

# Draft CVPIA Fiscal Year 2014 Annual Work Plan

April 30, 2013

## ***Program Title: CVPIA Section 3406(b)(4) - Tracy (Jones) Pumping Plant Mitigation Program***

### ***Responsible Entities:***

Staff Name	Agency	Role
J. Carl Dealy	Reclamation	Lead
Cesar Blanco	USFWS	Co-Lead (acting)
		State Partner

The Tracy (Jones) Pumping Plant Mitigation Program was established in 1992 under the 1992 Central Valley Project Improvement Act (CVPIA) which directed, "The Secretary, in consultation with other State and Federal agencies, Indian tribes, and affected interests, is further authorized and directed to...develop and implement a program to mitigate for fishery impacts associated with operations of the Tracy Pumping Plan. Such program shall include, but is not limited to improvement or replacement of the fish screens and fish recovery facilities and practices associated with the Tracy Pumping Plant.

### ***Program Goals and Objectives for FY 2014***

A. Improve Fish Protection and Fish Salvage at Tracy Fish Collection Facility (TFCF). Action addresses CVPIA 3406(b)(4), and Central Valley Project (CVP) OCAP Biological Opinions for Winter-Run Chinook salmon, Delta smelt, Central Valley Steelhead and Green Sturgeon."

B. Determine Best Practical Fish Protection Technology for making Long-term Future Improvements at Tracy and Other South Delta Facilities.

\* Species benefited - Chinook salmon, Steelhead, Delta smelt, Splittail, Sacramento blackfish, Longfin smelt, Striped bass, Threadfin shad and American shad.

### ***Status of the Program***

The initial focus of 3406(b)(4) starting in early 1990s was construction of the Tracy Fish Test Facility (TFTF). The TFTF as originally proposed was intended to be a new fish screening technology development and evaluation facility located adjacent to the existing TFCF in the South Delta. The TFTF was to develop critical information for new fish screens and salvage technology for the South Delta export facilities at Tracy and at Clifton Court Forebay, and a possible screened through Delta facility on the Sacramento River. The TFTF was to allow for the testing and evaluation of new facilities for fish screening, holding, sorting, and transportation in the South Delta which is influenced by tides, heavy debris loads, and a mix of 51 different fish species. The TFTF was to be designed by Reclamation with the oversight and assistance of a multi-agency coalition of fish facility experts pursuant to a "Project Management and Organization Agreement" signed by involved regulatory and water interests. The original TFTF Project was to be implemented as part of Section 3406(b)(4) of the CVPIA, and would have been integral to CALFED's South Delta and Conveyance Programs. Funding sources would have and did include appropriations from Reclamation, the State of California, and CALFED.

However, due primarily to very high construction cost concerns, it had been recommended by the CALFED South Delta Fish Facilities Forum (SDFF) in 2005 not to proceed with any further construction of a large scale fish test facility (TFTF) but to instead to focus on fixing and improving the existing fish collection facilities located at the

export pumps in the South Delta as best as possible to meet original design criteria and minimize loss of fish. The SDFP also recommended implementing other alternative actions outside of new fish screens to improve fish populations and assist in meeting agency fish population goals. Included in the SDFP recommendations were improvements in debris and predation management (e.g. new debris cleaning equipment and regular predator removals), phasing in replacement of a new secondary screening system, and continued facility research activities to better assess the existing facilities for current conditions and to implement and evaluate operational improvements. In essence, the existing facilities themselves will be used as the “test facility” to develop and evaluate improvements in technology and fish protection. It is expected that it will take approximately six to nine years to complete facility assessment and research efforts and phase in improvements to the existing facilities.

To date, Reclamation in coordination with Fish Agencies have identified 28 “actions” related to improving fish protection at the existing TFCF. Implementation of these actions has been ongoing since 1992 at TFCF and full implementation is not expected until 2016 at the earliest. Additional actions could be added to the program as needed, in response to any unforeseen issues or concerns that may require further analysis, assessment and improvements. The program has not defined fish loss reduction targets; rather, the program’s present goal is to implement and complete the 23 identified actions (See Table A, below) to reduce fish losses. To date, the program has completed 15 of 28 actions, or a little more than half of the program’s present goal.

Table A: Actions to Improve Tracy Fish Collections Facility

	<b>Actions</b>	<b>Start</b>	<b>Completion</b>
1	Implemented periodic predator removals	1992	ongoing
2	Upgraded instrumentation at the TFCF	1992	1996
3	Replaced high pressure utility pump with low pressure utility pump	1995	1996
4	Epoxy coated recessed collection tanks	1997	1997
5	Constructed aquaculture facility onsite	1997	2005
6	Constructed extraction device for Chinese mitten crab / debris removal	1998	1999
7	Installed air system in recessed collection tanks	1999	1999
8	Developed onsite laboratory for fish taxonomic work	1999	1999
9	Added air system to fish haul trucks	2000	2000
10	Upgraded fish count area to accommodate DNA sampling & fish ID	2000	2000
11	Updated fish identification key for training of operators	2000	2000
12	Replaced worn (“leaky”) bypass transition boxes	2003	2004
13	Replaced fish transfer bucket with new/improved fish transfer bucket	2006	2008
14	Replaced fish haul trucks with new/improved fish haul trucks	2006	2008
15	Constructed new biological resources building	2006	2010
16	Replace existing trash rack cleaner with new/improved trash rack cleaner	2006	2010
17	Replace primary louvers/cleaners with new system	2006	2017
18	Replace secondary louvers/cleaners with new system	2006	2014
19	Develop area onsite to improve ability to conduct research and operate TFCF	2006	2018
20	Construct new secondary screening and transfer system	2010	2016
21	Construct new aquaculture facility onsite	2013	2014
22	Automate velocity control pumps for the fish bypass system	2013	2014
23	Construct third fish release site	2014	2016

The project to replace the existing secondary louvers and construct new secondary screening system (Action No. 20) proceeded through the design phase in FY2012. The current schedule anticipates a contract award in June of 2013 and a beginning of phase I fabrications and mobilization for FY2013 with a possible one year delay.

