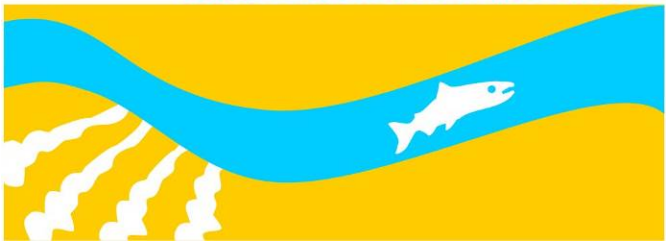
Mendota Pool Bypass and Reach 2B Improvements Project – Columbia Canal Intake and Siphon

Biological Assessment for the National Marine Fisheries Service

SAN JOAQUIN RIVER
RESTORATION PROGRAM



December 2016

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List of Abbreviations and Acronyms

BA	biological assessment
BMP	best management practice
BO	biological opinion
cfs	cubic feet per second
CL	critical low (water year)
CNDDB	California Natural Diversity Database
Corps	U.S. Army Corps of Engineers
DFW	California Department of Fish and Wildlife
DO	dissolved oxygen
DPS	Distinct Population Segment
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ESA	Federal Endangered Species Act
ESU	Evolutionarily Significant Unit
FE	Federally Endangered
FT	Federally Threatened
MLT	Mitigation Lands Trust 1986, current landowner of the property where the Columbia Canal Intake and Siphon will be constructed
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
ND	normal dry (water year)
NEP	nonessential experimental population
NMFS	National Marine Fisheries Service
NRDC	Natural Resources Defense Council
NW	normal wet (water year)
PEIS/R	Program Environmental Impact Statement/ Environmental Impact Report
Project	Mendota Pool Bypass and Reach 2B Improvements Project
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Settlement	Stipulation of Settlement in NRDC, et al., v. Kirk Rodgers, et al.
Settling Parties	Natural Resources Defense Council, Friant Water Authority, and the U.S. Departments of the Interior and Commerce
SJRRP	San Joaquin River Restoration Program

USFWS	U.S. Fish and Wildlife Service
W	wet (water year)

1.0 Introduction

The Bureau of Reclamation submitted a Biological Assessment (BA) to the National Marine Fisheries Service (NMFS) on the Mendota Pool Bypass and Reach 2B Project (Reach 2B Project) on January 14, 2016. The Reach 2B Project includes several distinct phases of construction for actions that will occur over approximately ten years. After further discussion with NMFS, Reclamation requested a programmatic consultation on March 14, 2016. NMFS issued a Programmatic Biological Opinion (BO) on the effects of the Mendota Pool Bypass and Reach 2B Improvements Project on October 24, 2016 (NMFS No: WCR-2016-4138).

The purpose of this site-specific BA is to analyze the effect of the Columbia Canal Intake and Siphon (Intake and Siphon) component of the Reach 2B Project on the:

- Central Valley steelhead Distinct Population Segment (DPS; *Oncorhynchus mykiss*) (steelhead) and the

- Central Valley spring-run Chinook salmon Evolutionarily Significant Unit (ESU; *O. tshawytscha)* non-essential experimental population (spring-run Chinook salmon).

The analysis in this BA is based on 100% designs and is intended to verify that the anticipated effects of the proposed action are within those analyzed in the Reach 2B Project Programmatic BA and BO. No proposed or designated critical habitat occurs for steelhead or spring-run Chinook salmon within the action area for the Intake and Siphon, and therefore critical habitat is not further discussed.

The Bureau of Reclamation intends to construct the Intake and Siphon starting in 2017 as part of the Reach 2B Project as an element of the San Joaquin River Restoration Program as authorized by Public Law 111-11. The Intake and Siphon Project involves constructing a diversion on Mendota Pool and a siphon under the future Mendota Pool Bypass, near the town of Mendota, California.

2.0 Proposed Action

The Action Area includes the entire contractor use area shown in Figure 2, and extends from Drive 10 ½, out into the San Joaquin River, and East to where Columbia Canal is immediately adjacent to the San Joaquin River near MLT Well #3. The Action Area is in Madera County, near the town of Mendota.

