E-8: Line 406/407 Fish Habitat Assessment

Fish Habitat Assessment
for the
Pacific Gas and Electric Company
Line 406 and Line 407 Pipeline Project

Placer, Sutter, Sacramento, and Yolo Counties, California

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EXECUTIVE SUMMARY

Pacific Gas and Electric Company (PG&E) is planning to construct the Line 406 and Line 407 Pipeline Project (project) in California's Central Valley in Yolo, Sutter, Sacramento, and Placer counties. This natural gas pipeline project involves a new transmission pipeline that begins at PG&E's existing Lines 400 and 401 in Yolo County at the foot of the Coast Range and extends east to Line 172A (Line 406); a new transmission pipeline that extends from Line 172A near the town of Yolo east to existing PG&E Line 123 in the City of Roseville (Line 407); and a new Distribution Feeder Main (DFM) that extends from Line 407 south paralleling Powerline Road to the Sacramento Metro Air Park development in Sacramento County (Powerline Road DFM).

TRC conducted literature research and used geographic information systems and aerial maps to determine if suitable habitat for special-status fish species exists in the Line 406 and Line 407 Project areas. Critical habitat for listed fish species was also considered during the review, and avoidance and/or minimization measures were established to avoid impacts during construction of the proposed natural gas pipeline.

TRC performed reconnaissance-level field surveys to further investigate the potential for suitable habitat for special-status fish species in the Line 406 and 407 project area on July 20, 2006 and June 21, 2007. The purpose of the surveys was to identify if streams, rivers, and canals in the project area have suitable access, flows, temperatures, and/or spawning or rearing conditions that could support these species and that could potentially be impacted by project activities.

Research indicated the potential for numerous special-status fish species to occur in the Line 407 project area, particularly in the Sacramento River, the Yolo Bypass, and its associated canals. Other waterways observed in the project area include irrigation canals and a few small ephemeral drainages in the Dunnigan Hills area within the Line 406 alignment, and a large network of irrigation canals and two small creeks, Steelhead Creek and Curry Creek within the Line 407 alignment.

Special-status fish species that are expected to occur in the Line 407 area include green sturgeon (*Acipenser medirostris*), delta smelt (*Hypomesus transpacificus*), river lamprey (*Lampetra ayresii*), Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley fall/late-fall run chinook salmon (*Oncorhynchus tshawytscha*), Central Valley winter run chinook salmon, Central Valley spring run chinook salmon, and Sacramento splittail (*Pogonichthys macrolepidotus*).

Project activities will not require in-stream work in or near waterways that are likely to support special-status fish species. All waterways with the potential to support special-status fish species will be crossed using horizontal directional drilling techniques. The mitigation measures outlined in this report will significantly reduce any potential for impact to special-status fish, their critical habitat, or to essential fish habitat. Therefore, the project may affect but is not likely to affect special-status fish species, critical habitat, or essential fish habitat.

INTRODUCTION

Pacific Gas and Electric Company (PG&E) is planning to construct the Line 406 and Line 407 Pipeline Project (project) to address the need for additional natural gas supply to serve ongoing residential and commercial load growth in the greater Sacramento River Valley region within Placer, Sutter, Sacramento, and Yolo counties. The project includes approximately 42 miles of 30-inch-diameter pipeline, approximately 2.5 miles of 10-inch-diameter pipeline, and approximately five aboveground pressure regulation and limiting stations.

PROJECT DESCRIPTION

PIPELINE SEGMENTS AND CONSTRUCTION METHODS

The new gas transmission pipeline will consist of four segments: Line 406, Line 407 West, Line 407 East, and the Powerline Road Distribution Feeder Main (DFM), which are described in further detail below.