### **Studies / Construction Beginning this Year**

- Secondary Louver Replacement At The Tracy Fish Collection Facility

The most significant Project for 2014 will be the Secondary Louver Replacement. This follows the re-design of the secondary channel to enhance the efficiency of screening, fish survival, and reduction of predation within the secondary channel structure. The field engineering estimate for the project is 3.9 million dollars. Funding was secured through the Replacements Additions and Extraordinary Maintenance (RAX) Program.

A complex project of this nature has a long history. Current Louver efficiency varied widely between 32 fish species identified in the salvage (Bowen, et al., 2004). Studies investigating louver cleaning methods and alternatives to louvers began in 2007. Studies and designs specific to adding a traveling fish screening system in the secondary louver channel began in 2009.

Results showed that fish salvage directly related to operation of the secondary dewatering channel show three major deficiencies in the louver system that impact fish salvage. First: The existing secondary louvers do not have an automated cleaning method. Cleaning requires shutting down the secondary channel, dewatering the channel and hand raking the louver bars. During cleaning, flow diversion through the primary louvers continues with no bypass flow and no fish salvage, resulting in increased fish loss through the primary louvers. Second: Debris buildup on the louvers over time reduces louver flow area increasing louver approach velocity and the debris load passed downstream into the fish holding tanks. Debris loads can plug large areas of the louvers in a few hours during the spring and fall when debris levels are highest. Third: Fish guidance efficiency studies of the secondary show fish salvage varies widely between species and with secondary channel flow velocity.

A physical model study was conducted in the Denver Technical Service Center (DTSC) Hydraulics Labs in 2011 of the secondary louver replacement. The model contained the downstream one-half of the secondary channel with traveling screens modeled at full scale but only partial depths. Test simulations were run at channel velocities between 1.5 and 3.5 ft/s, which correspond with historical channel velocities.

The existing louvers in the secondary channel of the TFCF are to be replaced with traveling fish screens. The new screens will be designed to continuously remove aquatic debris suspended in the flow and diverting fish to the fish holding tanks by blocking them from traveling downstream.

A single line of four traveling fish screens totaling about 46 feet in length replaces the two existing secondary louver lines. The screens are angled at 7 degrees to the flow (existing louvers are angled at 15 degrees to the flow). The traveling screens have a screen slot width of 1.75 mm, with 32 percent porosity and are self-cleaning. Screen have 3/4 -inch debris pegs attached to the screens to aid filamentous debris removal.

The following items are included in the construction project:

1. Removing the following existing equipment:
  - a. Crab screen and associated equipment
  - b. Secondary channel louvers and guides
  - c. Secondary channel concrete decks
  - d. Screen water channel cover plates and supports
  - e. Miscellaneous metalwork
  - f. Spraywater pumps (2), piping and valves
2. Furnishing and installing the following:
  - a. Tie-back system including cast-in-place concrete and asphalt repairs
  - b. Screen guides and supports
  - c. Traveling Fish Screens
  - d. Conveyors
  - e. Screened water channel cover plates and supports
  - f. Metal grating, handrails and ladders
  - g. Spraywater pumps (two)
  - h. Spraywater piping and valves
  - i. Electrical equipment

All work within the secondary channel where dewatering is required will need to occur during the VAMP period. This is a 30-day maintenance period usually occurring somewhere in the months of April and May, where the maximum period of time the secondary channel can be dewatered is 21 days.

## Studies continuing this year

- Evaluation of Chinook Salmon and Central Valley Steelhead Facility Losses at the Tracy Fish Collection Facility

Recently, NMFS completed a Biological Opinion stating TFCF operations are likely to jeopardize the continued existence of the endangered Sacramento River winter-run Chinook salmon and threatened Central Valley spring-run Chinook salmon and Central Valley steelhead (NMFS 2009). Our objective is to determine whole facility survival (from the trash boom to the holding tank) for juvenile Chinook salmon and steelhead.

Chinook salmon may be entrained at the TFCF from December through July, but the majority are entrained April and May (TFCF salvage data). Juvenile steelhead are uncommon at the TFCF, but the majority of those salvaged also appear in the spring. Recently, NMFS determined operations of Jones Pumping Plant (JPP) may adversely affect the existence of the endangered winter-run and threatened Central Valley spring-run Chinook salmon, and the Central Valley steelhead (NMFS 2009). This study will estimate TFCF survival for fall-run Chinook salmon as a surrogate for winter-run and spring run races and steelhead. Key areas of interest include a determination of non-participation (or swim-out), predation in front of and within the facility, and louver related losses.

The goal of this evaluation is to determine the baseline facility survival for juvenile Chinook salmon (<175mm fork length) and steelhead (about 200-225 mm fork length) under normal operating and hydraulic conditions.

