	San Francisco Bay/Sacramento–San Joaquin River Delta Estuary
BDAC	Bay-Delta Advisory Council
BDPAC	Bay-Delta Public Advisory Committee
BIA	Bureau of Indian Affairs
BMPs	best management practices
BNSF	Burlington Northern and Santa Fe Railway
BO	biological opinion
Br^-	bromide
Business Plan Act	Hazardous Materials Release Response Plans and Inventory Act

CAA	federal Clean Air Act
CAAQS	California Ambient Air Quality Standards
CALFED Ops Group	California-Federal Operations Group
CALFED Program	CALFED Bay-Delta Program
CALFED ROD	CALFED Programmatic Record of Decision
CALSIM	joint water supply planning model
CALSIM II	DWR and Reclamation joint planning model
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CAT	San Joaquin Area Transit
CBDA	California Bay-Delta Authority
CCC	Contra Costa Canal
CCF	Clifton Court Forebay
CCIC	Central California Information Center
CCMP	Comprehensive Conservation and Management Plan
CCR	California Code of Regulations
CCWA	Central Coast Water Authority
CCWD	Contra Costa Water District
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
Cl^-	chloride
cm	centimeters
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
COA	Coordinated Operations Agreement
Corps	U.S. Army Corps of Engineers
CPM	Certified Property Manager
CRHR	California Register of Historic Resources
CSUS	California State University, Sacramento
CUPA	Certified Unified Program Agency
CVP	Central Valley Project
CVP Tracy	CVP Tracy Pumping Plant
CVPIA	Central Valley Project Improvement Act
CVP-OCAP	CVP Operating and Criteria Plan
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	federal Clean Water Act of 1977
cy	cubic yards
D-1485	State Water Resources Control Board Decision-1485
D-1630	Water Right Decision 1630
D-1641	State Water Resource Control Board Decision 1641
D-893	Water Right Decision 893
DAT	Data Assessment Team

dB	Decibel
dBA	A-Weighted Decibel
DBW	California Department of Boating and Waterways
DCC	Delta Cross Channel
DEFT	Diversion Effects on Fisheries Team
Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
DIDI	Delta Island Drainage Investigations
DIP	Delta Improvements Package
DMC	Delta-Mendota Canal
DO	dissolved oxygen
DOC	dissolved organic carbon
DOI	U.S. Department of the Interior
DPC	Delta Protection Commission
DPR	California Department of Parks and Recreation
DPS	dredge placement sites
DRERIP	Delta Regional Ecosystem Restoration Implementation Plan
DSA	depletion study area
DSM2	Delta Simulation Model 2
DSM2	State of California Delta Simulation Model
DSOD	Department of Safety of Dams
DSRAM	Delta Smelt Risk Assessment Matrix
DWR	California Department of Water Resources
DWSC	Deep Water Ship Channel
E/I	export/inflow
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
EDR	Environmental Data Report
EIS/EIR	environmental impact statement/environmental impact report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Ecosystem Restoration Program
ESA	federal Endangered Species Act
ESU	evolutionarily significant unit
EWA	Environmental Water Account
EWP	Environmental Water Program
feet msl	feet above mean sea level
feet/sec	feet per second
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FPMP	fugitive PM10 management plan
FPPA	Farmland Protection Policy Act
FR	Federal Register
FRSA	Feather River Service Area
FRWP	Freeport Regional Water Project
FSZ	Farmland Security Zone
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act

g	force of gravity
GIS	geographic information systems
GPS	Global Positioning System
HCP	habitat conservation plan
HM	Habitat Management
Hp	horsepower
I-5	Interstate 5
IDHAMP	Interagency Delta Health Aspects Monitoring Program
IEP	Interagency Ecological Program
IESP	Interagency Ecological Study Program
in/sec	inches per second
Intertie	Delta-Mendota Canal and California Aqueduct Intertie
ISDP	Interim South Delta Program
ITAs	Indian Trust Assets
JPE	juvenile production estimate
JPOD	joint point of diversion
KCWA	Kern County Water Agency
kV	kilovolts
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
L_{min}	Minimum Sound Level
LOD	level of development
LOS	levels of service
LRMP	Land and Resource Management Plan
LTEWA	Long-Term EWA
L_{xx}	Percentile-Exceeded Sound Level
M&I	municipal and industrial
m/sec	meter per second
maf	million acre-feet
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAs	Management Agencies
MBK	Murray, Burns & Kienlen
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
Metropolitan	The Metropolitan Water District of Southern California
mg/l	milligrams per liter
mgd	million gallons per day
MLLW	mean lower low water
MOU	memorandum of understanding
µS/cm	microSiemens per centimeter
µg/l	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mph	miles per hour

mS/cm	milliSiemens per centimeter
MSA	Metropolitan Statistical Area
MSCS	Multi-Species Conservation Strategy
MSSCG	Montezuma Slough salinity control gates
MTC	Metropolitan Transportation Commission
MWQI	Municipal Water Quality Investigations Program
MWT	Fall Midwater Trawl survey
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAVD 88	North American Vertical Datum of 1988
NCCA	and Natural Communities Conservation Act
NCCP	Natural Community Conservation Plan
NCCPA	Natural Communities Conservation Planning Act
NEPA	National Environmental Policy Act
NGVD	national geodetic vertical datum
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NOC	Notice of Completion
NOD	Notice of Determination
NOP/NOI	Notice of Preparation/Notice of Intent
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
NWIC	Northwest Information Center
O&M	operations and maintenance
O^3	ozone
OCAP	CVP/SWP Operations Criteria and Plan
OES	Office of Emergency Services
OPR	Governor's Office of Planning and Research
PAs	Project Agencies
PCL	Planning and Conservation League
PG&E	Pacific Gas and Electric Company
PL	Public Law
PM10	particulate matter 10 microns in diameter or less
Porter-Cologne	Porter-Cologne Water Quality Control Act
ppb	parts per billion
ppt	parts per thousand
PPV	Peak Particle Velocity
Programmatic EIS/EIR	CALFED Programmatic Environmental Impact Statement/Environmental Impact Report
Proposition 65	Safe Drinking Water and Toxic Enforcement Act of 1986
PTM	Particle Tracking Module
Public Notice	Public Notice 5820A, Amended

RBDD	Red Bluff Diversion Dam
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RMP	risk management plan
ROC	reactive organic compounds
ROD	Record of Decision
RPA	Reasonable Prudent Alternative
RT	round trip
RTOC	Regional Tribal Operations Committee
RWQCB	Regional Water Quality Control Board
RWWCF	Stockton Regional Wastewater Control Facility
SAP	sampling and analysis plan
SB	Senate Bill
SCVWD	Santa Clara Valley Water District
SCWA	Sacramento County Water Agency
SDIP	South Delta Improvements Program
SDWA	South Delta Water Agency
SET	standard elutriate tests
SFBAAB	San Francisco Bay Area Air Basin
SFEP	San Francisco Estuary Project
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SJVAB	San Joaquin Valley Air Basin
SJVDIP	San Joaquin Valley Drainage Implementation Program
SJVUAPCD	San Joaquin Valley Unified Air Pollution Control District
SMART	San Joaquin Regional Transit District
SR	State Route
SRA	State Recreation Area
SRFCP	Sacramento River Flood Control Project
SS	suspended sediments
State Water Board	State Water Resources Control Board
Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
SVWMA	Sacramento Valley Water Management Agreement
SVWMP	Sacramento Valley Water Management Plan
SWP	State Water Project
SWP Banks	SWP Harvey O. Banks Pumping Plant
SWPPP	stormwater pollution prevention plan
taf	thousand acre-feet
taf/yr	thousand acre-feet per year
TDF	Through-Delta Facility
TDS	total dissolved solids
THMs	trihalomethanes
TMDL	total maximum daily load
TNS	Summer Townet Survey
TOC	total organic carbon
tpy	tons per year
TRMFRP EIS	Trinity River Mainstream Fishery Restoration Program Environmental Impact Statement

UBC	Uniform Building Code
Union Island	Old River at the head of Middle River
USC	U.S. Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Plan
VELB	valley elderberry longhorn beetle
VOCs	volatile organic carbons
WAP	Water Acquisition Program
WAPA	Western Area Power Administration
WDRs	waste discharge requirements
Williamson Act	California Land Conservation Act of 1965
WMU	Waste Management Unit
WOMT	Water Operations Management Team
WQCP	Water Quality Control Plan
WTP	Water Treatment Plant
WY	water years
X2	the distance in kilometers of the 2-ppt isohaline from the Golden Gate Bridge
yds^3	cubic yards

Chapter 1

Introduction

Chapter 1
Introduction

This Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) consists of the Draft EIS/EIR for the South Delta Improvements Program (SDIP) as revised (see edits in Chapter 2 of this volume), the comments on the Draft EIS/EIR, and the lead agencies' responses to those comments. The public comment period for the Draft EIS/EIR was from November 10, 2005, to February 7, 2006. Comments on the Draft EIS/EIR were received through the California Department of Water Resources (DWR) SDIP website; and by mail, fax, email; and at public hearings.