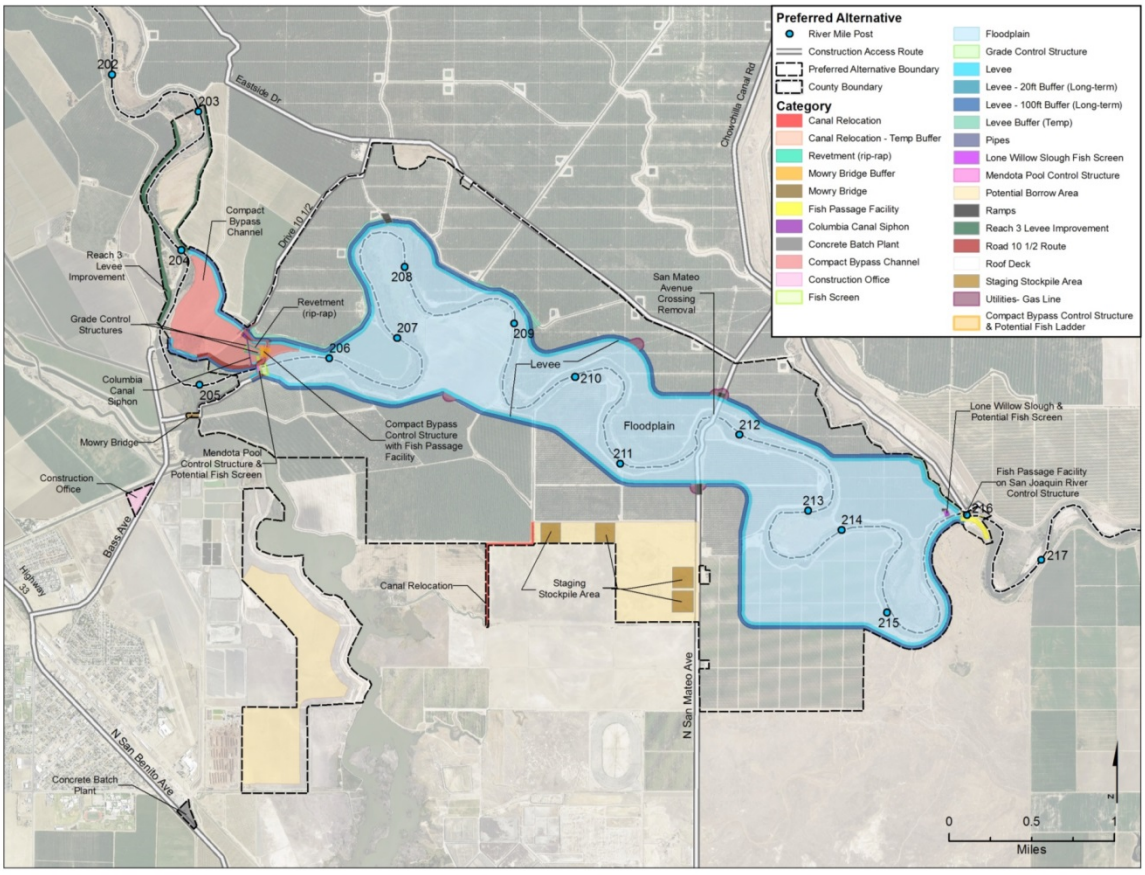

Figure 1.
Overview of the Mendota Pool Bypass and Reach 2B Project and the Project Vicinity

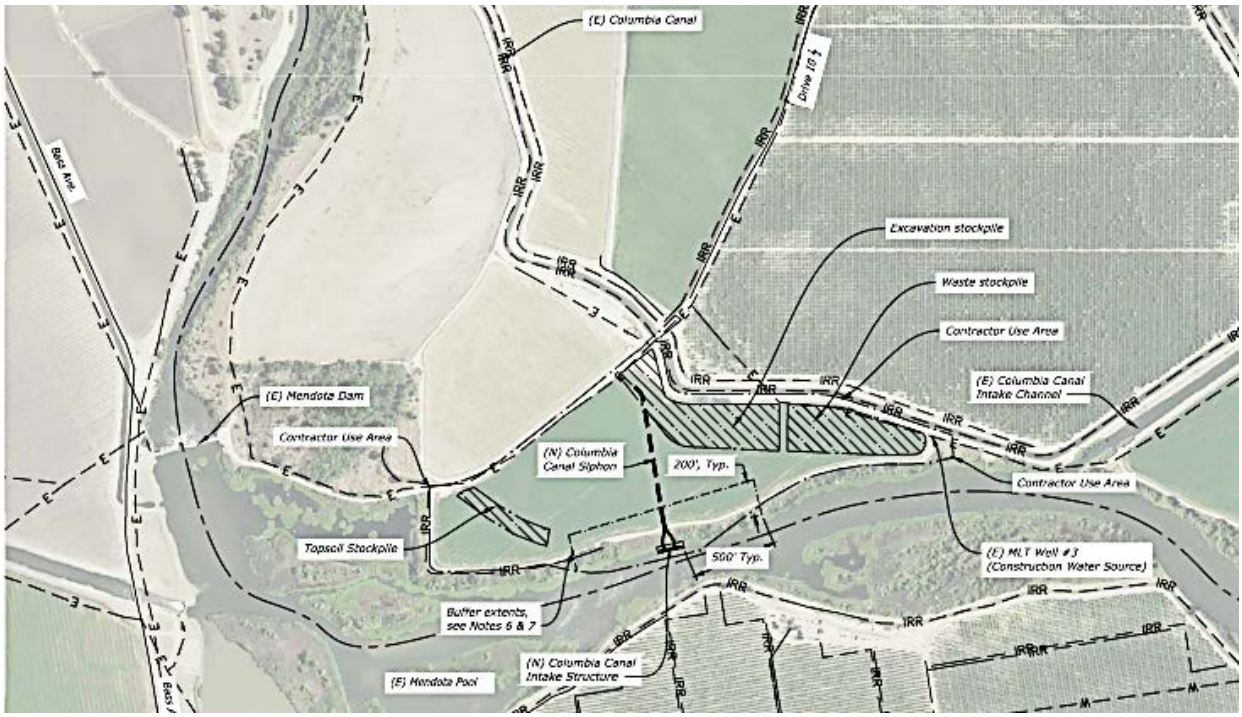

Figure 2.
Project Action Area showing the Columbia Canal intake, siphon, and contractor use areas

The purpose of the proposed action is to divert water from Mendota Pool and transport it under the Mendota Pool Bypass to be put into the Columbia Canal. This is required to implement the Exchange Contract between the San Joaquin River Exchange Contractors and the Bureau of Reclamation. Columbia Canal Company is one of the Exchange Contractors. A pumping plant will be built in a later phase of the Reach 2B Project which will pump water from the Columbia Canal siphon into Columbia Canal. Figure 2 includes a plan view of the Project's features. The Project includes:

- An intake structure on Mendota Pool to divert up to 250 cubic feet per second
- A double-barreled concrete siphon under the Mendota Pool Bypass to transport the water from Mendota Pool to the future Columbia Canal pumping plant
- Creation of a foundation for the future Mendota Pool Bypass south levee

Reclamation will implement all of the commitments included in the Programmatic Biological Opinion and Record of Decision for the Mendota Pool Bypass and Reach 2B Channel Improvements Project, as applicable to this phase of construction, including requirements for worker awareness training, staking and flagging of habitat, relocation of species where required, minimization of riparian vegetation removal, Monitoring and Management Plan development, et cetera.