- Investigations for Improvements to the Primary Channel at the TFCF

This research project will investigate screening concepts that will improve the primary channel collection process. Similar research was completed for the secondary channel which evolved into the scheduled replacement of the secondary louvers with traveling screens in 2013-14. In FY12 researchers were able to start addressing concerns regarding debris loading, screen failure, velocities, using existing louver guides with new traveling screens and other important parameters but were not able to complete all the necessary work. This year we continue to investigate possible improvements to the primary channel which will improve the salvage efficiencies of the TFCF, including looking at replacing the louvers with traveling screens similar to those that are scheduled to be installed in the secondary channel.

- Evaluation of the Use of Electricity for Predator Removal at the Tracy Fish Collection Facility

According to the "Reasonable and Prudent Alternative" in the 2009 National Marine Fisheries Service Biological Opinion, by December 31, 2011, Reclamation has been tasked to complete studies to determine methods for removal of predators in the primary channel, using physical and non-physical removal methods (e.g., electricity, sound, light, CO<sub>2</sub>), with the goal of reducing predation loss to 10 percent or less (National Marine Fisheries Service, 2009). This multi year study is to investigate the potential for using an electric crowder as a safe and effective way of deterring or preventing large predator fish from taking up residency in the primary channel of the TFCF. With the laboratory phase complete, a final, peer-reviewed Tracy Series report will be published and submitted to regulatory agencies for review in FY12-13.

In FY13, researchers will contact local and regional Reclamation safety officers to discuss human safety concerns relating to a field test in the secondary channel. A safety plan will be drafted. Permitting requirements for a field evaluation will be investigated for the purpose of preparing for a field evaluation in the secondary channel at the TFCF. The secondary channel field evaluation will occur after the installation of the secondary Hydrolox screens (installation currently scheduled for FY14).

- Effect of Negative Pressure on Selected Fishes Salvaged at Tracy Fish Collection Facility

Injury and exposure of fishes to stressors during the salvage process is a concern. Sub-lethal stressors that inhibit disease resistance and predator evasion are also a concern. The current lift bucket fish conveyance method has been implicated as one of the greatest sources of stress for fish in the salvage process (Portz 2007). Portz and Sutphin (2009) have proposed to evaluate use of a vacuum pump system at TFCF to remove fish from the recessed, cylindrical holding tanks in times of increased salvage that is beyond the fish-safe capacity of the lift bucket and transfer these fish to the fish-haul truck. Vacuum systems have been used to transfer fish in a variety of situations. The potential for a vacuum pump system to release salvaged fishes from the fish-hauling truck back to the Delta in a slower, safer, more adaptable manner, also exists.

We completed design, acquisition, and implementation of the negative pressure test chamber. Initial tests revealed a potential safety hazard and the chamber was reinforced. The majority of experiments at lower negative pressures were completed and preliminary analyses suggest no effect of negative pressure on fishes at -4 PSI. Through attempted tests at moderate/high treatment levels, it became apparent additional reinforcement of our test chamber was again warranted. As time permitted, tests at moderate treatment levels were completed. More tests at moderate/high pressure levels are needed and will be attempted during this coming post-salmon season. For the remainder of FY 2012 we are planning to continue collecting data for this project.

In FY 2013 we will seek to fill information gaps on the effect negative pressure has on health and survival of various fish species and size classes salvaged at the TFCF. This information will assist in evaluating the use of vacuum systems as a fish-safe transfer method. The overall goal is to provide data that will fill information gaps on the effect negative pressure has on health and survival of various fish species and size classes salvaged at the TFCF. Also to quantify survival (up to 21 d) of fish species and associated size classes salvaged at the TFCF after exposure to varying levels of negative pressure.

- Evaluating the Use of Carbon Dioxide as an Alternative Predator Removal Technique to Decrease TFCF Predator Numbers and Improve Facility Operations

In recent years, predator removal activities have slowed because of logistics and the length of time the facility is down to complete the fish removal effort. Removing these fish with the current methods is dangerous for employees; it also decreases daily salvage, and causes damage to the fish and/or fish mortality. An alternate method to remove predators is needed for the facility. In 2004, a new predator removal method using carbon dioxide (CO<sub>2</sub>) was approved for study. This method would not reduce daily salvage due to secondary channel downtime and could prove to be more efficient, and safer for employees and fish than the current predator removal method. This project was divided into five phases and summaries of Phases 1–4 (completed in Sept. 2007) are included below. Portions of Phase 5 that have been preliminarily investigated have also been summarized below. Predation may be significant within the primary bypass tubes and secondary channel because striped bass continue to reside within them.

The goals of this study are to determine means and methods to reduce the number and average size of striped bass in the secondary system by removing large resident fish; increase survival of fish collected during the predator removal process; decrease the amount of time necessary to perform the predator removal process and minimize, or eliminate, facility downtime during predator removals, and to develop a predator removal technique that is safer for employees.

- Evaluating Debris Removal from Circular Holding Tanks by Lifting the Holding Tank Screen at the Tracy Fish Collection Facility

At the TFCF, fish are collected and held in 6.1-m diameter holding tanks for 8–12 h before they are released in a process known as the “haul-out”. During the 8–12 h collection and holding time, large amounts of Brazilian elodea or woody debris can accumulate in the holding tanks and may impact fish survival when the fish count or haul-out buckets clog or complicate the fish count and haul-out procedures when extra labor is needed to remove the debris from the clogged buckets. Large amounts of debris in the fish count station can also cover or hide fish, which, when uncounted, could potentially result in reduced accuracy of fish salvage estimates used to determine when haul-outs are necessary. The primary objective of this study is to determine if quickly lifting and reseating the holding tank screen prior to collecting fish in the fish count and haul-out buckets is a cost efficient, effective and time conserving debris removal technique for periods when debris loads are excessive in the TFCF holding tanks.