Public Review Process

The public comment period for the SDIP Draft EIS/EIR began November 10, 2005, with an announcement of the availability of the Draft EIS/EIR. The formal public comment period closed February 7, 2006. Public meetings were held in Sacramento, Stockton, Oakland, Visalia, and Los Angeles, California, from December 6, 2005, to December 14, 2005. Public hearings were held in Sacramento, Stockton, and Los Angeles from January 24, 2006, to January 26, 2006. Both written and oral comments were received during these hearings.

The Draft EIS/EIR was filed with the U.S. Environmental Protection Agency (EPA). A Notice of Availability (NOA) describing the availability of the Draft EIS/EIR for public review and announcing the public hearing schedule was published in the *Federal Register* on November 10, 2005 (70 FR 68475). Additionally, the Draft EIS/EIR along with a Notice of Completion (NOC) was provided to the State Clearinghouse for distribution to interested state agencies, and an NOA was filed in every California County in which the project could have an effect. The NOA was also published in three newspapers: *The Sacramento Bee, The Los Angeles Times,* and *The San Francisco Chronicle*.

The Draft EIS/EIR was made available online at DWR's SDIP website, in several libraries throughout the State, and by request from DWR and U.S. Department of the Interior, Bureau of Reclamation (Reclamation). Approximately 2,000 copies were distributed, including CDs and paper copies. Approximately 18,000 comments were received during the public comment period. Public comments received during the public comment period and at the public hearings for the Draft EIS/EIR were considered and responded to during

preparation of this Final EIS/EIR. Responses to these comments are presented in this Final EIS/EIR.

NEPA and CEQA Compliance Steps

Although very similar, the final processes for completion of National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) compliance do differ. Therefore, each process is described separately below.

NEPA

The Final EIS/EIR will be filed with the EPA, and an NOA will be published in the *Federal Register* announcing the availability of the Final EIS/EIR. After a minimum 30-day waiting period, Reclamation will issue a Record of Decision (ROD) stating the decision and describing the alternatives considered; the environmentally preferable alternative; the factors considered with respect to the alternatives, environmental commitments, and mitigation measures to be applied to the action; any monitoring and enforcement program to be established; any significant comments received on the Final EIS/EIR; and responses to those comments.

CEQA

To certify the Final EIS/EIR, DWR must find that:

- the Final EIS/EIR has been completed in compliance with CEQA, and
- the Final EIS/EIR was presented to the decision-making body of the lead agency, and the decision-making body reviewed and considered the information contained in the Final EIS/EIR before selecting a project (State CEQA guidelines, Section 15090).

After DWR certifies the Final EIS/EIR, the Director will make the final decision regarding which project alternative, or portions thereof, are selected for implementation and adopt findings of fact regarding the significant effects identified in the Final EIS/EIR (State CEQA Guidelines, Section 15091). A statement of overriding considerations was not needed because changes or alterations have been required in, or incorporated into, the project that avoid or substantially lessen the significant environmental effect identified in the Final EIS/EIR. The findings must be based on substantial (factual) information in the record. DWR must also adopt a mitigation monitoring or reporting program that will ensure that the mitigation measures identified in the findings are implemented.

DWR will file a Notice of Determination (NOD) with the State Clearinghouse once it has approved the selected alternative. Filing the NOD begins a 30-day statute of limitations on court challenges to the approval under CEQA.

Responses to Comments

NEPA and CEQA regulations direct the lead agencies to respond to substantive public comments on a Draft EIS/EIR. All comments received during the comment periods are responded to in this Final EIS/EIR. The range of possible responses includes requiring specific mitigation measures, modifying alternatives, supplementing analyses, making factual corrections, and explaining why comments do not warrant further agency response. When there has been significant public response, the agency may summarize or consolidate similar comments, as long as all substantive issues are represented. This volume contains Master Responses that address common concerns expressed about SDIP, and responses to each individual comment on the Draft EIS/EIR.

Status of Related Programs, Issues, and Events

Several comments on the SDIP Draft EIS/EIR concern general topics or issues related to the policy-level planning and implementation by the state and federal agencies involved in the CALFED Bay-Delta Program (CALFED). These comments request an update on recent events and the status of activities that may be of general interest to stakeholders and individuals who are involved in the management and stewardship of the water and environmental resources of the Sacramento–San Joaquin River Delta (Delta). These general topics are important for understanding the relationship of the SDIP to other efforts to restore habitat, protect fish and wildlife, improve water quality, and provide adequate water supply for all beneficial uses in California.

The following descriptions of the programs, issues, and events that are directly related to the SDIP are provided in order to assist readers to better understand the overall water management and environmental resources protection context for the SDIP. However, these programs, issues, and events are independent of the SDIP evaluations and implementation decisions. The related programs, issues, and events are:

- CALFED Bay-Delta Program, CALFED Science, and the California Bay-Delta Authority
- Environmental Water Account
- Trinity River Restoration Implementation
- Anadromous Fish Restoration Program and Central Valley Project Improvement Act Implementation of b(2) Water
- Pelagic Organism Decline Investigations

- South Delta Temporary Barriers Program
- Vernalis Adaptive Management Program Implementation
- Water Use Efficiency and Conservation Programs
- Water Transfers and Long-Term Purchases
- Oroville Federal Energy Regulatory Commission Re-licensing
- Delta Cross Channel Re-Operation and the Through-Delta Facility Studies
- Tracy Fish Facility and Skinner Fish Facility
- Delta Improvements Package
- South Delta Salinity Objectives Compliance
- Implementation of the Contra Costa Water District Improvements at Veale Tract and Byron Tract
- Tom Paine Slough Diversions
- Jones Tract Levee Failure and Flooding, 2004
- San Joaquin River Water Quality Management
- Investigations of Delta-Mendota Canal Recirculation
- Delta-Mendota Canal–California Aqueduct Intertie Project

CALFED Bay-Delta Program, CALFED Science, and the California Bay-Delta Authority

The CALFED Bay-Delta Program is the collaboration among 24 state and federal agencies that began in 1995 to improve water supply reliability, water quality, levee stability and the ecological health of the San Francisco Bay/Sacramento–San Joaquin River Delta (Bay-Delta). In 2000, the collaboration drafted a 30-year master plan described in the CALFED Program ROD. This plan sets forth general goals and lays out a science-based planning process through which these collaborating agencies can implement better, more informed decisions on projects and programs affecting the Bay-Delta.

In 2002, the California Legislature passed the California Bay-Delta Authority Act, adopting the ROD's objectives as state policy and creating the California Bay-Delta Authority (CBDA) to coordinate and provide oversight for CALFED implementation. A general framework for implementing the CALFED Program was authorized by Congress in 2004 on behalf of CALFED's federal partners.

The CALFED agencies are accomplishing their individual responsibilities as well as cooperating in Bay-Delta monitoring, ecological investigations, proposed project environmental evaluations, habitat restoration planning, and permitting efforts. However, the CALFED Bay-Delta Program is in the midst of a transformation. Governor Schwarzenegger asked for a review of the program in

May 2005. He requested a fiscal review of expenditures, a management review of the coordination and oversight responsibilities, and a business review of contracting and reporting responsibilities. The results of these reviews were used by the Little Hoover Commission to suggest several changes in CALFED and CBDA. The likely future of CALFED is described in the "10-Year Action Plan" that was released in April 2006. Additional information about the reviews, recommendations, and subsequent implementation actions are available from the CALFED website, under the "Revitalizing CALFED" selection at:

<http://www.calwater.ca.gov>.

The CALFED 10-Year Plan (for years 2006–2015) is intended to refocus the CBDA and the other CALFED state agencies on solving major conflicts associated with Delta water supply, water quality, levee stability, and the environment. State responsibility for implementing the CALFED plan will be placed in the Resources Agency. The CALFED Science Program will be maintained as an independent review and integration staff that will work cooperatively with the established Interagency Ecological Program (IEP). The Ecosystem Restoration Program (ERP), along with the funding for competitive and agency-directed grants, will be transferred to and administered by California Department of Fish and Game (DFG). Additional information on the accomplishments of CALFED as well as the anticipated near-future actions can be found in the 2005 Annual Report, available on the website.

CBDA staff will serve the functions of program integration and coordination, strategic planning, program tracking, and support to the proposed new governance structure, the CALFED Leadership Council and Public Advisory Committee. CBDA science staff will recommend funding to research projects and provide analysis and support for the program's lead scientist and members of the Independent Science Board (ISB). A new Science Board has been appointed, and the 4th Biennial CALFED Science Conference is scheduled for October 2006.