Line 406

Line 406 consists of approximately 14 miles of 30-inch-diameter gas transmission pipeline that will run between existing Lines 400 and 401 and existing Line 172A in Yolo County. From Lines 400 and 401, the pipeline will head east across agricultural fields and Hungry Hollow Canal to County Road (CR) 87, where it will jog south to a point just north of the intersection with CR 19. The route will proceed east under CR 87 and across more agricultural fields and two unnamed irrigation canals to Interstate 505 (I-505) in order to align with CR 17. After crossing under I-505 and Goodnow Slough, the route will parallel CR 17. From this point, Line 406 will continue east, paralleling CR 17 and crossing a number of small ephemeral drainages to a point at the east end of the Dunnigan Hills, where it will jog north for approximately 2,500 feet. At this point, the route will turn east along farm roads to, and under, Interstate 5 (I-5). On the east side of I-5, Line 406 will continue east to a tie-in point with Line 172A and Line 407 West. The proposed in-service date is October 1, 2009.

Line 407 West

Line 407 West consists of approximately 13.5 miles of 30-inch-diameter pipeline that will run between the junction of existing Line 172A and proposed Line 406 in Yolo County, and proposed Line 407 East near the intersection of Powerline and Riego roads in Sutter County. Beginning at the tie-in point with Lines 406 and 172A near I-5, Line 407 West will run east through agricultural fields to CR 98. The route will cross under and parallel CR 98 south to CR 16A. The pipeline will then head east along CR 16A to CR 99B, which it will parallel south to CR 17. At CR 17, the pipeline will turn east and parallel CR 17 to the Knights Landing Ridge Cut. The route will cross under this canal to the east and pass through more agricultural fields before going under the western levee of the Yolo Bypass. Line 407 West will then cross east through agricultural fields within the Yolo Bypass before crossing under the eastern levee of the Yolo Bypass and Tule Canal and reaching an irrigation canal on the eastern side of the bypass, which it will parallel north to CR 16. The route will parallel CR 16 east through Sacramento

River Ranch Conservation Bank lands and walnut orchards to the Sacramento River crossing site near the junction of CR 16 and CR 117. From this point, the pipeline will cross under the Sacramento River for approximately 3,000 feet and will then follow Riego Road in Sutter County past the Huffman East, Huffman West, Vestal, and Atkinson Natomas Basin Habitat Conservation tracts, to the corner of Powerline and Riego roads, where it will meet the Powerline Road DFM and Line 407 East.

Line 407 East

Line 407 East consists of approximately 12 miles of 30-inch-diameter pipeline that will run between proposed Line 407 West in Sutter County and existing Line 123 in Placer County. Line 407 East will extend east from the junction of Line 407 West and the Powerline Road DFM along Riego and Baseline roads in Sutter and Placer counties. The route will cross State Route (SR) 70/99 and a number of irrigation canals, including the North Drainage Canal and the Natomas East Main Drainage Canal (Steelhead Creek). Line 407 East will continue east, crossing an unnamed tributary to Steelhead Creek and Curry Creek along Baseline Road before connecting with Line 123 near the intersection of Baseline and Fiddyment roads.

Powerline Road Distribution Feeder Main

The Powerline Road DFM consists of approximately 2.5 miles of 10-inch-diameter steel pipeline that will supply natural gas to new developments in north Sacramento County, including the Metro Air Park and North Natomas. This segment will parallel Powerline Road between Riego Road in Sutter County where Lines 407 East and West meet, and West Elverta Road in Sacramento County. The Powerline Road DFM will be constructed concurrently with Line 407 East.

Regulator Stations

The project will include the construction of additional appurtenances necessary for operation of the four line segments. Five fenced, aboveground pressure limiting, pressure regulating, metering, and main line valve stations will be constructed along Line 406 and Line 407 to ensure that proper pressures are maintained in the transmission system and to reduce the pressure of the gas before delivering it to the distribution pipeline system. These stations will consist of the following.

- The Capay Metering Station is required at the connection of Lines 400 and 401 and Line 406, and will cover an area of approximately 100 feet by 100 feet.

- The Yolo Junction Pressure Limiting Station is required at the connection of Line 406 and Line 172A near I-5, and will cover an area of approximately 100 feet by 130 feet.

- The Baseline Road Pressure Limiting Station is required at the connection of Line 407 and Line 123 at Baseline Road and Watt Avenue and will be approximately 85 feet by 145 feet.