In this study, our goal is to determine the range of debris load in the holding tank in which the “Holding Tank Screen Lift” prevents each bucket from clogging, and to determine the range of debris load in the holding tanks in which the percent fish loss for the “Holding Tank Screen Lift” is below that for the routine fish count process when fish are lost in debris and left uncounted. We will also determine the range of debris load in the holding tanks in which the time it takes to complete the fish count and haul-out processes, using the “Holding Tank Screen Lift,” is less than that required to complete the fish count or haul-out processes using the normal method.

- Evacuation Rates of Acoustic Tags in Striped Bass

It is widely recognized that non-native piscivores consume migrating salmonids throughout the Delta including, and perhaps exacerbated within, pumping facilities. Acoustic-tagged salmon consumed by untagged predators may lead to false positive detections by acoustic receivers and confounds researchers' abilities to adequately assess acoustic data. Data are needed on the rate at which striped bass digestively pass acoustic tags that were inside predated salmon. This information will assist researchers with evaluation and interpretation of data on survival and movement of salmon and steelhead throughout the Central Valley of California, with probable application to other systems.

The overall goal of this study is to collect data that will assist with evaluation and interpretation of data on survival and movement of Chinook salmon and steelhead throughout the Central Valley of California. We also want to quantify the rate at which striped bass digestively pass acoustic tags that were inside predated Chinook salmon and steelhead, and to evaluate the role of fish size and water temperature with respect to the rate at which striped bass digestively pass acoustic tags that were inside predated Chinook salmon and steelhead.

- Low Cost Solution to Retain More Larval Fish: Effectiveness of Using a Fine Mesh Screening on the Holding Tanks

The current holding tank mesh size was selected in the early 1950s as it was the smallest screen size shown to operate successfully most of the year and not clog with peat fibers (USBR 1956). This still holds true today, and the holding tank screen only clogs a few days per year.

The early designers did not consider changing the mesh size on the holding tanks to meet the conditions of the debris load in the water, as this was too expensive and labor intensive. With the invention of light weight, flexible, Nitex screen it is now possible to change the mesh size of the holding tanks quickly and inexpensively. Larval fish are lost through the holding tank screen during fish salvage collections. A temporary blanket of 0.5 mm Nitex screen over the existing holding tank screen has shown promise for short term use. A successful Nitex screen retention of larval and juvenile fishes will mean enhanced salvage and more fishes released to the Delta. Application of the Nitex screen will be most valuable when delta smelt and longfin smelt (*Spirinchus thaleichthys*) larvae are present in the system.

In 2000 and 2008, a 1 mm and 0.5 mm mesh screens were used respectively. Both net sizes were able to fish for 24 hrs without clogging. The goal of this trial study is to determine if the nitex screen is durable enough to be incorporated into the normal salvage operations at the TFCF and if this material will result in a greater number of living larval and juvenile fish being loaded into the fish-haul truck for release back to the Delta.

- Influence of Acoustic Tags on Susceptibility of Chinook Salmon to Predation

It is unknown if acoustic-tagged Chinook salmon are consumed by predatory fishes in the Delta at a rate different than untagged salmon. The possible substandard condition of acoustic tagged salmon was mentioned by Vogel (2010) as a factor contributing to the suspected high level of predation upon tagged salmon. Information acquired in our study will assist researchers with evaluation and interpretation of data on survival and movement of Chinook salmon throughout the Central Valley of California, with probable application to other systems. The goal of this trial study is to determine if acoustic-tagged Chinook salmon in ongoing VAMP studies are consumed by predatory fishes in the Delta at a rate different than untagged salmon. Also to determine if there are differences with respect to initial survival of acoustic-tagged Chinook salmon released at night or during the day.

- Scoping Report of Incorporating a Moving Retractable Chain System to Move Predators through the Primary Channel

Predatory fish, mainly striped bass, are able to take up residency in the primary channel and increase entrainment losses (B. Bridges, personal communication). These predatory fish need to be moved out of the louver channels regularly. According to the Reasonable and Prudent Alternative in the 2009 Biological Opinion, Reclamation shall complete studies to determine methods for removal of predators in the primary channel, using physical and non-physical removal methods, with the goal of reducing pre-screen predation loss to 10 percent or less of exposed salmonids (National Marine Fisheries Service 2009). When used as a barrier, hanging chains are considered a non-physical method. Their potential use as a crowding device should be investigated.

This is a literature review to consider the possibility of incorporating a rolling, vertical "chain" system to regularly move predators through the primary channel. Perform a literature review of vertical chain, curtain, net, or other similar systems to identify where these features have been installed either as barriers or crowders. Determine the viability of using a hanging chain or other system for predator crowding at the TFCF.

- Scoping Report of Incorporating Barging into Salvaged Fish Release Procedures

The current fish release protocol requires that fish be released through a long pipe at 1 of 2 release sites in the south central Sacramento-San Joaquin delta where predatory fish are known to reside or at least prey on released fish (Miranda et al. 2010). In addition, migrating salmonid smolts are vulnerable to tidal and other influences and may become disoriented from outmigrating to the ocean. According to the Reasonable and Prudent Alternative in the 2009 Biological Opinion (National Marine Fisheries Service 2009), "Release Site Studies shall be conducted to develop methods to reduce predation at the "end of the pipe" following release of salvaged fish. Studies shall examine but are not limited to the potential use of barges to release the fish in different locations within the western Delta, with slow dispersion of fish from barge holding tanks to Delta waters.