The CALFED ROD identified nearly 300 separate actions to be completed during Stage 1 (first 7 years). CALFED's implementing agencies have recently identified a subset of the actions that will be managed more intensively through the CALFED process. These actions generally include those that have a direct link to problems and solutions in the Delta. Key actions to be implemented over the next 3 to 4 years include:

- implement ERP actions to protect and restore pelagic organisms and other Delta dependent at-risk species;
- complete the environmental review and implement the SDIP;
- complete the Delta Risk Management Study and develop an implementation plan and schedule for strengthening and protecting Delta levees;
- implement Delta Improvements Package (DIP) actions, which include the SDIP;
- implement San Joaquin River upstream salinity drainage management; and

- complete studies to provide information for the end of CALFED Stage 1 decisions (scheduled for the end of 2007).

Additional information on the specific tasks and priorities for each of the 11 CALFED programs can be found in the "Program Plan Year 7" documents, available on the website.

The protection of Delta resources into the future is being further considered in the development of an integrated and sustainable long-term vision for the Delta that will set its course for the next 100 years. The Resources Agency will develop an open, collaborative public process involving local government and stakeholders to create a 100-year vision for the Delta, including land use and transportation. Work on the Delta Vision process began in January 2006, with a framework to be completed by December 2006 and a completed Delta Vision by December 2007, to complement the CALFED Stage 1 evaluations.

A funding strategy has been developed based on existing State Bonds (approved by the public as Propositions 204, 13, and 50) and the new infrastructure bonds that will be on this year's ballot, as well as anticipated federal funding. During the first 4 years of ROD implementation, CALFED total funding was $2.5 billion, with a funding distribution of $1.2 billion local match; $1.1 billion state; and $242 million federal.

CALFED funding for the next 3 years has been identified. Approximately 75% of the funding needed to support near-term critical actions is already in place. The proposed additional funding includes existing bond funds, General Funds, federal appropriations in FY 2007–2008, and local match contributions from water users.

The environmental evaluation and implementation of SDIP were included in the CALFED ROD and remain a major anticipated action to improve conveyance and local water quality. The SDIP Stage 1 decision will allow the tidal gates and other local improvements to be implemented as one of the CALFED Stage 1 implementation actions. The further evaluation of SDIP Stage 2 alternatives for increased pumping limits will likely extend into the next CALFED implementation period. The SDIP remains an important part of the comprehensive CALFED ROD planning and implementation framework for multi-purpose actions within the Bay-Delta.

Environmental Water Account

The Environmental Water Account (EWA) is a cooperatively managed CALFED program intended to provide protection to the fish of the Bay-Delta Estuary through environmentally beneficial changes by increased flexibility in the operations of the State Water Project (SWP) and Central Valley Project (CVP) while providing water supply reliability for the Projects. Responsibility for implementing EWA rests with the National Marine Fisheries Service (NMFS),

U.S. Fish and Wildlife Service (USFWS), and DFG, as well as with Reclamation and DWR.

Fish protection is achieved by periodically curtailing project water delivery from the Bay-Delta to project water users south of the Delta and replacing it at a later date. EWA replaces project water through EWA assets. EWA assets consist of operational assets, which are acquired through changes in SWP and CVP operations, purchased assets, which are acquired through purchases from willing water sellers, and source shifting, which involves deferral of scheduled delivery of water allocations to willing participants. In addition, EWA can carryover debt into the following calendar year of up to 100 thousand acre-feet (taf).

The amount of water used by EWA for export reductions to protect fish in the first 5 years of EWA implementation were: 290 taf in 2001, 250 taf in 2002, 350 taf in 2003, 125 taf in 2004, and 340 taf in 2005. This is an average of about 250 taf each year.

For the first seven months of 2006, EWA has exercised water export cuts three times (April, May and June) with a total combined water volume of 148,300 acre-feet. EWA expects to make up for these cuts through a purchased asset of 62,000 acre-feet from Yuba County Water Agency (YCWA) and through sufficient operational assets to replace the rest of the cuts to the projects.

Currently EWA is funded through State of California Proposition 50 and federal funds. Reclamation, USFWS, and NMFS have received Congressional authorization to participate in EWA at least through 2011. However, continuation of EWA past 2007 requires NEPA and CEQA compliance, which is being met through an EIS/EIR expected to be complete in the fall of 2007. Because EWA is a specific CALFED program, more specific information about the EWA is available in the "EWA Program Plan Year 7" document, available from the CALFED website:

<http://www.calwater.ca.gov>.

The SDIP environmental evaluation of alternatives included the existing EWA program as part of the baseline conditions. The preferred mitigation for potential increased entrainment impacts on fish because of the increased SDIP Stage 2 pumping limits would rely on an expanded (enlarged) EWA program. If the long-term implementation of EWA is similar to the existing EWA program, the SDIP Stage 2 mitigation will include avoidance and crediting measures that will increase the EWA assets sufficiently to reduce entrainment impacts to less than significant. For a description of theses avoidance and crediting measures, please see Master Response E, *Reliance on Expanded Environmental Water Account Actions for Fish Entrainment Reduction*, in Chapter 3, "Master Responses."

Trinity River Restoration Implementation

The Trinity River Restoration Program (TRRP) is currently based on the December 19, 2000 ROD. The fishery restoration flow schedule for Water Year 2006 was the second one prepared since the U.S. Court of Appeals for the Ninth Circuit (Ninth Circuit) denied petitions for a rehearing filed by Westlands Water District and the Northern California Power Agencies on November 5, 2004. This years' schedule was designed to meet Extremely Wet water year objectives outlined in the ROD and will include a peak release of 10,000 cubic feet per second (cfs).

Additional floodplain structure modifications will be completed by spring 2007 to allow peak releases of 11,000 cfs (full capacity for an Extremely Wet water year). The first of 47 channel rehabilitation sites was completed in November 2005, resulting in a three-fold increase in juvenile salmon rearing habitat at that project location which is over one mile in length. Five additional projects will be constructed in 2006, with the remaining Phase 1 sites (24 total) completed by 2008. Monitoring and evaluation activities are continuing, with emphasis on finalizing an integrated monitoring plan and completing a baseline assessment of anadromous fish habitat for the upper 40 miles of river.

The TRRP ROD is being fully implemented by Reclamation. SDIP Stage 2 evaluations indicate that there will be no significant impacts on the CVP operations of the Trinity River Division because the Trinity River restoration flows will be provided in all years, and carryover storage of Trinity Reservoir will be maintained at existing levels to preserve the required coldwater releases from Lewiston Reservoir. For a more complete discussion of the SDIP evaluation of potential environmental impacts on the Trinity River, please see Master Response N, *Trinity River Operations*, in Chapter 3, "Master Responses."

Anadromous Fish Restoration Program and Central Valley Project Improvement Act Implementation of b(2) Water

Reclamation continues to annually dedicate and manage 800,000 acre-feet of water pursuant to Section 3406(b)(2) of the Central Valley Project Improvement Act (CVPIA). In water year 2005, approximately 675,000 acre-feet of water were used for fishery purposes and about 125,000 acre-feet were carried over to 2006 as part of a pilot banking program. In 2006, the accounting of the fishery actions will most likely total less than 800,000 acre-feet because of high runoff conditions. Reclamation and USFWS are currently evaluating the fishery needs and wildlife and habitat restoration needs for the remainder of the year. Any remaining water under the 800,000 acre-feet may be either banked or made available for other project purposes.

The management of the CVPIA b(2) water by the Anadromous Fish Restoration program (AFRP) is important for the SDIP because the baseline conditions were assumed to include upstream releases and export curtailment at the CVP Tracy Pumping Plant during the Vernalis Adaptive Management Plan (VAMP) periods and at other times needed for fish protection. The existing management of this water is included in the CALSIM modeling. The SDIP will have no effect on the management of the CVPIA b(2) water.

Pelagic Organism Decline (POD) Investigations

The recent decline of numerous pelagic (open water) fish in the upper San Francisco estuary (Delta and Suisun Bay) as reported by the IEP led to the formation of the Pelagic Organism Decline (POD) Work Team to evaluate the potential causes of reduced catch in the fall mid-water trawls and other fish surveys. Although several species show evidence of long-term declines, recent low levels were unexpected given the relatively moderate runoff flows over the past several years. The species of concern include the delta smelt, age-0 striped bass, longfin smelt, and threadfin shad.