2.1.1 Columbia Canal Intake Structure

The Columbia Canal water intake facility would be located in Mendota Pool, and would consist of ten 12-foot-wide, 7-foot-tall bays, with a bar screen to prevent aquatic vegetation from entering the siphon. The extensive intake area would be required to maintain appropriate velocities and minimize sediment and vegetation issues. Intake bays would be 7 feet tall to account for 5 feet of subsidence. Existing water surface elevations in Mendota Pool would rise to approximately 3 feet above the intake crest elevation.

Temporary dewatering sheetpiles will be installed in Mendota Pool around the location of the Columbia Canal Intake Structure. Dewatering wells installed within the sheetpiles will remove water from within the sheetpile box to enable construction in the dry (Figure 3 and Appendix A).

In addition, a portion of the edge of Mendota Pool on either side of the Columbia Canal Intake Structure will be filled in with soil to create a foundation for the future Compact Bypass south levee. Prior to filling in this area with soil, a sheetpile wall will be driven into the bottom of Mendota Pool to exclude water and any species from the area. This sheetpile wall will be removed after construction of the foundation for the future Compact Bypass south levee. A series of stepped vegetated earthen embankments will extend from the water surface up the bank of the foundation.

The construction contractor is only allowed to remove vegetation as necessary within 500 feet of the Columbia Canal Intake Structure to minimize impacts to existing vegetation for both vegetation and migratory bird protection. Removal of vegetation at the location of the Columbia Canal Intake Structure will take place after September 16, 2017, per the conservation measure requirement for vegetation removal outside of the migratory bird nesting season.

After removal of vegetation, the construction contractor will install temporary dewatering sheetpiles in Mendota Pool around the location of the future intake structure (Drawing page 18), which will draw down the water within the sheetpiles and allow a dry working area for construction of the intake structure. The construction contractor will also install sheetpiles for several hundred feet on either side of the intake structure to allow for construction of the Compact Bypass south levee foundation between the sheetpile and the existing land.

Reclamation will develop and implement a Fish Rescue and Relocation Plan (FRRP), as approved by NMFS, prior to sheetpile construction. In addition, to assess and minimize the impacts of underwater noise on salmonids, a pile driving analysis will be submitted to NMFS 90 days prior to the start of any pile driving activities. NMFS will have 45 days to review both documents.

The bar screen would be cleaned by an automatic trash rake, with trash deposited on a concrete slab to the side of the intake structure where trucks can access and remove the vegetation. A sediment sump would be provided in the center bay to allow for sediment removal. The top of the intake facility would be covered with grating to allow for easy access for maintenance.

The future Mendota Pool Fish Screen will be upstream of the Columbia Canal intake, and will significantly reduce the number of fish that would have entered the intake from reaching the intake location. The Mendota Pool Entrainment Analysis included in the Programmatic Mendota Pool Bypass and Reach 2B Project Biological Assessment provides more details on the expected efficiency of the Mendota Pool Fish Screen.

2.1.2 Columbia Canal Siphon

The Columbia Canal siphon would cross underneath the Compact Bypass from the intake facility on Mendota Pool to the future pumping plant located near the existing Columbia Canal, approximately 1,000 feet. The siphon would be two adjacent 4-foot by 6-foot concrete box culverts, that would be buried a minimum of 5 feet below the low flow channel in the Compact Bypass. The Columbia Canal intake facility and pumping plant would be constructed with SCADA (supervisory control and data acquisition) capability, but able to be manually operated as well. SCADA allows the Columbia Canal Company to control the flow rate through the pumping plant remotely.

It is unlikely maintenance will need to occur on the Columbia Canal siphon, as there is a bar screen on the intake structure to prevent debris and vegetation from getting into the intake, as well as a sediment trap built into the intake structure so that sediment will deposit out before going through the siphon. The siphon has been designed as two adjacent 4-foot by 6-foot concrete box culverts so that in the event maintenance does need to occur on the siphon, one of the box culverts can continue to supply water while the other is undergoing maintenance.

The Compact Bypass area would be excavated to approximately 30 feet below existing grade in the center of the siphon alignment. After installation of the siphon, excess soil would be deposited on top of the siphon until there is no soil left. No borrow material would be necessary for the project.

Siphon construction will occur on land, in the dry.