This proposal is to conduct a literature review of existing fish barging systems including physical features, operations, and effectiveness. We hope to potential identify increases in survival rates attributed to holding fish before release, as well as other potential positive and negative outcomes of barging.

- Evaluation of the Tracy Fish Collection Facility Holding Tank Screen Entrainment Efficiency for Juvenile Delta Smelt

The number of fish in the holding tanks and haul-out trucks are estimated using the fish count procedure in which a sub-sample of the water flowing into the tanks is taken every 2 hours. It is possible that juvenile delta smelt between 20 and 30 mm are lost through the holding tank screen during the 8–12 h holding period, which may results in pump mortality as well as inaccurate estimation of the both the number of fish salvaged and the fish loading densities in the fish haul truck.

In 2004 and 2005 the fish count procedure was tested for its efficiency in retaining juvenile delta smelt (*Hypomesus transpacificus*). This data was released in 2007 and indicates a large percentage (60%) of delta smelt 20–30 mm FL are passing through the screen commonly used to condense fish during fish counting procedures (Sutphin et al. 2008) and are therefore not counted. Consequently, the number of larval and juvenile fish salvaged between sub-samples may be greater than estimated, which can result in the fish-haul truck transporting overly high densities of fish, affecting water quality and possibly survival.

Determining which size classes of delta smelt are effectively retained in the holding tank will help us to verify the effectiveness of the current holding tank screen at retaining = 20 mm delta smelt as well as gain insight on the accuracy of TFCF juvenile smelt salvage data along with the accuracy of the fish loading densities in the fish haul truck.

The goal of this evaluation is to determine the holding tank screen entrainment efficiency for five size classes of larval and juvenile delta smelt during 0, 1, 5, 15 and 30-minute swirl periods. As well as to develop a probability-capture curve for larval and juvenile delta smelt based on standard length and the amount of time swirled in the holding tanks (0, 1, 5, 15 and 30 minutes).

## **Reports due this Year from Previous Studies**

- Debris Study report
- Tracy Series Reports
- Release Site Design

## ***Adaptive Management***

The research activities that we undertake at the TFCF are in response to legal requirements of CVPIA (the 23 actions) and/ or Reasonable and Prudent Alternative (RPA), 2009 Biological Opinion in pursuit of improvements to reduce pre-screen loss and improve fish handling and screening efficiency. We use an adaptive management approach to take advantage of opportunities to learn from actions by explicitly identifying assumptions and data gaps, and then design and implement research activities that deliver meaningful feedback to project planners. This feedback comes from and stakeholder TIFTIF meetings. Another key feedback source is the TFFIP peer review process resulting in the publication of the Tracy Volume Series.

For this year continuing studies in particular rely on an adaptive management approach to improve study design and implementation. One multi-year study, the Evaluation of Chinook Salmon and Central Valley Steelhead Facility Losses at the Tracy Fish Collection Facility is an example. Our objective is to determine whole facility survival (from the trash boom to the holding tank) for juvenile Chinook salmon and steelhead. The study design is the result of many years of investigations and trials, starting with the first evaluations of louver efficiencies in 1960 and takes in the latest developments in acoustic listening systems.

Continuing predator removal studies and development of alternate methods to remove predators is a completely iterative process. The Evaluation of the Use of Electricity for Predator Removal in the primary channel, using physical and non-physical removal methods (e.g., electricity, sound, light, CO<sub>2</sub>) started with laboratory trials at the Denver Technical Service Center. This has led to a discussion of human safety concerns relating to a field test in the secondary channel. This year a safety plan and permitting requirements for a field evaluation will be drafted. Evaluating the Use of Carbon Dioxide for Predator Removal began in 2004 as a new predator removal method. At that time we recognized the problems with current methods. They can be dangerous for employees, decreases daily salvage, and causes damage to the fish and/or fish mortality. The goals of CO<sub>2</sub> study are to determine means and methods to reduce the number and average size of striped bass in the secondary system by removing large resident fish; increase survival of fish collected during the predator.

Altering fish handling techniques is another opportunity for continual adaptation and improvement. As part of our performance criteria development we completed design, acquisition, and implementation of the negative pressure test chamber. In our trials last year of negative pressure on selected fishes salvaged, our preliminary analyses we found no effect of negative pressure on fishes. This year we will seek to fill information gaps on the effect negative pressure has on health and survival of various fish species and size classes salvaged at the TFCF. This information will assist in evaluating the use of vacuum systems as a fish-safe transfer method. Also since we now have a new haul-out bucket and new fish-haul trucks in use at the TFCF, we must evaluate their performance to determine the effects of fish density on important water quality parameters at the onset, throughout, and at the end transport. Evaluation of this new equipment, paired with the development of updated fish transport tables, will increase the likelihood that the millions of fish that are salvaged.

Among the new studies this year are two studies involving Acoustic Tags. These studies, one to investigate evacuation rates in Striped Bass the other to study the influence of Acoustic Tags on susceptibility of Chinook salmon to predation are designed to fill-in data gaps. Acoustic-tagged salmon consumed by untagged predators may lead to false positive detections by acoustic receivers and confounds researchers' abilities to adequately assess acoustic data. Data are needed on the rate at which striped bass digestively pass acoustic tags that were inside predated salmon. The other area lacking data is the suspected high level of predation upon tagged salmon. Our study will assist researchers with evaluation and interpretation of data on survival and movement of Chinook salmon throughout the Central Valley of California, with probable application to other systems.

