APPENDIX A

# 2-Gates Fish Protection Demonstration Project Background and Regulatory Constraints

# Project Background

The Delta serves many functions and has many competing uses. It is a vital diversion point for both the Central Valley Project (CVP) and the State Water Project (SWP). This vast water supply system provides drinking water for over 23 million Californians. The CVP and SWP also supply irrigation water for more than 1.3 million acres of farmland valued over $13 billion annually (California Department of Food and Agriculture 2002). The Delta also provides habitat for many protected species including delta smelt, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, North American green sturgeon, and longfin smelt. The focus of this project is to reduce conflicts between water exports and protected species, principally delta smelt.

The CVP and SWP are operated under the Operations Criteria and Plan (OCAP) and other water rights and water quality requirements. As described below, these operations must comply with the Reasonable and Prudent Alternatives (RPAs) in the recent Biological Opinions (BOs) for the OCAP from the U.S. Fish and Wildlife Service (FWS 2008) and National Marine Fisheries Service (NMFS 2009). The RPAs include actions to limit reverse flows in Old and Middle Rivers (OMR flows) to reduce entrainment of fish at the CVP and SWP export facilities.

## PROJECT PURPOSE

The 2-Gates Project proposes an alternative management strategy to achieve the protection goals of the FWS OCAP Biological Opinion (BO) for delta smelt (FWS 2008). The Project seeks to provide equal or improved protection to delta smelt (reduced entrainment at the export pumps) with higher than the minimum allowed water exports described in the OCAP BO RPAs while operating within the other water management requirements (D-1641). In particular, the Project is intended to demonstrate that operable gates, strategically placed in the central Delta and managed in conjunction with some restrictions on OMR negative flows, can provide equal or greater protection for delta smelt than restrictions on OMR negative flows alone. The proposed 2-Gates Project is designed as a demonstration project to test this premise.

## DELTA HYDRODYNAMICS

The hydrodynamics of the Delta are complex and highly altered. The Delta receives freshwater inflow from roughly 40 percent of California's land area, with approximately 60 percent and 15 percent of the inflow coming from the Sacramento and San Joaquin rivers, respectively. Sacramento River waters enter the central Delta directly through natural channels such as Georgiana Slough, and through man-made channels such as the gated Delta Cross Channel. Decades of water development in the Central Valley have decreased winter inflows to the Delta, increased summer inflows, reduced inflows overall, and have made the interior Delta more persistently fresh (NMFS 2009).

Old River and Middle River are channels that run generally north and south through the southern Delta, located west and south of the main stem of the San Joaquin River. Several man-made

channels connect the Old and Middle Rivers along their parallel paths. Both are tidal channels that generally flow southward during flood tides and northward during ebb tides. Net (downstream) flow in Old and Middle Rivers is inherently northward. However, when combined CVP and SWP water export rates exceed rates of inflow from the San Joaquin River, water is drawn southward in Old and Middle Rivers from the central Delta, resulting in net upstream flows toward the export facilities (i.e. negative OMR flows). This net upstream flow increases the vulnerability of small fish inhabiting the central and southern Delta to entrainment at the CVP.

The Delta receives runoff from an area covering about 40% of the land area of California. Inflow to the Delta is split with 80% coming from the Sacramento River, 15% from the San Joaquin River and 5% from the eastside tributaries. The inflow is highly seasonal and is composed of rainfall runoff in winter and snowmelt runoff in spring and early summer. Substantial dams for water supply, hydroelectric power production and flood control have been constructed on the major rivers. The Delta is strongly influenced by inflows, outflows, exports and tidal flows. Basic information on the Delta such as water flow rates, salinity, turbidity, and dissolved oxygen is available on the Bay-Delta Live website www.baydeltalive.com.

## DELTA SMELT

The delta smelt (*Hypomesus transpacificus*) is a small fish endemic to the upper San Francisco Estuary and Delta. In early winter, mature delta smelt migrate upstream from brackish areas around Suisun Bay to freshwater spawning areas in the Delta (Moyle 2002, Bennett 2005). Upstream migration appears to be triggered by abrupt changes in flow and turbidity associated with the first flush of winter precipitation (Grimaldo et al. in press). Spawning occurs from late February through June and peaks in April and May. The distribution of larval and juvenile delta smelt depends on spawning locality and Delta hydrodynamics (FWS 1994). Adequate flows are necessary to transport larvae and juveniles downstream to productive rearing habitat in Suisun Bay and to prevent entrainment by the export facilities.

Many factors individually, or in combination, influence the movement of adult delta smelt into the south Delta where they are vulnerable to entrainment. This movement can be influenced by Delta inflow, tidal flows, pumping at CVP and SWP Delta facilities, complex channel configurations and connections along with salinity, temperature, and turbidity gradients. The southward movement of water, influenced by pumping at the CVP and SWP water export facilities, makes these fish vulnerable to entrainment. The current regulatory framework to protect delta smelt is focused largely on flow objectives. This is typified by the recent OCAP BO requirements for reduced exports to restrict negative OMR flows (FWS 2008, NMFS 2009).