An initial 2005 evaluation to provide insight into the best lines of inquiry for 2006–2007 studies was completed by the POD Work Team. The studies are an interdisciplinary, multi-agency effort consisting of staff from DFG, DWR, Reclamation, EPA, the U.S. Geological Survey (USGS), CBDA, San Francisco State University (SFSU), and the University of California at Davis (UC Davis). The major findings through 2005 were synthesized using two conceptual modeling approaches:

- First, a species matrix model was developed to examine which stressors (entrainment, toxic effects on fish, toxic effects on food sources, harmful algal blooms, clam *Corbula* effects on food availability, and disease and parasites) were most likely to be important.
- Second, narrative explanations were constructed for recent abrupt declines in abundance of pelagic species in the context of their long-term trends or previous patterns. Thus far two narrative models have been developed, the Winter Entrainment Hypothesis and the Bad Suisun Bay Hypothesis. The Winter Entrainment Hypothesis focuses on sources of mortality from water diversions for exports, in-Delta uses, and power plant cooling in the central and southern Delta. The Bad Suisun Bay Hypothesis focuses on food web effects in Suisun Bay and the west Delta.

The POD plan is to evaluate and refine data for the conceptual models. Expansion of existing monitoring (five expanded surveys), ongoing studies (19 studies) and new studies (15 studies) are planned for 2006–2007. The estimated cost of these studies is $3.7 million annually. Project components were selected based on their ability to evaluate the conceptual models and the feasibility with respect to methods, staffing, costs, timing, and data availability.

The study design of the matrix models is based on temporal, spatial, and species contrasts for selected fish and zooplankton. Various variables will be evaluated for each contrast, including abundance, growth rate and fecundity, feeding success, condition factor, parasite load, and histopathology. The data will be collected at one time so the relative importance of the different stressors can be evaluated.

The narrative models suggest linkages among different stressors and pathways to produce observed declines of more than one species. The work plan for evaluating the narrative models emphasizes analyses of the proposed linkages among stressors.

The POD Work Team will develop, direct, review, and synthesize the results of the study efforts. A wide range of products and deliverables will be developed, including management briefs, publications and reports, web-based monitoring data, and presentations at conferences, workshops, and meetings.

For more information go to the POD overview link on the CBDA website:

<http://science.calwater.ca.gov/pod/pod_index.shtml>.

The POD efforts are directly linked with the SDIP evaluations because one of the narrative POD models suggests that increased exports at the CVP and SWP pumping plants may be a major factor in the recent decline of these pelagic fish species. DWR and Reclamation have decided, therefore, to implement the SDIP in two stages. For more discussion of the connection between the POD evaluations and the SDIP, please see Master Response B, *Relationship between the South Delta Improvements Program and the Pelagic Organism Decline*, in Chapter 3, "Master Responses."

South Delta Temporary Barriers Program

The South Delta Temporary Barriers Program, initiated as a test project in 1991 and extended for 5 years in 1996 and again for 7 years in 2001, was partially in response to a 1982 lawsuit filed by the South Delta Water Agency (SDWA). Although the South Delta Temporary Barriers Program has been in place since 1991, the Middle River barrier and the fall head of Old River barrier have been installed in earlier years under different programs. The project consists of four rock barriers across South Delta channels.

Of the four rock barriers, the head of Old River barrier serves as a fish barrier and has been in place most years since 1963 between September 15 and November 30. It also has been installed in the spring between April 15 and May 30 since 1992 (although high San Joaquin River flows prevented installation in 1993, 1995, 1998, 1999, 2005, and 2006).

Three barriers serve as agricultural barriers and are installed between April 15 and September 30 of each season. The Old River near Tracy barrier (ORT) has

been installed since 1991, and the Middle River barrier (MR) has been installed since 1987. A rock barrier in Grant Line Canal (GLC) was first installed in spring 1996. The four rock barriers were not installed in 1998 because of high San Joaquin River flows.

Objectives of the program are to:

1. increase water levels, circulation patterns, and water quality in the southern Delta area for local agricultural diversions, and
2. improve operational flexibility of the SWP to help reduce fishery impacts and improve fishery conditions.

Water levels and water circulation in the south Delta have improved with agricultural barrier installation. Migration conditions for San Joaquin River salmon have improved when the head of Old River barrier has been installed. Consequently, and if other actions are not taken, it is essential to continue barrier installations to protect San Joaquin River salmon migrating through the Delta, and to provide an adequate agricultural water supply for south Delta farmers. An adequate agricultural water supply must satisfy quantity, quality, and channel water levels to meet the reasonable and beneficial needs of water users in the SDWA.

Continued installation of the barriers will allow DWR to maintain the current level of water quality protection for south Delta agricultural users until a permanent solution is implemented. The Temporary Barriers Program is included in the SDIP baseline. For more discussion of how the water quality in the south Delta is influenced by the Temporary Barriers Program, please see Master Response G**,** *No-Barriers Conditions Compared with the No-Action Baseline*, in Chapter 3, "Master Responses." The SDIP Stage 1 permanent tidal gates will replace the Temporary Barriers Program. Operations of the tidal gates will be more flexible than operations of the temporary barriers. For more discussion of how the tidal gates would be operated, please see Master Response O**,** *Gate Operations Review Team*, in Chapter 3, "Master Responses."

Vernalis Adaptive Management Program Implementation

Water year 2006 was the seventh year of the 12-year VAMP implementation, which is a component of State Water Resources Control Board (State Water Board) water rights decision 1641 (D-1641). The San Joaquin River Agreement (SJRA) commits Reclamation and DWR to fund water purchases to meet flow targets for VAMP. Under the SJRA, Reclamation and DWR agreed to spend up to $3 million and $1 million, respectively, per year to purchase VAMP water. In 2005 and 2006 generally wet conditions in the San Joaquin River basin resulted in relatively high flow conditions in the spring. Due to these high flows, DWR was unable to install the temporary head of Old River Barrier. Additionally, the flow in the San Joaquin River at Vernalis exceeded the maximum VAMP target

flow of 7,000 cfs; therefore no supplemental water was provided by the San Joaquin River Group Authority (SJRGA) agencies. In 2006, Reclamation and DWR operated to maintain combined exports at about 1,500 cfs for the first half of the VAMP period and about 6,000 cfs for the second half. Table 1-1 summarizes the San Joaquin River flows at Vernalis, the supplemental VAMP pulse flow volumes, and the combined CVP and SWP export pumping during the VAMP periods for 2000–2006.

Table 1-1. VAMP Flow and Export Conditions for 2000–2005

Year	VAMP Period	Vernalis Flow (cfs)	VAMP Volume (taf)	VAMP Flow (cfs)	Combined Export (cfs)
2000	April 15–May 15	5,869	78	1,270	2,155
2001	April 20–May 20	4,220	79	1,287	1,420
2002	April 15–May 15	3,300	33	538	1,430
2003	April 15–May 15	3,235	58	943	1,446
2004	April 15–May 15	3,155	66	1,072	1,331
2005	May 1–May 31	10,390	0	0	2,986

Additional information about VAMP can be found on the SJRGA website:

<http://sjrg.org>.

The VAMP program includes increased San Joaquin River flows and reduced CVP and SWP export pumping during this 30-day period in April and May. These VAMP flows and export reductions are included in the SDIP baseline, and in each of the Stage 2 operational alternatives. The VAMP period will remain important for fish protection because this is the period when the majority of the San Joaquin River fall-run Chinook salmon migrate down the river into the Delta. The SDIP will replace the temporary barrier at the head of Old River with a permanent tidal gate that might be operated (partially closed) for longer periods in the spring and fall to protect juvenile and adult migration.

Water Use Efficiency and Conservation Programs

To meet the needs of California's projected population of 48 million in the year 2030, the State's water supply must be augmented and made more efficient. Water conservation, recycling, desalination, trading and storage of surface and groundwater are components that will be needed to successfully manage the State's overall water supply. Currently, California is recycling approximately 700,000 acre-feet of water per year for various uses. California has the potential to recycle up to 1.5 million acre-feet per year of water by the year 2030. This could free up freshwater supplies to meet approximately 40% of the household water needs associated with projected population growth. However, to achieve

that potential, Californians will have to invest nearly $11 billion (approximately $400 million annually) for additional infrastructure to produce and deliver the recycled water.

The DWR Office of Water Use Efficiency and Transfers (OWUET) provides support for the stewardship of California's water resources, energy efficient use of water and the safe use of recycled and desalinated water. In addition to providing statewide coordination and technical assistance to water recycling and desalination activities, OWUET is responsible for water use efficiency planning and coordination, providing technical information, resources evaluation, and financial assistance. The California Irrigation Management Information System (CIMIS) collects weather data from over 120 stations and calculates reference evapotranspiration (ET) to assist landscape and crop managers irrigate efficiently. The OWUE conducts data analysis, demonstration projects, and research to achieve energy and water use efficiency, and provides loans and grants to make more efficient use of water.