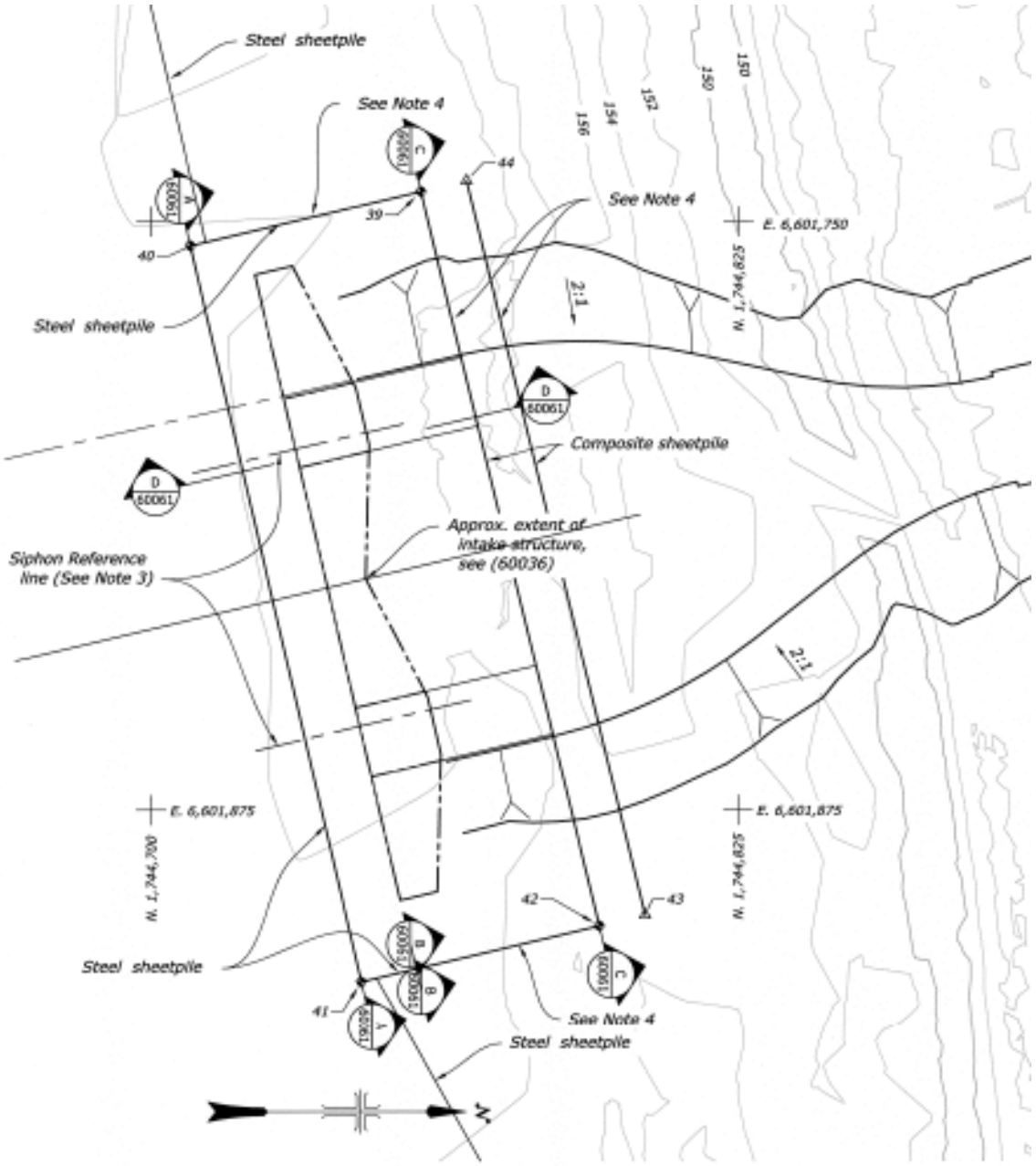

Figure 3.
Columbia Canal Intake Structure Sheetpile Wall

2.1.3 Conservation Measures

The proposed action includes conservation measures applicable to this phase of construction of the Reach 2B Project, as described in the Reach 2B Project Programmatic BA and BO, which are based on the SJRRP Conservation Strategy, developed with the USFWS, NMFS, and DFW, which will be implemented in a manner that is consistent with adopted conservation plans for sensitive species, and for wetland and riparian ecosystems of the Restoration Area (Table 1).

Table 1. Conservation Measures included in the Proposed Action

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description
FISH-1.	The Hills Ferry Barrier will be operated and maintained to exclude Central Valley steelhead from the Restoration Area during construction activities and until suitable habitat conditions are restored, and trapping and monitoring will occur to detect steelhead moving upstream and relocate them to the mouth of the Merced River. Reclamation will continue to implement the Steelhead Monitoring Plan or similar action to prevent steelhead from entering the action area before completion of all aspects of the proposed action. Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the Project are positive. Disturbance of riparian vegetation will be avoided to the greatest extent practicable. A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (e.g., oils, transmission and hydraulic fluids, cement, fuel) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and will be implemented in case of a spill. Stockpiling of materials, including portable equipment, vehicles and supplies, such as chemicals, will be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas. A qualified biological monitor will be present during all construction activities, including clearing, grubbing, pruning, and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction, to monitor implementation of conservation measures and water quality. The floodplain will be designed in accordance with the Rearing Habitat Design Objectives.