The delta smelt was listed as a state and federal threatened species in 1993. Since 2002, abundance indices of delta smelt and other pelagic species in the Delta have declined to historically low levels (Sommer et al. 2007). Factors proposed for the delta smelt's decline include reductions in fresh water outflow, extremely high fresh water outflows (which push them too far down the estuary), entrainment losses at water diversions, changes in food type and abundance, toxic substances, disease, competition, and predation (Sommer et al. 2007, Fish et al. 2008). The FWS identified entrainment at the south Delta export facilities as a key factor in the

decline of the species and concluded that it is necessary to reduce entrainment by the export facilities in order to avoid jeopardizing the continued existence of the species (FWS 2008).

## REGULATORY CONSTRAINTS ON CVP AND SWP OPERATIONS

CVP and SWP operations within the Delta are constrained by regulatory conditions imposed by the State of California and recent biological opinions by the FWS and NMFS. These are summarized below, in chronological order.

### Decision 1641

The SWRCB imposes a number of conditions upon the operations of the CVP and State SWP in the Delta. With Water Rights Decision 1641, the SWRCB implements the objectives set forth in the SWRCB 1995 Bay-Delta Water Quality Control Plan and imposes flow and water quality objectives upon the Projects to assure protection of beneficial uses in the Delta. The SWRCB also grants conditional changes to points of diversion for the Projects within D-1641. The numerous flow and export restraints are designed to protect fisheries. These objectives include specific outflow requirements throughout the year, specific export restraints in the spring and export limit based on a percentage of estuary inflow through the year. The water quality objectives are designed to protect agricultural, municipal, and industrial users in and around the Delta, as well as fishery uses, and they vary through the year and wetness of the year.

### FWS Biological Opinion on Coordinated Operations of the CVP and SWP

The December 15, 2008, biological opinion by the FWS on the coordinated operations of the CVP and SWP (FWS 2008) concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of delta smelt without further flow conditions in the Delta for their protection and the protection of designated delta smelt critical habitat. The FWS developed a RPA which consists of five components aimed at protecting delta smelt, improving and restoring habitat, and monitoring and reporting results. Two RPA components establish flow conditions on OMR flows to reduce the effects that reverse flows have on the entrainment of adults, larvae and juvenile life stages into the CVP and SWP pumping facilities in the south Delta:

- RPA Component 1 - addresses high and low entrainment risk periods and actions to protect adult delta smelt under specific conditions during the winter adult migration period. The measures reduce entrainment risk by limiting OMR reverse flows.

- RPA Component 2 - implemented upon the completion of RPA Component 1 or when Delta water temperatures reach 12ºC, a level that is associated with the start of delta smelt spawning, or biological evidence is collected in trawl programs or at the fish facilities that adult smelt have started spawning. OMR flows are also limited under RPA Component 2 depending on the location of the population relative to the proximity of the conveyance channels leading to the pumping facilities in the south Delta.

## DFG 2081 Incidental Take Permit (ITP) for Longfin Smelt

The DFG issued an ITP pursuant to Fish and Game Code section 2081 to the DWR on February 23, 2009 for the on-going and long-term operation of SWP facilities in the Delta for the protection of longfin smelt. For the most part the 2081 ITP conditions of approval prescribe OMR flow requirements which are also included in the FWS OCAP BO. These requirements are designed to protect adult longfin smelt migration and spawning during the December through February period and larval and juvenile longfin smelt during the January through June period. For the adults (December through February) DFG identified OMR flows no more negative than -5,000 cfs. For the larval/juvenile longfin smelt period, they identified OMR flows no more negative than -1,250 to -5,000 cfs, January through March, no more negative than -2,000 to -5,000, April and May, and no more negative than -5,000 cfs during June.

## NMFS Biological Opinion on Coordinated Operations of the CVP and SWP

The NMFS published a biological opinion on June 4, 2009 describing the anadromous fish protections for the continued long term coordinated operations of the CVP and SWP (NMFS 2009). This BO concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of Sacramento River winter run Chinook salmon, Central Valley spring run Chinook salmon, Central Valley steelhead, and the southern DPS of North American green sturgeon. They also concluded that continued CVP/SWP operations were "likely to destroy or adversely modify" designated or proposed critical habitat of these species.

The NMFS concluded that Reclamation and DWR (the "water projects") both "directly altered the hydrodynamics of the Sacramento-San Joaquin River basins and have interacted with other activities affecting the Delta to create an altered environment that adversely influences salmonid and green sturgeon population dynamics." Within the Delta, the NMFS opinion identified adverse effects which include: water diversion from the north Delta into the Delta interior; enhance vulnerability of juvenile salmonids to entrainment at the export pumping facilities; enhanced vulnerability of San Joaquin River steelhead to direct entrainment and export relate changes in Delta hydrodynamics; and direct mortality of salmonids due to entrainment at the export pumps. To address these issues, the NMFS described six actions within RPA IV to be taken in the Delta:

- Action IV.1 - Modify DCC gate operations and evaluate methods to control access to Georgiana Slough and the Interior Delta to reduce diversion of listed fish from the Sacramento River into the southern or central Delta.

- Action IV.2 - Control the net negative flows toward the export pumps in OMR to reduce the likelihood that fish will be diverted from the San Joaquin or Sacramento River into the southern or central Delta.

- Action IV.3 - Curtail exports when protected fish are observed near the export facilities to reduce mortality from entrainment and salvage.

- Action IV.4 - Improve fish screening and salvage operations to reduce mortality from entrainment and salvage.
- Action IV.5 - Establish a technical group to assist in determining real-time operational measures, evaluating the effectiveness of the actions, and modifying them if necessary.
- Action IV.6 - Do not implement the South Delta Barriers Improvement Program.

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