The main methods for increasing agricultural use efficiency are irrigation scheduling and return systems. Using a more scientific scheduling (CIMIS) can decrease the amount of water applied while improving yield. To provide adequate water to the low end of the field, surface irrigation requires that a certain amount of water be spilled. Return systems catch this runoff and pump the water back to the top of the field. On-farm water savings have been estimated at 10–15% of previously applied water.

The most common recycled water uses include: (1) landscape irrigation uses; (2) industrial uses; (3) agricultural uses; and (4) aquifer recharge uses along the coast to control seawater intrusion. Groundwater aquifers have been recharged with recycled water in California since the 1960s. The California Department of Health Services (DHS) requires advanced treatment of recycled water before it is used to recharge groundwater aquifers. These treatment requirements are more restrictive than the typical requirements for discharges to inland surface or coastal waters.

Assembly Bill No. 331 (2001) required the creation of the 2002 Recycled Water Task Force (Task Force) to identify constraints, impediments, and opportunities for the increased use of recycled water. Representatives of federal, State, and local agencies, private entities, environmental organizations, universities, concerned individuals and public-interest groups were appointed to the 40-member Task Force in April 2002. DWR, the State Water Board, and the DHS provided technical assistance to the Task Force. The Task Force devoted considerable attention to issues surrounding public health and the need for increased education and outreach related to scientific research about recycled water. Financial incentives for the local development of water recycling projects (i.e., Propositions 13 and 50 loan and grant programs) have been an effective tool for the construction of water recycling facilities and infrastructure. The Water Recycling Task Force Final Report is available at:

<http://www.owue.water.ca.gov/recycle/docs/TaskForceReport.htm>.

Water recycling is an important issue for the SDIP Stage 2 evaluations because the need for the Stage 2 increases in SWP diversion limits may depend on the future demand for water. If the potential for recycling municipal wastewater is large enough, the SWP contractor water demands may not be as great as expected in the future. However, as indicated in the Task Force findings, even the most optimistic projections of water recycling (1.5 million acre-feet [maf] in 2030) would only help to reduce the rate of growth in urban water demand. It is therefore likely that the SDIP Stage 2 assumptions about future SWP contractor demand will continue to be reasonable.

Water Transfers and Long-Term Purchases

Reclamation, DWR and the State Water Board implemented the CALFED Water Transfer Program until 2006, when it was designated as a coordinated action and eliminated from the CALFED program. DWR now coordinates water transfers through the OWUET.

In 1991 (a critical year), about 800,000 acre-feet were purchased by the DWR Drought Water Bank. Governor Wilson established the DWR Emergency Drought Water Bank as the purchaser of water for all parties who wished to participate in water transfers across the Delta. Less amounts of water were transferred in subsequent Water Banks through 1994. Beginning in 1995 California experienced a series of wetter-than-normal years, and the need for water transfers decreased substantially.

In 2001 and 2002 moderate water transfers for EWA and other CALFED agencies were made through the Delta without the controversy experienced in the past. In 2001 (a dry year) over 600,000 acre-feet of water were transferred. In 2002 (a below normal year) over 300,000 acre-feet were transferred. Water transfers have been lower in the recent wet years. Water transfers to CVP and SWP water contractors are more likely in normal and dry years. Water transfers to EWA, CVPIA, and VAMP may be needed in all years.

Water transfers are expected to increase in the future. Water transfers are important for the SDIP Stage 2 evaluation because increased pumping limits will allow more water transfers to occur in the summer period of July–September when fish densities for many of the species of concern are lowest.

Oroville Federal Energy Regulatory Commission Re-licensing

The Oroville Federal Energy Regulatory Commission (FERC) re-licensing program began with initial planning in 1997. DWR chose to follow FERC's Alternative Licensing Procedure, which is a collaborative process undertaken by

the licensee to involve federal, state, and local stakeholders in the broad balancing of resources. Public outreach was started in 2000.

Work groups collaboratively identified 71 specific studies and formulated study work scopes that resulted in more than 160 individual technical reports. These reports encompass roughly 35,000 pages of data, information, analyses, and conclusions relating the ongoing operation of Oroville to all the major resource areas.

Pursuant to the FERC mandate that applicants must file an application for a new license 2 years prior to the expiration of their existing license, DWR filed an application for a new license with FERC in late January 2005. The seven-volume, 5,000-page application included a Preliminary Draft Environmental Assessment that FERC will use to develop their NEPA EIS.

On a parallel track with the work group efforts outlined above, DWR began intense Settlement Negotiations in April 2004. The settlement negotiations process resulted in a signed Settlement Agreement with 51 stakeholder organizations in March 2006. The signing parties include all of the major regulatory and resource agencies and a multitude of local and non-governmental organizations.

The Settlement Agreement outlines a plan to balance resources at the Oroville Facilities for the next 50 years. This includes comprehensive plans or programs to protect and enhance the environment, recreational resources, and cultural resources while maintaining the important SWP purposes and functions. Overall, the Settlement Agreement is estimated to exceed $1 billion in a wide array of protections, mitigation, and enhancements for these resources. The signed Settlement Agreement has been submitted to FERC with all the signing parties endorsing and requesting that FERC propose new license terms and conditions that are consistent with the Agreement.

FERC is expected to issue a draft EIS in fall 2006 that will delineate FERC's proposed action for a new Oroville Facilities license. On a parallel path, DWR will be releasing a draft EIR that will delineate the Settlement Agreement as the preferred alternative. The EIR is intended to meet the requirements of obtaining a Clean Water Act (CWA) Water Quality certification from the State Water Board.

The Oroville re-licensing agreement is important for the SDIP because Oroville Reservoir is the major SWP storage facility located upstream of the Delta. The SDIP Stage 2 operations alternatives may influence operations of the Oroville facilities. However, many local agreements and commitments also control the operations of Oroville Reservoir. As a result of these local controls, the evaluation of SDIP Stage 2 alternatives in the Draft EIS/EIR indicates that no significant changes in Feather River flows or temperatures will be caused by the SDIP changes in the SWP Harvey O. Banks Pumping Plant (Banks) diversion limits.

Delta Cross Channel Re-Operation and the Through-Delta Facility Studies

The CALFED Stage 1 strategy for the conveyance program is to develop a through-Delta conveyance alternative based on the existing configuration of the Delta, with some modifications. The SDIP is the initial modification in the south Delta channels, and the combination of Delta Cross Channel (DCC) re-operations and a proposed 4,000-cfs Through-Delta Facility (TDF) are the major modifications for the north Delta. DWR and Reclamation are the implementing agencies for these conveyance program actions. The evaluations for the DCC re-operation and the proposed TDF are considered top priorities for state fiscal year 2006–2007 and federal fiscal year 2007 (CALFED Conveyance Program Plan Year 7).

The DCC is closed (both gates) to prevent local scour and reduce flooding on the lower Mokelumne River when flows on the Sacramento River exceed about 25,000 cfs. The DCC is also closed for protection of migrating Chinook salmon and steelhead. Closing the DCC reduces the diversion of Sacramento River water into the central Delta. Under D-1641, the DCC is closed from February 1 to May 20, and for an additional 45 days between November 1 and January 31 and 14 days between May 21 and June 15 (about half the time). Reclamation determines the closure days after consulting with DFG, USFWS, and NMFS.

The DSM2 model indicates that DCC closure generally reduces the diversion into the central Delta by about 20% of the Sacramento River flow. For example, if the Sacramento River flow is 20,000 cfs, the diversion with the DCC open is about 5,000 cfs (25%) in the DCC and 3,000 cfs (15%) in Georgiana Slough. With DCC closed, the Georgiana Slough diversion is about 4,000 cfs (20%). Closure of the DCC therefore reduces the total diversion from about 40% to 20% of the Sacramento River flow. However, DCC closure may produce a salinity impact by reducing the net San Joaquin River flow near Jersey Point and Antioch and allowing more salinity intrusion into Franks Tract. DCC closure also may cause more juvenile fish near Antioch or the confluence of the San Joaquin and Sacramento Rivers to be transported upstream toward Franks Tract. (See pages 5.2-9 and D-36 in the SDIP Draft EIS/EIR for more information about the DCC and Georgiana Slough).

To assess possible effects of DCC gate operations on migrating adult Chinook salmon, the USGS, Reclamation, DFG, and USFWS collaborated on a pilot study in 2000. The purpose of this pilot study was to compare abundance and migration timing of adult Chinook salmon in the Sacramento River, DCC, and Georgiana Slough with the DCC gates open and closed using hydroacoustic, sonic tagging, and fyke trap data. The pilot study was expanded in 2001 by increasing sampling effort and duration. A combination of tidal hydraulic and water quality modeling together with intensive tidal flow and electrical conductivity (EC) data collection throughout the central Delta channels by the USGS is being used to evaluate the effects of DCC closure and possible re-operation. The USGS will be conducting experimental measurements of the

secondary currents and juvenile fish movement patterns in the Clarksburg bend, located upstream of the DCC, during fall 2006. The results of these initial DCC investigations are being used to plan an even more extensive series of flow, EC, and juvenile fish movement measurements during 2007.