Fish-2. Minimize Loss of Habitat and Risk of Take of Fish Species.	Construction Best Management Practices (BMPs) for off-channel staging, and storage of equipment and vehicles, will be implemented to minimize the risk of contaminating the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. Riparian vegetation removed or damaged will be replaced within the immediate area of the disturbance to maintain habitat quality. If individuals of listed species are observed present within the Project area, NMFS will be notified within 24 hours. NMFS personnel will have access to construction sites during construction, and following completion, to evaluate species presence and condition and/or habitat conditions. If bank stabilization activities are necessary, then such stabilization will be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation. Reclamation will implement a NMFS-approved Worker Environmental Awareness Training Program for construction personnel to be conducted by the NMFS-approved biologist for all construction workers prior to the start of construction activities. The program will provide workers with information on their responsibilities with regard to Federally-listed fish, their critical habitat, an overview of the life-history of these species, information on take prohibitions, protections under the ESA, and an explanation of the applicable contract requirements or terms andconditions identified in a NMFS biological opinion. Written documentation of the training must be submitted to Reclamation within 14 days of the completion of training. A video recording of the training may be used in place of a live training, as needed. The construction contractor will use a vibratory hammer, where feasible, to avoid acoustic impacts to ESA-listed fish when pile driving. If an impact hammer is necessary, in order to assess and minimize the impacts of underwater noise on salmonids, a pile driving analysis, including an assessment of sound levels from Project activities, would be submitted to NMFS prior to the start of any pile driving activities. If an impact hammer is necessary, the contractor would consider the use a cushion block to attenuate hydroacoustics during in-water pile driving. The construction contractor will use turbidity curtains during in-water work activities, where feasible, to minimize the release of sediment that may be stirred up by the construction activities. Construction work will be conducted under the guidance of a Stormwater Pollution Prevention Plan (SWPPP)as required by the Construction General Permit (Order No. 2009-0009-DWQ, as amended). As a part of the sampling and monitoring requirements of this permit, in-water turbidity sampling will be conducted by a qualified person to show that turbidity levels do not exceed the limits in the Construction General Permit. Reclamation will require mulches used for hydroseeding in the future floodplain area to contain low concentrations of fertilizer, to the extent feasible. The contractor will use erosion and sediment control measures to minimize harmful runoff into the aquatic ecosystem. Measures shall be taken to ensure that future proposed actions related to the Mendota Pool Bypass and Reach 2B Improvements Project minimize, to the maximum extent practicable, any adverse effects on Federally listed salmon and steelhead that are subject to this consultation. If Reclamation changes operations of the proposed actions from what is analyzed in the BO then NMFS must be notified with a signed letter at least 45 days before proposed changes take place. The notification should include any additional analysis to determine if take would exceed what is currently authorized

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description
	in the ITS of the opinion from the operational changes. NMFS would work with Reclamation to find solutions to operational changes to the extent reasonable and feasible that does not cause harm to populations of listed fish. A Fish Rescue and Relocation Plan (FRRP) will be developed by Reclamation or their contractors and provided to NMFS for approval 90 days prior to cofferdam construction. The FRRP will include methods of flow bypass, diversion, dewatering, salmonid collection, transport and release, water quality data, and formation of a team of qualified biologists with expertise in handling, collecting, and relocating salmonids. NMFS will have 45 days to review and approve the FRRP so contractors can be given time to make necessary changes, if any, to follow NMFS guidance or criteria while staying on construction schedule. . Measures shall be taken to minimize the impacts of bank protection and setback levee construction by implementing integrated conservation measures that provide beneficial growth and survival conditions for salmonids. Also, actions shall be taken to ensure riparian habitat is preserved and protected to the maximum extent allowed within the functional designs of the proposed action. Preserved habitat shall be combined with restorative plantings and features to enhance natural recruitment of riparian vegetation, for protection and creation of fish habitat features. Reclamation shall ensure that native vegetation is used in all replanted areas. All plantings must be provided with the appropriate amount of water to ensure successful establishment. Reclamation shall develop a vegetation plan in consultation with NMFS to allow for the protection of existing vegetation in place and the planting and establishment of new native riparian vegetation. Measures shall be taken to insure that contractors, construction workers, and all other parties involved with these Proposed Actions implement the Proposed Actions as laid out in the biological assessment and the NMFS Biological Opinion. Reclamation shall provide a copy of the NMFS Biological Opinion, or similar documentation, to the prime contractor, making the prime contractor responsible for implementing all requirements and obligations included in these documents and to educate and inform all other contractors involved in the Proposed Action as to the requirements of the NMFS Biological Opinion. A notification that contractors have been supplied with this information will be provided to the reporting address below. A NMFS-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by the NMFS-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to Federally-listed fish, their critical habitat, an overview of the life-history of all the species, information on take prohibitions, protections afforded these animals under the ESA, and an explanation of the relevant terms and conditions of the NMFS Biological Opinion. Written documentation of the training must be submitted to NMFS within 30 days of the completion of training. Measures shall be taken to ensure that riparian habitat within the study area is preserved and protected to the maximum extent feasible for protection of fish habitat features that are the subject of the NMFS Biological Opinion.

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description
FISH-3. Wash Equipment.	Equipment used for the proposed action would be thoroughly washed off-site to remove invasive plant seed, stems, etc. and inspected to prevent transfer of aquatic invasive species, such as quagga mussel and New Zealand mud snail, prior to arriving at the construction area.
Minimize Loss of Habitat and Risk of Take from Implementation of Construction Activities	Construction BMPs for off-channel staging and storage of equipment and vehicles will be implemented to minimize the risk of contaminating the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. Riparian vegetation removed or damaged will be replaced, as applicable, in accordance with the Riparian Habitat Monitoring Management and Mitigation Plan, and will be coordinated with the USFWS and NMFS and/or other agencies as appropriate. If bank stabilization activities are necessary, then such stabilization will be constructed to minimize predator habitat, minimize erosion potential, minimize sedimentation in the waterway, and contain material suitable for supporting riparian vegetation.
EFH Conservation Recommendations	Avoid restoration work during critical fish windows to reduce direct impacts to important ecological functions such as spawning, nursery, and migration. This conservation measure requires scheduling projects when managed species are not expected in the area. These periods will be determined, in coordination with the SJRRP Implementing Agencies. prior to project implementation to reduce or avoid any potential impacts. Minimize the removal of existing native riparian vegetation. Mitigate fully any unavoidable damage to EFH during project implementation and accomplish within reasonable period of time after the impacts occurred. For effects related to erosion/sedimentation, increased turbidity, changes in temperature, and potential introduction of pollutants during construction: a. Use BMPs in all construction and maintenance activities such as avoiding ground disturbing activities during the wet season, minimizing the time disturbed lands are left exposed, using erosion prevention and sediment control methods, minimizing vegetation disturbance, maintaining buffers of vegetation around wetlands, streams and drainage ways, and avoiding building activities in areas of steep slopes with highly erodible soils. Use methods such as sediment ponds, sediment traps, or other facilities designed to slow water run-off and trap sediment and nutrients.
RHSNC	
RHSNC-1. Avoid and Minimize Loss of Riparian Habitat and Other Sensitive Natural Communities	Biological surveys have been conducted to identify, map, and quantify riparian and other sensitive habitats in potential construction areas. See Section 6.3.3 of the Reach 2B Project EIS/R. Construction activities will be avoided in areas containing sensitive natural communities, as appropriate.
RHSNC-2. Compensate for Loss of Riparian Habitat	The Riparian Habitat Mitigation and Monitoring Plan for the SJRRP is being developed and implemented in coordination with DFW. Credits for increased acreage or improved ecological function or riparian and wetland habitats resulting