- The Powerline Road Pressure Regulating Station, near the corner of Powerline Road and West Elverta Road along the Powerline Road DFM, will be constructed in a yard measuring approximately 40 feet by 100 feet.

- The Powerline Road Main Line Valve will be installed within a yard measuring approximately 30 feet by 30 feet at the intersection of Riego and Powerline roads.

Other components necessary to the operation of the pipeline include aboveground line markers and electrolysis test stations.

Construction and Right-of-way

The 30-inch-diameter pipeline will be constructed within a 100-foot-wide right-of-way (ROW). The ROW will consist of 50 feet of temporary construction workspace and 50 feet of permanent easement. The 10-inch-diameter DFM will be constructed in a 60-foot-wide ROW. The ROW will consist of 25 feet of temporary construction workspace and 35 feet of permanent easement. Additional ROW space may be required in areas such as directionally-drilled crossings, bore locations, and as needed for laydown of project materials. In certain areas where sensitive environmental or land-use issues are determined to exist, the ROW may be narrowed to avoid these features.

WATERBODY AND ROAD CROSSING PROCEDURES

Specific crossing methods have not yet been identified for all of the water features that will be crossed by Line 406 and Line 407. Major crossings include two crossings of Knights Landing Ridge Cut, the Yolo Bypass/Tule Canal, the Sacramento River, Steelhead Creek, Curry Creek, and sensitive vernal pool complexes. Where feasible and warranted to avoid impacts to resources, bore or horizontal directional drilling (HDD) techniques may be employed. At smaller crossings, such as irrigation ditches and intermittent creeks, PG&E may employ dry-crossing techniques (flumed or dam and pump-around) to open cut these features.

Open Cut

For crossings where it is feasible and all required permits have been obtained, PG&E plans to open cut features such as smaller irrigation ditches and canals. When water is flowing, water features that are open cut will likely require a dam-and-pump-around setup where the workspace to be trenched is kept dry during construction and water is pumped around the workspace. Open-cut crossings will be trenched, the pipe installed, and the trench backfilled in one day where possible.

Bores

Traditional bores, also referred to as jack and bore, involve the excavation of a bore pit on one side of the crossing, and a receiving pit on the other side. A bore power rig is placed on a rail assembly in the bottom of the bore pit. The first segment of pipe is set on supports on the rail assembly, with auger sections inside. A cutting head, which is slightly larger in diameter than the pipe, is attached to the leading edge of the auger, and the other end of the auger is attached to the

power unit. The auger segments serve to move the soil back through the pipe and into the pit as the cutting head advances. The power unit rotates the cutting head and, using the rail assembly to maintain the proper alignment, pushes the pipe segment into the hole as the cutting head advances. Once the end of the first pipe segment approaches the face of the bore pit, the auger is disconnected, and the power unit backs out. A second pipe segment is lowered into the pit, and an auger section is inserted and threaded into the section already in the hole. The second pipe segment is welded together with the segment in the hole, and the rotating and pushing resumes. Additional pipe and auger segments are successively added in this manner until the leading pipeline edge and cutting head break through into the receiving pit. Soil deposited into the bore pit by the auger is removed by an excavator.

Horizontal Directional Drill

HDD utilizes a hydraulically powered horizontal drilling rig mounted on a portable steel skid. Support equipment includes a drilling mud tank and a power unit for the hydraulic pumps and mud pumps. The variable-angle drilling unit is adjusted to the proper design angle for the particular bore, and the first and smallest of the cutting heads begins the bore at the surveyed entry point in a small pit on the surface. The first section of drill stem has an articulating joint near the drill cutting head that can be controlled by the bore operator. Successive drill stem sections are added as the drill head makes its way under the crossing. Once the drill head reaches the midpoint and deepest point of the crossing, the drill head is articulated slightly by the operator to begin its upward climb toward the exit point. Once through, a succession of larger cutting heads and reamers are pulled and pushed through the bore hole until it is the appropriate size for the pipeline.