Possible DCC re-operation alternatives might involve (1) opening at least one gate during low-flow conditions (to reduce salinity effects), (2) diurnal or tidal cycle opening (to allow some diversions when fish are reduced in density), (3) upstream flow baffles (dikes) to redirect fish away from the DCC gates, or (4) possible fish screens in front of (or attached to) the DCC gates.

The proposed TDF as generally described in the ROD was envisioned to be a flat plate fish screen on the left bank near Hood, with a pumping facility to convey 4,000 cfs to the South Fork of the Mokelumne River (near Beaver Slough). DWR will prepare an initial engineering report for the TDF during 2007. Preliminary salinity modeling of a combination of historical DCC operations and the TDF indicate that substantial improvement in south Delta EC can be achieved. The 4,000-cfs TDF would actually increase the total diversion from the Sacramento River by about 2,000 cfs when the DCC was open (summer and fall) and by about 3,000 cfs when DCC was closed (winter and spring). A combined strategy for operating the DCC and TDF (with variable flow) will be developed at the end of the series of water quality and fish tracking experiments that are planned for 2007. The combined Stage 1 report will be available at the end of 2008. A technical work group, coordinated by CALFED Science, directs these DCC (and TDF) investigations and evaluations.

Tracy Fish Facility and Skinner Fish Facility

The Tracy Fish Collection Facility (TFCF) is undergoing continued research efforts to further analyze the facility for improvements in salvage operations. Included are changes in facility operations for species of interest (e.g., delta smelt), improvements in trucking and handling, and better management of predator species in the facility. Also included in current plans related to physical changes/improvements to the facility are acquisition of improved trashrack and louver cleaning equipment, construction of a new secondary system for improved hydraulic control, and construction of additional fish release sites for delta smelt.

The CALFED ROD identified the replacement of the existing CVP and SWP fish salvage facilities as a major objective to restore and protect fisheries resources. Delta salvage facilities require the collection, handling, transport, and release (CHTR) of fish away from the influence of the export pumps. Concerns that CHTR processes may adversely affect the survival of salvaged delta smelt and limit the benefits of new fish screening facilities led to a comprehensive program designed to investigate the impacts of CHTR on salvaged delta smelt and assess the potential benefits of improved CHTR technologies. Results of the CHTR studies will be used to assess the ecological role of entrainment loss, identify opportunities for facility improvements, and determine the feasibility of modern fish screening facilities as an ecosystem restoration option. Three aspects of fish

response during CHTR are being studied by DFG, with funding as a CALFED directed action.

Acute Mortality

One aspect of the CHTR study measured the acute mortality and injury rates of cultured and wild adult and juvenile delta smelt at the SWP Skinner salvage facility in 2005 and 2006. The field data collection was completed in July 2006. Known numbers of marked cultured delta smelt were injected at two points in the CHTR process, test fish were exposed to routine operational conditions, and then these fish were recovered. Surviving test fish were held in controlled conditions and observed over a 48-hour period. Injury assessments were performed on all mortalities and a subsample of the surviving fish. Repeated trials were conducted throughout the adult and juvenile delta smelt entrainment periods (winter-spring) using the experimental releases and appropriate controls. Preliminary results for adults indicate relatively high survival for adult delta smelt with relatively low injury rates. Juvenile studies yielded highly variable survival rates for juvenile delta smelt.

This study will provide the first detailed assessment of delta smelt survival in the SWP salvage facilities. Results will help assess export entrainment loss, identify opportunities for facility improvements, and determine the feasibility of modern screening and salvage facilities as an ecosystem restoration option. The study is in the data analysis and report writing phase. A draft IEP Technical Report is scheduled for April 2007, with the final report expected in July 2007.

Predation

Fish predation is an unmeasured portion of entrainment loss associated with the SWP and CVP export facilities. Predation on listed species during the CHTR portion of the fish salvage process was expected because predators and prey are concentrated and held at unnaturally high densities. Two studies were conducted to assess the occurrence and magnitude of predation in the CHTR phase at the SWP Skinner salvage facility. Predatory fish were sampled at two points of the CHTR process and stomach contents were analyzed. Predator selectivity rates for prey and seasonal effects of physical parameters on predation rates (temperature, dissolved oxygen [DO], EC, water clarity, and debris) were examined. Digestion rate experiments using captive predators fed representative prey fish were conducted concurrently to develop indices for determining when fish were consumed. Both studies were done during spring 2005 and winter 2006 seasons.

These studies provide the first quantitative assessment of predation during the CHTR process. Preliminary stomach analyses from the spring 2005 and winter 2006 seasons both suggest that the mean occurrence of fish eaten did not change significantly through the CHTR process and physical-chemical factors did not

significantly influence predation rates. Predators, including striped bass (*Morone saxatilis*), showed a slight prey selectivity for Chinook salmon (*Oncorhynchus tshawytscha*) and delta smelt (*Hypomesus transpacificus*). All field and lab work has been completed, and data analysis and report writing is underway. The scheduled date for the final CALFED report is April 2007.

Stress

Unfavorable conditions associated with CHTR (i.e., crowding or handling) may produce a stress response in fish, which, if excessive, may result in reduced fitness or higher mortality rates. A stress assessment protocol was designed to test fish stress responses to existing and planned CHTR processes. The primary research goal was to develop methods for measuring stress impacts in the CHTR phases at the existing SWP fish salvage facility. The final goal is to recommend specific methods for assessment of current or future research/fish screening facilities. Data on stress response during collection and handling (CH) and transport and release (TR) phases. Stress was assessed by collecting blood plasma from adult delta smelt, wild and cultured, up to 48 hours after CHTR exposure. Plasma samples collected were analyzed at UC Davis's Endocrinology lab for the stress hormone cortisol. Blood hematocrits and glucose and lactate data were also collected. Preliminary results reveal new information about the significance of stress during CHTR and may show differences between stress levels in portions of the salvage processes. A final report on this work will be available by April 2007.

Improvements at the CVP Tracy and SWP Skinner fish facilities are directly related to the SDIP because these facilities are the major mitigation measures for the entrainment losses of fish caused by the existing CVP and SWP export pumping. Improvements at these fish salvage facilities that could increase the survival of fish during handling or reduce predation of fish would be beneficial to the overall protection of several fish species.

Delta Improvements Package

The CALFED Delta Improvements Package (DIP) outlines coordinated actions related to water project operations in the Delta that will result in increased water supply reliability, improved water quality, environmental protection and ecosystem restoration, protection of the Delta levee system, and analyses and evaluation to support improved real-time and long-term management. More information about the DIP can be obtained from the CALFED website at <http://calwater.ca.gov> under the DIP.

In response to concerns about the coordinated CALFED planning and implementation, the state and federal agencies began to develop the DIP during the fall of 2003. The implementation plan was finalized in August of 2004. The purpose of this Delta Improvements Package Implementation Plan is to clarify

the roles, responsibilities, and commitments of the state and federal agencies in the implementation of programs, projects, evaluations, and other undertakings focused on the Delta region that advance the CALFED Bay-Delta Program goals in the areas of water supply reliability, water quality, ecosystem restoration, Delta levee integrity, and science, consistent with the CALFED Program's principle of balanced implementation.

The major DIP conveyance actions include the SDIP and the Delta-Mendota Canal/California Aqueduct (DMC/CA) Intertie Project. The DMC/CA Intertie Project status is described in a separate update section below.

The major DIP water quality actions were the two drainage relocation projects for CCWD intakes, compliance plans for the San Joaquin River at Vernalis and south Delta salinity objectives, and a general salinity management plan for the San Joaquin River. These water quality actions are described in separate update sections.

Another DIP water quality action is a management plan for the low DO in the Stockton Deep Water Ship Channel (DWSC), which includes the construction and demonstration of a DO aeration device in the Stockton DWSC. The DO demonstration project is being implemented by DWR and is in the final stages of construction. The demonstration aeration device uses liquid oxygen as the source of oxygen gas to inject small bubbles into two well devices (200 feet deep) where the high hydrostatic pressure allows most of the oxygen gas to dissolve. Each device consists of two concentric tubes, with the water and gas bubble flowing down the center 20-inch-diameter tube and then up the 30-inch-diameter outer tube. Two screened pumps with a flow capacity of 25 cfs pump river water into the wells and then discharges the water back into the DWSC through a multi-port diffuser located at a depth of 15 feet. The DO concentration will be about 45–50 milligrams per liter (mg/l) at the diffuser and will mix rapidly in the diffuser jets and be tidally transported throughout a 2-mile length of the DWSC. Monitoring of the DO response in the DWSC will be conducted during the 3-year demonstration period. Because of the high natural variation in DO concentrations, the aeration device will be operated for several days and then turned off for a few days, to determine the DO response in the DWSC. The device will be operational in spring 2007 and is designed to deliver 10,000 pounds per day (lb/day) of DO to the DWSC, which is enough to raise the DO by 1.0 mg/l within a 2-mile section of the DWSC each day of operation. The design, construction, and 3-year demonstration will cost about $7 million.