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description
and Other Sensitive Natural Communities	from the implementation of SJRRP actions will be applied as compensatory mitigation before additional compensatory measures are required. If losses of other sensitive natural communities (e.g., recognized as sensitive by CNDDB, but not protected under other regulations or policies) would not be offset by the benefits of the SJRRP, then additional compensation will be provided through creating, restoring, or preserving in perpetuity in-kind communities at a sufficient ratio for no net loss of habitat function or acreage. The appropriate ratio will be determined in coordination with USFWS or DFW, depending on agency jurisdiction.
WUS	
WUS-1. Identify and Quantify Wetlands and Other Waters of the United States	The distribution of wetlands (including vernal pools and other seasonal wetlands) in the Project area is described in Section 15.3.3 of the Reach 2B Project EIS/R. That section of the Reach 2B Project EIS/R also describes the acreage of effects on waters of the United States, based on the mapped distribution of these wetlands, hydraulic modeling and field observation. A delineation of waters of the United States has been submitted to the Corps for verification. The delineation was conducted according to methods established in the Corps *Wetlands Delineation Manual* and *Arid West Supplement* (Corps Environmental Laboratory 1987, 2008). Construction and modification of road crossings, control structures, fish barriers, fish passages, and other structures will be designed to minimize effects on waters of the United States, and will employ BMPs to avoid indirect effects on water quality.
WUS-2. Obtain Permits and Compensate for Any Loss of Wetlands and Other Waters of the United States	Determine the acreage of effects on waters of the United States that will result from implementation of the SJRRP. Adhere to a "no net loss" basis for the acreage of wetlands and other waters of the United States that will be removed and/or degraded. Wetland habitat will be restored, enhanced, and/or replaced at acreages and locations and by methods agreed on by the Corps and the Central Valley RWQCB, and DFW, as appropriate, depending on agency jurisdiction. Obtain Section 404 and Section 401 permits and comply with all permit terms. The acreage, location, and methods for compensation will be determined during the Section 401 and Section 404 permitting processes. The compensation will be consistent with recommendations in the SJRRP Fish and Wildlife Coordination Act Report (Appendix F of the PEIS/R).
CVS	
CVS-1. Avoid Loss of Habitat and Risk of Take of Species	Impacts to habitat conditions (i.e., changes in flows potentially resulting in decreased flows in the tributaries, increases in temperature, increases in pollutant concentration, change in recirculation/recapture rates and methods, decrease in floodplain connectivity, removal of riparian vegetation, decreases in quality rearing habitat, etc.) are analyzed in the Reach 2B Project Programmatic BA and BO. Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive. A NMFS-appointed representative will be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner. A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (e.g., oils, transmission and hydraulic fluids, cement, fuel) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and will be implemented in case of a spill. NMFS will be notified in the event of a spill or any other contamination of the San Joaquin River related to the proposed project.

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description
	Stockpiling of materials, including portable equipment, vehicles and supplies, such as chemicals, will be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas. A qualified biological monitor will be present during all construction activities, including clearing, grubbing, pruning, and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction, to monitor implementation of conservation measures and water quality. The floodplain would be designed in accordance with the Rearing Habitat Design Objectives.
CVS-2. Minimize Loss of Habitat and Risk of Take of Species	Construction BMPs for off-channel staging, and storage of equipment and vehicles, will be implemented to minimize the risk of contaminating the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. Riparian vegetation removed or damaged will be replaced within the immediate area of the disturbance to maintain habitat quality. If individuals of listed species are observed present within the Project area, NMFS will be notified. NMFS personnel will have access to construction sites during construction, and following completion, to evaluate species presence and condition and/or habitat conditions. If bank stabilization activities should be necessary, then such stabilization will be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation.
EFH	
EFH-1. Avoid Loss of Habitat and Risk of Take of Species	A NMFS-appointed representative will be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner. A qualified biological monitor will be present during all construction activities, including clearing, grubbing, pruning, and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction to monitor implementation of conservation measures and water quality.

Acronyms:
BMP = best management practice
CNDDB = California Natural Diversity Database
Corps = U.S. Army Corps of Engineers
DFW = California Department of Fish and Wildlife
NMFS = National Marine Fisheries Service

3.0 Environmental Setting and Biotic Resources

The environmental setting focuses on the Columbia Canal Intake and Siphon Action Area, which was analyzed in the Reach 2B Project Programmatic BA and BO. Please see

the Mendota Pool Bypass and Reach 2B Improvements Project Programmatic Biological Assessment for detailed descriptions of habitat and species life history and presence.