During the HDD, drilling mud is pumped under high pressure through the drill stem to rotate the cutting head and return the soil cuttings to the small pit at the surface entry point. The mud is pumped from this small pit to a processing unit where the cuttings are removed and the mud reused. Infrequently, the geologic strata above the bore may be weak and/or unconsolidated and the high pressure of the drilling mud results in a fracture of these strata, allowing drilling mud to rise to the surface. The boring operation is stopped immediately when this occurs. This situation is termed a "frac-out" and is usually resolved by reducing the mud system pressure or increasing the mud viscosity. While the bore is occurring, special armor-coated pipe sections to be pulled through the crossing are strung on pipe supports in the extra workspace along the edge of the ROW, welded, and the joints are coated. Once the bore hole is the correct diameter, a pulling head is welded on the end of this pipeline section, and the pipe is pulled through the bore until it surfaces on the other side. Bulldozers with sidebooms and slings support the pipe as it is slowly pulled through the bore hole. The completed bored crossing is then connected to the trenched pipeline, and the trench tie-in sites are backfilled.

SCHEDULE

The Line 406 and Line 407 Pipeline Project is scheduled to be constructed as dictated by the need for additional natural gas supply resulting from added load on the existing natural gas transmission system. Current projections are that Line 406, Line 407 East, and the Powerline Road DFM will be constructed between 2009 and 2010. Line 407 West is projected to be constructed between 2010 and 2012. Regulatory agencies responsible for special-status species

and water quality in the project area may require that construction take place during work windows that are designed to minimize impacts to special-status species, their habitats, and water quality.

SETTING

Line 406 is located in the Lower Cache and Sacramento-Stone Corral watersheds (U.S. Geological Survey [USGS] Hydrologic Units 18020110 and 18020104, respectively) in Yolo County. Only Hungry Hollow Canal, Goodnow Slough, and several small unnamed ephemeral streams in the Dunnigan Hills Region will be crossed by Line 406 (see Figure 1-1 in Attachment A). According to preliminary research, these waterways are not likely to support special-status fish species because they do not have suitable water quality, flow, temperature, substrate, and/or impassible barriers exist that do not allow access to fish.

Line 407 and the Powerline Road DFM are located within the Sacramento-Stone Corral, Lower Sacramento, and Lower American watersheds (USGS Hydrologic Units 18020104, 18020109, and 18020111, respectively) in Yolo, Sutter, Sacramento, and Placer counties. Surface water flows in the region include three major rivers; the Sacramento, American, and Feather. Of the major river systems in the project vicinity, Line 407 will only cross the Sacramento River (Figure 1-2 in Attachment A).

In addition to the Sacramento River, Line 407 will cross the Knights Landing Ridge Cut and Tule Canal, two larger drainage canals, and the Yolo Bypass, a large flood conveyance bypass that receives water from the Sacramento River and associated canals during high winter flows. The Knights Landing Ridge Cut runs southeast from the Colusa Basin to the Yolo Bypass and conveys water from the Colusa Basin Drainage Canal. In winter months, the Ridge Cut also delivers excess flood waters from the Sacramento River into the Yolo Bypass. Running roughly north to south, the Tule Canal serves as the eastern drainage boundary of the Yolo Bypass and conveys flood waters from the Sacramento River away from the more populated centers of the Sacramento Valley and into the Toe Drain, which eventually flows back into the Sacramento River downstream. While these two waterways may support special-status fish species during high flows in the winter and spring, special-status fish species are not likely to survive summer low flows, poor water quality, and high temperatures. Studies have found that in the winter months, the Yolo Bypass contains many listed species, including delta smelt (*Hypomesus transpacificus*), river lamprey (*Lampetra* ayresi), steelhead (*Oncorhynchus mykiss*), chinook salmon (*Oncorhynchus tshawytscha*), and Sacramento splittail (*Pogonichthys macrolepidotus*), but that these species leave the bypass in the vicinity of the project as waters recede in the spring and summer months (Sommer et. al., 2001).