Three other DIP water quality actions are the DCC reoperation and through-Delta facility, evaluation of Franks Tract salinity management, and possible relocation of the Los Vaqueros intake to Victoria Canal. These evaluations and feasibility studies are underway.

The DIP environmental protection actions include the long-term EWA and the ESA compliance evaluations for the OCAP and the SDIP. An EIR/EIS for the long-term expanded EWA is being prepared by Reclamation and DWR.

The DIP science actions include EWA review panels and workshops and studies of the south Delta hydrodynamics and the fish facilities. The 2005 EWA Review Panel was focused on the POD.

The DIP is important for the SDIP because it identifies several commitments by Reclamation and DWR before SDIP Stage 2 (8,500 cfs operations) can be approved and implemented. These commitments include the south Delta tidal gates (i.e., SDIP Stage 1) and the long-term EWA implementation. Reclamation and DWR are conducting the necessary environmental evaluations and ESA commitments, and are proceeding with the feasibility studies that are described in the DIP. Approval and implementation of SDIP Stage 1 tidal gates and dredging will be a major accomplishment that was identified in the DIP, as well as in the original CALFED ROD.

South Delta Salinity Objectives Compliance

DWR and Reclamation are responsible for implementing water quality salinity objectives in the Delta pursuant to State Water Board water rights D-1641. They monitor EC at several Delta locations and adjust Delta inflows and exports to the extent possible to help provide necessary Delta outflows to meet requirements for implementing the salinity (EC) objectives listed in Table 1 (for municipal and industrial [M&I] beneficial uses), Table 2 (for agricultural uses), and Table 3 (for fish and wildlife beneficial uses) in water rights decision D-1641. Reclamation generally releases water from New Melones Reservoir to regulate the EC of the San Joaquin River to satisfy the EC objectives at Vernalis, as required under D-1641.

The south Delta salinity objectives for agricultural uses are specified at (1) San Joaquin River at Vernalis, (2) San Joaquin River at Brandt Bridge site, (3) Old River near Middle River, and (4) Old River at Tracy Boulevard (Road). Each of these sites is monitored with 15-minute EC data that are sent to the California Data Exchange Center. Compliance is determined with a 30-day running average value. The EC objectives at Vernalis are 0.7 milliSiemens per centimeter (mS/cm) for April–August of all water year types, and 1.0 mS/cm for September–March of all water year types. Footnote 5 of Table 2 (in D-1641) indicates that these same EC objectives are effective at the three other south Delta stations beginning in April 2005. Interim objectives at the three sites were specified as 1.0 mS/cm for all months of all water year types.

The State Water Board issued a Cease and Desist Order (Order) on May 3, 2005 to Reclamation and DWR, for the “threatened violation” of their water right permit and license conditions requiring compliance with salinity objectives in the interior southern Delta. DWR and Reclamation are meeting the requirements of the Order. The Order requires DWR and Reclamation to maintain accurate EC data from the three south Delta compliance locations, report any potential or actual violations to the State Water Board executive director, and submit a compliance plan and prepare quarterly updates on implementation of the tidal

gates (SDIP Stage 1) to achieve full compliance with the 0.7 mS/cm objective by April 2009.

The SDIP Stage 1 tidal gates are necessary to allow control of salinity at the Old River stations. DWR and Reclamation have provided information to the State Water Board showing that operations of the proposed permanent operable gates are the most feasible method for controlling salinity at these stations.

Implementation of the Contra Costa Water District Improvements at Veale Tract and Byron Tract

Contra Costa Water District (CCWD) completed the implementation phase of the Old River (Byron Tract) and Rock Slough (Veale Tract) Water Quality Improvement project in June 2006. Funding for the related studies and construction of the project came from state bond funds ($4.8 million from Proposition 13) and SWP water contractors ($710,000). Actions included the completion of environmental compliance, permitting, design, and construction of (1) a new agricultural drainage pump station and discharge outfall diffuser from Byron Tract to Old River and (2) a new agricultural drainage pump station and discharge from Veale Tract to Indian Slough.

The Bryon Tract component was completed in cooperation with the Town of Discovery Bay (Reclamation District 800 [RD800]). The new pump station and diffuser provide improved dispersion of relatively high salinity agricultural water discharged into Old River from RD800. The result of the improved dispersion is improved water quality in the adjacent CCWD Old River intake water.

The Veale Tract component includes a new pump station on the southern boundary of Veale Tract, discharging into Indian Slough, which receives all agricultural drainage previously discharged into Rock Slough. The new discharge location results in no discharge of drainage water into Rock Slough and improved water quality in the Contra Costa Canal (CCC).

Additional CALFED program work is being performed by CCWD on the Contra Costa Canal Replacement Project. This Proposition 13–funded project includes environmental compliance, permitting, and design for the replacement of the canal with a pipeline from Rock Slough to Pumping Plant #1, to eliminate seepage of higher salinity agricultural drainage water into the canal.

CCWD has estimated that these projects will provide water quality benefits of reduced chloride at CCWD intakes and potential water supply benefits from reduced water releases from state and federal reservoirs to meet D-1641 water quality objectives. CCWD estimates that once all three projects are completed, an average reduction of about 3 mg/l chloride (about 15 microSiemens per centimeter [µS/cm] EC) will be achieved at the Contra Costa Canal Pumping Plant #1, and an average reduction of about 1 mg/l chloride (about 5 µS/cm) will be achieved at the Old River intake.

These water quality improvements for CCWD are important for the SDIP because the analysis of the SDIP Stage 1 tidal gates shows a slight increase in salinity at the Old River intake location. This result is attributable to more San Joaquin River water flowing past Stockton and mixing into the central Delta. Although no significant salinity effects were identified, the salinity increases caused by SDIP Stage 1 and Stage 2 operations are to be considered in conjunction with the CCWD water quality improvement projects funded by CALFED to assure the CALFED Program objective of improved Delta source water quality is met.

Tom Paine Slough Diversions

In recent years, agricultural water diverters on Tom Paine Slough have had difficulty acquiring all the water they need, especially during hot weather when demand is high. Some of the difficulties may be caused by insufficient water levels in Sugar Cut, at the siphon station located at the northwest end of the slough. These relatively low water levels may be caused by the temporary barriers. Other reasons for the lack of water capacity may be sedimentation of the slough and clogging of the slough by aquatic weeds.

Nevertheless, DWR has been responsive to Tom Paine Slough water diverters and has installed temporary pumps to improve access to Old River water at the northwest end of the slough. DWR is studying the issues and causes of lack of capacity and will soon release a report on their findings and potential solutions.

This situation is important for the SDIP because DWR and Reclamation are committed to providing adequate water and sufficient water quality to the diverters from Tom Paine Slough. DWR has committed to continued operation of the Clifton Court Forebay (CCF) gates to remain closed during the higher-high tide each day, to maintain the existing high-tide water levels that are necessary to supply the Tom Paine Slough siphons in Sugar Cut.

Jones Tract Levee Failure and Flooding, 2004

On June 3, 2004, a 300-foot-long section of the Upper Jones Tract levee on Middle River failed. No cause for this levee failure has been identified. This levee failure was just 3 miles downstream of the Middle River temporary barrier (and proposed tidal gate). As the water filled Upper and Lower Jones Tract it moved the salinity gradient (i.e., X2 was located at Collinsville) upstream along the San Joaquin River. A “gulp” of fresh water following a levee break and the subsequent movement of more saline water toward the export facilities could affect water quality at the CVP and SWP pumping plants. Fortunately, the Jones Tract levee failure was located relatively far upstream so that Jones Tract was filled with low salinity water, and salinity on the San Joaquin River was not increased upstream of Jersey Point.

The CVP Tracy Pumping Plant was operating at about 4,000 cfs, and SWP Banks Pumping Plant was operating at about 2,000 cfs on June 3, 2004. DWR and Reclamation both reduced Delta pumping to counteract the salinity intrusion that was expected from the reverse flow of about 140,000 acre-feet required to fill Upper and Lower Jones Tract (in about 5 days). The Delta Cross Channel gates were opened to allow more Sacramento River water into the central Delta to reduce salinity intrusion along the San Joaquin River. DWR and the U.S. Army Corps of Engineers (Corps) started emergency repairs of the break and a major effort to prevent further breaks and damage to the levees from wind and wave action caused by the large area of open water. The levee along Trapper Slough (adjacent to State Route 4) was reinforced to a height of 6 feet above mean sea level (msl) with 40,000 tons of rocks and 55,000 cubic yards of fill, and protected with plastic sheeting.