The siphon construction area consists of an existing alfalfa field. The Columbia Canal Intake Structure area consists of a portion of Mendota Pool, riparian habitat including native trees and vegetation along the edge of Mendota Pool, an existing farm road, and a portion of an existing alfalfa field. Please see the Mendota Pool Bypass and Reach 2B Project Programmatic Biological Assessment for a detailed description of the habitat in the Action Area.

3.1 Species Presence in the Action Area

Construction of the Intake and Siphon will occur starting in 2017 and continue through 2019. This is before fish passage barriers downstream of the action area will be removed.

Adult steelhead and spring-run Chinook salmon cannot reach the action area except during very high flows due to fish passage barriers downstream, including:

- Eastside Bypass Control Structure
- Dan McNamara Road
- Merced National Wildlife Refuge Weirs
- Sack Dam
- Mendota Dam

Spring-run Chinook salmon are being reintroduced by the SJRRP. Spring-run juveniles have been released into the river in 2014, 2015, and 2016, held in Reach 1, and transported down to Reach 5 for release. In 2016, several adult spring-run Chinook salmon were left to spawn in Reach 1 naturally. Progeny of these fish are the only spring-run Chinook salmon that could reach the Action Area. Wild adult spring-run Chinook salmon returning to the Restoration Area are blocked from the action area by the passage barriers listed above.

Some of the hatchery-reared juvenile Central Valley spring-run Chinook salmon may return to the San Joaquin River during construction of the Intake and Siphon. Adult spring-run Chinook salmon migrating through the San Joaquin River would be identified at Hills Ferry Barrier, then trapped in the fyke nets in Reach 5 and hauled to Reach 1 until there is unimpeded passage in the Restoration Area, which is anticipated to occur in 2021. Some migrating adult spring-run Chinook salmon may bypass the traps in Reach 5 just upstream of the Hills Ferry Barrier and continue migrating upstream. In order for these individuals to enter the Action Area, they would need to ascend both Sack Dam and Mendota Dam, which would likely be possible only during high flow events when the flash boards are removed at Mendota Dam. If adult spring-run Chinook successfully spawn in Reach 1, either after migrating naturally through the Restoration Area or being transported from the Hills Ferry Barrier, juveniles could emigrate through the Action Area during construction (2017 to 2019). If spring-run

Chinook salmon were present in the Action Area during the construction, the likelihood of survival would be low as current conditions do not reliably provide suitable rearing, or migratory habitat.

There is currently a very low potential for steelhead to pass downstream barriers and arrive naturally in Reach 2B. Steelhead monitoring in Reach 5 would occur when the Hills Ferry Barrier is not in place (mid-December through mid-September) and when Restoration Flows meet with the Merced River by March 15th. When monitoring is taking place, fyke traps would be installed and the majority of migrating steelhead would be trapped and released at the mouth of the Merced River. Some steelhead could bypass the fyke traps and continue migrating upstream, but would be blocked from the action area by passage barriers.

Central Valley steelhead cannot reach the action area due to fish passage barriers downstream, including the Eastside Bypass Control Structure, Dan McNamara Road, Merced National Wildlife Refuge Weirs, Sack Dam, and Mendota Dam. Volitional fish passage at these barriers will not be possible before construction is complete on the Intake and Siphon, however, passage is possible during very high flow events. Should Central Valley steelhead swim over Sack Dam during high flow events, they still may not be able to ascend Mendota Dam. Central Valley steelhead could potentially access the San Joaquin River upstream of Mendota Dam when the flash boards are removed during very high flow events. Construction of the Intake and Siphon would not occur during very high flow events.

If adult steelhead were to successfully migrate and spawn in Reach 1, then juveniles could access Reach 2B under current conditions by swimming downstream. Kelts could also emigrate through Reach 2B from Reach 1 after spawning. If steelhead were present in the Action Area, the likelihood of survival would be low as current conditions do not reliably provide suitable rearing or migratory habitat. No spawning of steelhead has occurred in Reach 1 to date. Therefore, the likelihood of steelhead presence in the Action Area would continue to be very low throughout the construction of the Intake and Siphon.

Construction of the Columbia Canal Intake and Siphon is expected to conclude in 2019. As described in the Framework for Implementation, the Sack Dam and Arroyo Canal project will not be complete until approximately 2022. Thus, fish passage barriers downstream of the action area will prevent adult spring-run Chinook salmon and steelhead from reaching the Action Area during this project's entire construction period, except possibly during very high flow events.

During long-term operations and maintenance, the Mendota Pool Fish Screen will reduce as much as possible the potential for steelhead and spring-run Chinook salmon entering the Columbia Canal Intake Structure.

4.0 Potential Effects and Avoidance and Minimization Measures

4.1 Effects to Central Valley Steelhead and Central Valley Spring-run Chinook Salmon

As described in the SJRRP and Reach 2B Project Programmatic BAs and BOs, the overall effect of the Reach 2B Project, combined with other SJRRP actions, would improve habitat in the Project area for salmonids. However, some impacts to Central Valley steelhead or Central Valley spring-run Chinook salmon could potentially occur during Reach 2B Project activities. For the purposes of this BA, effects of the Project are separated into two types: effects that would occur during Project construction (2017 to 2019) and those that would occur during long-term operation.

4.1.1 Potential Effects During Construction

Potential for Injury or Mortality

In general, the Action Area currently contains poor quality habitat for salmonids. The Action Area does not presently contain salmonid spawning habitat or support salmonid spawning. While juvenile salmonids could potentially utilize the Action Area for rearing, the quality of rearing habitat is also poor.