With the data collected this year we can continue to integrate experimental and pilot studies, to continually improve project outcomes, meeting our legal requirements and demands to make effective improvements to reduce pre-screen loss and improve fish handling and screening efficiency.



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Table 1. FY2014 Proposed Activities and Costs

CVPIA Section 3406 (b)(4), Jones (Tracy) Pumping Plant/ Tracy Test Fish Facility

	3406 (b)(4) Requested Funding for Fiscal Year 2014				
	Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources
<b>Total Funding</b>	\$0	\$5,178,000	\$0	\$0	\$5,178,000
Reclamation	\$0	\$4,893,400			\$4,893,400
Service	\$0	\$0			\$0
CA DFG			\$0	\$0	\$0
CA DWR			\$0	\$0	\$0

1.1 Program Management												
AWP Activity Number	Activity Name	Activity Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
1.1.1	Program Lead	Coordination of the interagency, interdisciplinary Tracy Technical Advisory Team and sub groups; soliciting proposals; reviewing and ranking proposals; selecting projects to fund; writing grant and other agreements; conducting project and program reviews; providing oversight on all funded projects; and coordinating with Bay-Delta RPA Implementation team.	BOR	0.20				\$44,000			\$44,000	
							<b>Sub-Total for Program Management, FY2014</b>					
							<b>Subtotal Funding</b>	\$0	\$44,000	\$0	\$0	\$44,000
							Reclamation	\$0	\$44,000			\$44,000
							Service	\$0	\$0			\$0
							CA DFG			\$0	\$0	\$0
							CA DWR			\$0	\$0	\$0

1.2		Program Support				3406 (b)(4) Requested Funding for Fiscal Year 2014						
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
			Name	Fractional FTE								
1.2.1	DTSC Admin. Management	Coordination of Research Projects, Materials, Publication Reviews, and Contracts/Agreements	BOR	0.65				\$149,500			\$149,500	
							<b>Sub-Total for Program Support, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$149,500	\$0	\$0	\$149,500
							<i>Reclamation Service</i>	\$0	\$149,500			\$149,500
							<i>CA DFG</i>	\$0	\$0			\$0
							<i>CA DWR</i>			\$0	\$0	\$0

1.3		Technical Support				3406 (b)(4) Requested Funding for Fiscal Year 2014						
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
			Name	Fractional FTE								
1.3.1	Third fish release site survey	Research supporting the construction of a new fish release site is a requirement in accordance with the implementation plan for Section 3406(b)(4) of the CVPIA. This is identified as Action number 23 in the Annual Work Plan for completion by 2016. It identified in the Suite IV.4 Actions contained in the Reasonable and Prudent Alternative (RPA) of the NMFS 2009 Biological Opinion (BO) governing the operation of the Delta facilities of the Central Valley Project. Specifically, the RPA requires Reclamation to implement Action (IV.4.3(3)) of the NMFS BO to reduce predation on salvaged fish at the fish release sites.	BOR	0.05				\$10,000			\$10,000	
							<b>Sub-Total for Technical Support, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$10,000	\$0	\$0	\$10,000
							<i>Reclamation Service</i>	\$0	\$10,000			\$10,000
							<i>CA DFG</i>	\$0	\$0			\$0
							<i>CA DWR</i>			\$0	\$0	\$0

2.1		Pre-Project Study, Research, Reconnaissance									
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014				
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources
2.1.1	Third fish release site reconnaissance	Research supporting the construction of a new fish release site is a requirement in accordance with the implementation plan for Section 3406(b)(4) of the CVPIA. This is identified as Action number 23 in the Annual Work Plan for completion by 2016. It identified in the Suite IV.4 Actions contained in the Reasonable and Prudent Alternative (RPA) of the NMFS 2009 Biological Opinion (BO) governing the operation of the Delta facilities of the Central Valley Project. Specifically, the RPA requires Reclamation to implement Action (IV.4.3(3)) of the NMFS BO to reduce predation on salvaged fish at the fish release sites.	BOR	0.05	n/a	Real Property and Engineering Data for the Proposed New Fish Release Site.		\$11,500			\$11,500
2.1.2	Third fish release site property research	Real Property Research supporting the construction of a new fish release site is a requirement in accordance with the implementation plan for Section 3406(b)(4) of the CVPIA. This is identified as Action number 23 in the Annual Work Plan for completion by 2016. It identified in the Suite IV.4 Actions contained in the Reasonable and Prudent Alternative (RPA) of the NMFS 2009 Biological Opinion (BO) governing the operation of the Delta facilities of the Central Valley Project. Specifically, the RPA requires Reclamation to implement Action (IV.4.3(3)) of the NMFS BO to reduce predation on salvaged fish at the fish release sites.	BOR	0.05	n/a	Real Property Data for the Proposed New Fish Release Site.		\$9,000			\$9,000
							<b>Sub-Total for Pre-Project Study, Research, Reconnaissance, FY2014</b>				
							<b>Restoration Fund</b>	<b>Water and Related Resources</b>	<b>State Cash</b>	<b>State In-Kind</b>	<b>Total All Sources</b>
<b>Subtotal Funding</b>							\$0	\$20,500	\$0	\$0	\$20,500
<b>Reclamation Service</b>							\$0	\$20,500			\$20,500
<b>CA DFG</b>							\$0	\$0			\$0
<b>CA DWR</b>									\$0	\$0	\$0