The levee breach was closed by the contractor (Dutra Construction) with 200,000 tons of rocks on June 30, 2004. The protection of the 16 miles of interior levees was completed on the same day. The pump-out of Upper and Lower Jones Tract began on July 12, 2004, with full capacity (eight 42-inch pumps and two 30-inch pumps) achieved on July 30, 2004. The pumping rate varied from a maximum capacity of 780 cfs early in the pumping to a sustained rate of about 300 cfs later in the process. Pump-out of the 140,000 acre-feet was completed by the middle of December. The salinity of the water on Jones Tract increased from about 300 µS/cm in June to about 400 µS/cm at the end of October. The dissolved organic carbon (DOC) in Jones Tract water was increased by releases from the peat soils, which had been recently plowed and planted, from 5 mg/l in June to about 25 mg/l at the end of October. As the pump-out continued, the DOC at the CVP and SWP pumps was increased somewhat. DOC was the primary water quality concern, although the contribution from the Jones Tract water was relatively small (i.e., less than 10% of the water) and DOC at CCF remained less than 4 mg/l through October.

The DSM2 model was used to simulate the tidal flows and salinity (EC) following the Jones Tract levee failure (calendar year 2004). The model results matched the measured tidal stages and tidal flows and measured EC quite well at most Delta locations, and can be obtained from the DWR Bay-Delta Office website:

<http://modeling.water.ca.gov/delta/reports/annrpt/2005/2005Ch3.pdf>.

Photograph 1. Levee Failure on Upper Jones Tract, June 3, 2004. (Source: California Department of Water Resources.)

Photograph 2. Repairing the Upper Jones Tract Levee Breach on Middle River, June 2004. (Source: California Department of Water Resources.)

The Upper Jones Tract levee failure is important for the SDIP because there is a general concern about the future sustainability (risk) of the Delta levees. The possibility that levee failures may cause a large seawater intrusion event and increase the salinity at the CVP and SWP Pumping Plants is also a major

concern. While the Jones Tract levee failure illustrates that Delta levees can fail without warning and during any time of the year, there is a general ability for DWR and Reclamation to respond rapidly to reinforce and repair the levees, pump out the water, and adjust the CVP and SWP upstream reservoir releases, the DCC gate operations, and the CVP and SWP export pumping in response to the event.

The SDIP Stage 1 operable tidal gates will provide additional flexibility during future levee failure events, to control tidal flows into the south Delta and adjust the diversions from the San Joaquin River into Old River.

San Joaquin River Water Quality Management

DWR and Reclamation are continuing to implement many of the San Joaquin Valley Drainage Implementation Program (SJVDIP) recommendations in partnership with California Universities, CALFED, Resource Conservation Districts, Watershed groups, and Water and Drainage Districts. These activities include: (a) grants for control of agricultural drainage water, (b) developing and promoting the use Integrated On-Farm Drainage Management Systems (IFDM) in the San Joaquin Valley, and (c) providing technical assistance on demonstration projects to develop drainage reuse systems, identify cost effective salt tolerant crops, and improve drainage treatment and disposal technologies.

Measures to control salinity upstream of Vernalis include: (a) on-farm management activities to reduce subsurface drainage, (b) real-time water quality management to maximize the assimilative capacity of the San Joaquin River, and (c) efforts to schedule wetlands discharges to provide dilution flows. Irrigation and drainage management activities have proven to be effective in reducing salt loads in the San Joaquin River. These measures include improved irrigation systems; agricultural tailwater and tilewater recycling; and subsurface drainage water reuse.

The San Joaquin River Water Quality Management Group has merged into the Water Quality Subcommittee of the San Joaquin River Management Plan (SJRMP) with the purpose of implementing the recommendations in the 2005 report that include: (a) implementation of the Westside Regional Drainage Plan to eliminate the Grasslands Drainage Area discharges to the San Joaquin River, (b) scheduling of wetlands discharges to provide dilution water (February–April), and (c) real-time monitoring program to support the management of San Joaquin River flow and salinity. DWR and Reclamation are lead agencies for the SJRMP.

The West Side Regional Drainage Plan would eliminate irrigated agricultural drainage water from about 100,000 acres in the Grasslands Drainage Area. The program began as an effort to reduce selenium discharges to the San Joaquin River. It is now proposed to go beyond regulatory requirements and eliminate selenium and salt discharges to the River. The Plan relies on four general tactics

to reduce the volume of drainage water and then treat and dispose of the salt load without a river discharge:

- reduction of drainage volumes through efficient water management techniques such as replacement of furrow irrigation with micro-irrigation technology, and lining of unlined delivery canals;
- recirculation of tailwater and tile drainage;
- reuse of tile drainage water on halophytic croplands in order to concentrate drainage; and
- treatment and disposal of remaining drainage water through reverse osmosis, evaporation and disposal or reuse of salts.

With about 4,000 acres of land being used for drainage water reuse, reductions and future elimination of the salt discharges through the San Luis Drain and into Mud Slough then to the San Joaquin River will be achieved. About $75 million has been spent on the land and facilities through 2005, and another $100 million will be required to complete the implementation over the next five years.

Investigations of Delta-Mendota Canal Recirculation

The release of water from the DMC was first used in 1964 to increase flows in the San Joaquin River past Stockton to improve the low DO concentrations and improve migration conditions for adult fall-run Chinook salmon (California Department of Fish and Game 1964). Release of DMC water into the Newman Wasteway to the San Joaquin River upstream of the Merced River was tested in August of 2004 (Bureau of Reclamation 2005).

The State Water Board, as part of D-1641, required Reclamation to fully evaluate the possible water supply, water quality, and fish effects from this general action that was called DMC recirculation. A Plan of Action (POA) was submitted to the State Water Board during April 2006. The State Water Board notified Reclamation by letter that the POA was provisionally approved pending receipt of the Plan of Study. The Plan of Study was submitted to the State Water Board during May 2006. Reclamation plans to initiate the feasibility study before the end of the 2006 fiscal year.

Potential future DMC recirculation is directly related to the SDIP because one of the likely effects from the SDIP Stage 1 tidal gates will be a substantial reduction in the salinity (EC) at the CVP Tracy Pumping Plant, which supplies the DMC water. Therefore, because of the tidal gate operations, the salinity of DMC water will be reduced, and the effectiveness of any DMC recirculation to the San Joaquin River will be enhanced. SDIP Stage 2 increased SWP Banks Pumping Plant diversion limits could allow more pumping, some of which could be joint point of diversion (JPOD) pumping of CVP water at SWP Banks, which could allow DMC recirculation to occur without major water supply effects on CVP contractors.

Delta-Mendota Canal–California Aqueduct Intertie Project

Reclamation and the San Luis & Delta Mendota Water Authority are proposing to construct and operate the DMC/CA Intertie Project. The purpose of the project is to help the CVP meet water supply demands south of the Delta, and to increase the operational flexibility of the CVP and SWP to respond to emergencies and conduct system maintenance. As currently planned, the project would allow up to 400 cfs to be pumped from the DMC to the California Aqueduct and up to 900 cfs could be conveyed from the California Aqueduct to the DMC using gravity flow.

In early 2005, Reclamation and the San Luis & Delta Mendota Water Authority completed a joint Environmental Assessment/Initial Study for the project and issued an ROD and an NOD, respectively. The Planning and Conservation League (PCL) then sued Reclamation in U.S. District Court on the adequacy of the NEPA compliance for the project. The court found in favor of the PCL and granted a temporary restraining order enjoining construction of the project. Reclamation has since agreed not to move forward with constructing the DMC/CA Intertie Project until completing an EIS on the project. Reclamation's goal is to have the EIS completed in spring 2007.

The DMC/CA Intertie Project is related to the SDIP because it would result in about 400 cfs more CVP pumping at the Tracy pumping plant during the winter months, with less required JPOD for CVP at the Banks Pumping plant. This will improve the operating flexibility for the CVP and SWP operators. One of the likely effects from the SDIP Stage 1 tidal gates will be a substantial reduction in the salinity (EC) at the CVP Tracy Pumping Plant that supplies the DMC water. This will reduce the potential salinity effects from the DMC/CA Intertie, because the salinity of DMC water will be more similar to the California Aqueduct water pumped at the SWP Banks Pumping Plant. The salinity of SWP and CVP water stored in San Luis Reservoir will therefore be slightly lower with the SDIP.