Presently, there is a very low potential for Central Valley steelhead or Central Valley spring-run Chinook salmon to enter Reach 2B by swimming up the main San Joaquin River channel during high flows when the considerable downstream barriers are temporarily passible. As described previously, and in the Reach 2B Project Programmatic BA and BO, it would be possible, but unlikely, for Central Valley steelhead or Central Valley spring-run Chinook salmon to migrate through or occur in the Action Area during high flow events. Migrating adult spring-run Chinook salmon in Reach 5 would be transported to Reach 1, so there is a possibility that juveniles could emigrate through the Action Area if spawning is successful. In the event that Central Valley steelhead or Central Valley spring-run Chinook salmon are present in the Action Area during construction, the proposed Project construction activities may result in adverse effects due to injuring or killing individuals, however the potential for this to occur during construction of the Intake and Siphon is anticipated to be very low, given the low potential for species occurrence in the action area. It is not anticipated that the proposed action will result in more take than was addressed in the BO.

Cofferdam Construction. The Columbia Canal siphon construction would occur in what is currently upland habitat, in which case there would be no potential to injure or kill Central Valley steelhead or Central Valley spring-run Chinook salmon. Construction of the Columbia Canal Intake Structure must occur in the San Joaquin River channel and would be isolated from the river through the use of cofferdams (i.e. sheetpile walls). Cofferdams would be installed to allow construction to occur in isolation from the river

channel or Mendota Pool, in the dry (to the extent that dewatering achieves a dry condition), to minimize river turbidity, and to limit contact between Project activities and the channel segments potentially supporting Central Valley steelhead or Central Valley spring-run Chinook salmon.

Installation of cofferdams and sheetpile walls would require enclosing and dewatering the area contained by the walls, which may cause entrainment of salmonids. Fish entrained behind the cofferdam would be exposed to increased water temperatures and decreased dissolved oxygen (DO) concentrations, and would be vulnerable to predation by other entrained fish and potential stranding (Cushman 1985). The low frequency of salmonid occurrence in Reach 2B makes it unlikely that these species would be encountered during Project construction.

Adverse effects to Central Valley steelhead and Central Valley spring-run Chinook salmon resulting from cofferdam installation would be minimized by implementing the Conservation Measures described above, including a Fish Rescue and Relocation Plan as described above. The plan will include methods of flow bypass, diversion, dewatering, salmonid collection, transport and release, water quality data, and formation of a team of qualified biologists with expertise in handling, collecting, and relocating salmonids. The pile driving plan would describe anticipated sound impacts. NMFS would have 45 days to review the Fish Rescue and Relocation Plan and the Pile Driving Plan so contractors can be given time to make necessary changes, if any, to follow NMFS guidance or criteria while staying on construction schedule.

Effects on Habitat

As described in the Reach 2B Project Programmatic BA and BO, the Reach 2B Project would restore floodplain habitat and provide upstream and downstream fish passage around Mendota Dam for adult salmonids and other native fishes and provide downstream passage for juvenile salmonids. However, minor impacts would occur during construction of the Intake and Siphon, including:

- Loss of habitat because of installation of sheetpile walls in Mendota Pool and removal of riparian vegetation

- Erosion and sedimentation entering the San Joaquin River during installation of sheetpile walls, leading to a reduction in prey abundance

- Temporary increases in turbidity due to installation of sheetpile walls, leading to reduced foraging ability and reduced growth

- Temporary changes in water temperature due to construction activities

- Accidental spills of hazardous materials, causing injury or mortality

- Noise from sheetpile installation, causing avoidance behavior in the fish or injury if directly adjacent to installation

Potential for Injury or Mortality During Construction
Effects are anticipated to be within what was analyzed in the Reach 2B Project Programmatic BA and BO.

4.1.2 Potential Effects During Operation

Salmonid Entrainment
The Intake Structure will be downstream of and behind the future Mendota Pool Fish Screen. No fish except for the smallest juveniles that can fit through the screen will be able to reach the intake structure.

After construction of the Intake Structure but prior to construction of the Mendota Pool Fish Screen, estimated to be from 2020-2023, fish could reach the Intake Structure and the rest of the many existing diversions in Mendota Pool. Effects during this 4 year period are anticipated to be within what was analyzed in the Reach 2B Project Programmatic BA and BO.

4.2 Cumulative Effects

Please see the Reach 2B Project Programmatic BA analysis of cumulative effects.

4.3 Conclusions

The Intake and Siphon would involve sheet pile construction which could have an extremely low potential to injure or kill Central Valley steelhead and the Non-essential Experimental Population (NEP) of spring-run Chinook salmon, would degrade habitat quality (via sedimentation, increases in turbidity and temperature, and introduction of pollutants), and produce harmful levels of noise during construction. In addition, adverse effects during Project operation may include entrainment in Mendota Pool. The avoidance and minimization measures, as described in Table 1 will be implemented to avoid and minimize habitat effects and the risk of incidental take associated with construction and operation activities. However, because these measures cannot completely eliminate the possibility of the Intake and Siphon impacting Central Valley steelhead, Reclamation has determined in accordance with Section 7(a)(2) of the ESA, the Project may affect, and is likely to adversely affect Central Valley steelhead. Reclamation has determined in accordance with Section 7(a)(4) of the ESA, the Project may affect, but would not jeopardize the NEP of Central Valley spring-run Chinook salmon within the San Joaquin River. The effects of the Intake and Siphon on California Central Valley Steelhead and the NEP of spring-run Chinook salmon are anticipated to be within those analyzed in the Reach 2B Project Programmatic BA and BO.

5.0 References

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