2.2		Planning-Feasibility										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
2.2.1	Third Fish Release Site Feasibility	To build state-of-the-art salvage release procedures and develop identified additional potential release sites for supporting the construction of a new fish release site is a requirement in accordance with the implementation plan for Section 3406(b)(4) of the CVPIA. This is identified as Action number 23 in the Annual Work Plan for completion by 2016. It identified in the Suite IV.4 Actions contained in the Reasonable and Prudent Alternative (RPA) of the NMFS 2009 Biological Opinion (BO) governing the operation of the Delta facilities of the Central Valley Project. Specifically, the RPA requires Reclamation to implement Action (IV.4.3(3)) of the NMFS BO to reduce predation on salvaged fish at the fish release sites.	BOR	0.05	n/a	Correspondence, Site Selection Criteria Development		\$11,500			\$11,500	
							<b>Sub-Total for Planning-Feasibility, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$11,500	\$0	\$0	\$11,500
							<i>Reclamation Service</i>	\$0	\$11,500			\$11,500
							<i>CA DFG</i>			\$0	\$0	\$0
							<i>CA DWR</i>			\$0	\$0	\$0

2.3		Outreach and Public Involvement										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
2.3.1	Fisheries Outreach	Technical Advisory	BOR	0.02	RPA IV.4.1 Tracy Fish Collection Facility	Participation in Technical Advisory Team		\$4,000			\$4,000	
							<b>Sub-Total for Outreach and Public Involvement, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$4,000	\$0	\$0	\$4,000
							<i>Reclamation Service</i>	\$0	\$4,000			\$4,000
							<i>CA DFG</i>			\$0	\$0	\$0
							<i>CA DWR</i>			\$0	\$0	\$0

2.4		Environmental Compliance										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
2.4.1	Third Fish Release Site	Mapping, Planning for the state-of-the-art salvage release procedures and develop identified additional potential release sites.	BOR	0.05	n/a	Preliminary Assessment		\$10,000			\$10,000	
2.4.2	Compliance	Environmental Specialist, responsible for writing NEPA / CEQA, ESA, Cultural Resources compliance documents for Reclamation relevant projects as selected.	BOR	0.05	n/a	Compliance Document as needed		\$9,000			\$9,000	
							<b>Sub-Total for Environmental Compliance, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$19,000	\$0	\$0	\$19,000
							<i>Reclamation Service</i>	\$0	\$19,000			\$19,000
							<i>CA DFG</i>	\$0	\$0			\$0
							<i>CA DWR</i>			\$0	\$0	\$0

2.5		Design										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
2.5.1	Third Fish Release Design	Design Coordination with the State of California Department of Water Resources	BOR	0.02	n/a	Participation on the Relece Site Technical Team		\$4,600			\$4,600	
							<b>Sub-Total for Design, FY2014</b>					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$4,600	\$0	\$0	\$4,600
							<i>Reclamation Service</i>	\$0	\$4,600			\$4,600
							<i>CA DFG</i>	\$0	\$0			\$0
							<i>CA DWR</i>			\$0	\$0	\$0

2.7		Construction/Implementation										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
2.7.1	Replace Secondary Louvers - TFCF	The existing louvers in the secondary channel of the TFCF are to be replaced with traveling fish screens. The new screens will be designed to continuously remove aquatic debris suspended in the flow and diverting fish to the fish holding tanks by blocking them from traveling downstream.	BOR	0.00	RPA IV.4.1 Tracy Fish Collection Facility	0		\$3,900,000			\$3,900,000	
							Sub-Total for Construction/Implementation, FY2014					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$3,900,000	\$0	\$0	\$3,900,000
							<i>Reclamation Service</i>	\$0	\$3,900,000			\$3,900,000
							<i>CA DFG</i>	\$0	\$0	\$0	\$0	\$0
							<i>CA DWR</i>	\$0	\$0	\$0	\$0	\$0

4.1		Monitoring (Programmatic)										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
4.1.1	Water Quality - TFCF	Monitor Hydro Lab and collect and analyze water samples	BOR	0.11	RPA IV.4.1 Tracy Fish			\$19,800			\$19,800	
4.1.2	WQ - TFCF	Ancillary Costs for equipment and chemicals	BOR	0.00				\$5,000			\$5,000	
							Sub-Total for Monitoring (Programmatic), FY2014					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$24,800	\$0	\$0	\$24,800
							<i>Reclamation Service</i>	\$0	\$24,800			\$24,800
							<i>CA DFG</i>	\$0	\$0	\$0	\$0	\$0
							<i>CA DWR</i>	\$0	\$0	\$0	\$0	\$0

4.2		Research (Evaluations, Studies, Investigations)									
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014				
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources
4.2.1	South Sacramento-San Joaquin Delta research #1	Research supporting improvement in facility salvage efficiency of the Tracy fish collection facility. Actions to reduce losses associated with the salvage process, (1) conduct studies to evaluate current operations and salvage criteria to reduce take associated with salvage.	BOR	0.65				\$130,000			\$130,000
4.2.2	TFCF - Whole Facility Efficiency	Research supporting Whole facility salvage efficiency testing of the Tracy fish collection facility for Salmonids.	BOR	0.85				\$195,500			\$195,500
4.2.3	TFCF - WFE	Equipment Costs	0	0.00				\$284,600			\$284,600
4.2.4	South Sacramento-San Joaquin Delta research #2	Research supporting improvement in facility salvage efficiency of the Tracy fish collection facility. Actions to reduce losses associated with the salvage process,(2) develop new procedures and modifications to improve the current operations.	BOR	0.55				\$110,000			\$110,000
4.2.5	South Sacramento-San Joaquin Delta research #3	Research supporting improvement in facility salvage efficiency of the Tracy fish collection facility. Actions to reduce losses associated with the salvage process,(3) implement changes to the physical infrastructure of the facilities where information indicates such changes need to be made.	BOR	0.55				\$110,000			\$110,000
4.2.6	South Sacramento-San Joaquin Delta, QA/QC	Quality control and quality assurance programs, genetic analysis, louver cleaning loss studies, release site studies and studies to determine methods for removal of predators in the primary channel, leading to the primary louver screens with the goal of reducing predation loss to 10% or less . Also new studies to estimate green sturgeon screening efficiency at both facilities and survival through the trucking and handling process.	BOR	0.55				\$110,000			\$110,000
							<b>Sub-Total for Research, FY2014</b>				
							<b>Restoration Fund</b>	<b>Water and Related Resources</b>	<b>State Cash</b>	<b>State In-Kind</b>	<b>Total All Sources</b>
							\$0	\$940,100	\$0	\$0	\$940,100
							<i>Reclamation</i>	\$0	\$655,500		\$655,500
							<i>Service</i>	\$0	\$0		\$0
							<i>CA DFG</i>		\$0	\$0	\$0
							<i>CA DWR</i>		\$0	\$0	\$0



4.4		Data Management										
AWP Activity Number	Activity	Activity Name & Description	Agency		Program Performance Goal	FY2014 Projected Performance	3406 (b)(4) Requested Funding for Fiscal Year 2014					
			Name	Fractional FTE			Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
4.4.1	DTSC Data Management	Web Site and Meta-Data Management	BOR	0.25				\$50,000			\$50,000	
							Sub-Total for Data Management, FY2014					
							Restoration Fund	Water and Related Resources	State Cash	State In-Kind	Total All Sources	
							<i>Subtotal Funding</i>	\$0	\$50,000	\$0	\$0	\$50,000
							<i>Reclamation Service</i>	\$0	\$50,000			\$50,000
							<i>CA DFG</i>	\$0	\$0			\$0
							<i>CA DWR</i>			\$0	\$0	\$0

Outyear activities are estimates of funding capability only and do not reflect the future Congressional Appropriations process.

Table 2. FY2015 Proposed Activities and Costs

CVPIA Section 3406 (b)(4),

Jones (Tracy) Pumping Plant/ Tracy Test Fish Facility

	3406 (b)(4) Requested Funding For Fiscal Year 2015			
	Restoration Fund	Water and Related Resources	State Cash	Total All Sources
<b>Total</b>	\$354,000	\$1,233,000	\$118,000	\$1,705,000
<b>US Bureau of Reclamation</b>	\$354,000	\$1,233,000		\$1,587,000
<b>US Fish and Wildlife Service</b>	\$0	\$0		\$0
<b>California Dept of Fish and Wildlife</b>			\$118,000	\$118,000
<b>California Dept of Water Resources</b>			\$0	\$0

Task	Project Name	Project Description	Federal Costs(\$)				State Cost Share (\$)		Total Costs (\$)
			BOR Restoration Fund	BOR W&RR Fund	FWS Restoration Fund	FWS W&RR Fund	CA DFW	CA DWR	
<b>Program Mgmt &amp; Support</b>									\$0
<b>Project 1</b>	Program Management			\$248,000					\$248,000
<b>Project 2</b>	WQ - Monitoring TFCF			\$25,000					\$25,000
<b>Project 3</b>	Third Fish Release Site		\$354,000				\$118,000		\$472,000
<b>Project 4</b>	BOR Research Projects - South Sacramento-San Joaquin Delta			\$360,000					\$360,000
<b>Project 5</b>	BOR Research Project - TFCF - WFE			\$600,000					\$600,000

Outyear activities are estimates of funding capability only and do not reflect the future Congressional Appropriations process.

Table 2. FY2016 Proposed Activities and Costs

CVPIA Section 3406 (b)(4),

Jones (Tracy) Pumping Plant/ Tracy Test Fish Facility

	3406 (b)(4) Requested Funding For Fiscal Year 2016			
	Restoration Fund	Water and Related Resources	State Cash	Total All Sources
<b>Total</b>	\$3,225,000	\$1,293,000	\$1,075,000	\$5,593,000
<b>US Bureau of Reclamation</b>	\$3,225,000	\$1,293,000		\$4,518,000
<b>US Fish and Wildlife Service</b>	\$0	\$0		\$0
<b>California Dept of Fish and Wildlife</b>			\$1,075,000	\$1,075,000
<b>California Dept of Water Resources</b>			\$0	\$0

Task	Project Name	Project Description	Federal Costs(\$)				State Cost Share (\$)		Total Costs (\$)
			BOR Restoration Fund	BOR W&RR Fund	FWS Restoration Fund	FWS W&RR Fund	CA DFW	CA DWR	
<b>Program Mgmt &amp; Support</b>									\$0
<b>Project 1</b>	Program Management			\$260,000					\$260,000
<b>Project 2</b>	WQ - Monitoring TFCF			\$25,000					\$25,000
<b>Project 3</b>	Third Fish Release Site		\$3,225,000				\$1,075,000		\$4,300,000
<b>Project 4</b>	BOR Research Projects - South Sacramento-San Joaquin Delta			\$378,000					\$378,000
<b>Project 5</b>	BOR Research Project - TFCF - WFE			\$630,000					\$630,000