Line 407 will also cross Curry Creek and Steelhead Creek, as well as a number of irrigation canals and ditches of various sizes. Curry Creek is a small, seasonal drainage that runs in a generally east to west direction into the Cross Canal and eventually into the Sacramento River. Steelhead Creek is a larger perennial drainage that has been channelized through the project area and over much of its length, and runs in a north-to-south direction in the project area, eventually flowing into the Sacramento River. An unnamed tributary to Steelhead Creek flows from east to west and will also be crossed by Line 407. Near the project area, flows in Steelhead Creek are

more seasonal than in the stretches below the confluence with Dry Creek. Dry Creek is a perennial, spring-fed tributary to Steelhead Creek located approximately 6 miles south and downstream of the project area.

METHODS

LITERATURE REVIEW

The California Department of Fish and Game (CDFG) California Natural Diversity Data Base (CNDDB), U.S. Fish and Wildlife Service (USFWS) Endangered Species List, and the National Marine Fisheries Service (NMFS) list of protected anadromous species were accessed for information on special-status fish species, critical habitat, and essential fish habitat (EFH) known to occur in the project area and its vicinity. The NMFS Sacramento Area Office and the California Department of Water Resources, Aquatic Ecology Section were also contacted for information on the potential for special-status species to occur in the project area.

Special-status fish species that were considered in this assessment include all federally and state-listed threatened and endangered species, candidates for listing, and federal and state species of concern. A special-status species was considered a potential inhabitant of the project area if its general habitat requirements (i.e., suitable water quality, temperature, flow, substrate, and access to the waterway) and known geographical distribution encompassed any waters within the project, or within approximately 10 miles of the project.

FIELD SURVEY

TRC biologists Benjamin Hart and Kevin Janik conducted field reconnaissance-level surveys on July 20, 2006 and June 21, 2007 to identify any waterways in the survey area that may provide suitable habitat for special-status fish species. A survey area of approximately 500 feet on either side of the proposed project alignment was established to encompass any potential ROW adjustments and extra workspace needed for the project that could potentially impact waterways that support special-status fish species. Additionally, areas downstream of the proposed project were also considered in the survey as impacts to water quality within the project area could potentially affect waters downstream of the project. Conditions that were considered included seasonal flow and water quality characteristics, riparian cover, substrate composition, and accessibility of the waterway, including in-stream structures that may create barriers to fish passage.

REGULATORY BACKGROUND

PACIFIC COAST SALMON PLAN

The Pacific Coast Salmon Plan guides management of commercial and recreational salmon fisheries off the coasts of Washington, Oregon, and California. This fishery management plan (FMP) covers the coastwide aggregate of natural and hatchery salmon species that is contacted by salmon fisheries in the exclusive economic zone (EEZ) off the coasts of Washington, Oregon, and California. In addition, the plan contains requirements and recommendations with regard to EFH for the managed stocks. The EFH includes marine areas within the EEZ, as well as

estuarine and freshwater habitat within the internal waters of Washington, Oregon, California, and Idaho.

While all species of salmon fall under the jurisdiction of this plan, it currently only contains fishery management objectives for chinook, Coho, pink (odd-numbered years only), and any salmon species listed under the Endangered Species Act that is measurably impacted by Pacific Fishery Management Council fisheries.

ESSENTIAL FISH HABITAT

The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996, requires federal agencies to consult with NMFS on activities that may adversely affect EFH. In addition, the law requires fishery management councils to include descriptions of EFH and potential threats to EFH in all federal fishery management plans. The Pacific Fishery Management Council amended the Pacific Coast Salmon Plan in 2000 to include descriptions of EFH for different salmonid species. EFH for chinook was defined for freshwater, estuarine, and marine waters.

Freshwater EFH for chinook salmon consists of four major components, including spawning and incubation, juvenile rearing, juvenile migration corridors, and adult migration corridors and adult holding habitat. Important features of essential habitat for spawning, rearing, and migration include substrate composition, water quality, water quantity, depth and velocity, channel gradient and stability, food, cover and habitat complexity, space, access and passage, and floodplain and habitat connectivity.

Chinook salmon EFH includes all those streams, lakes, ponds, wetlands, and other waterbodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California. Salmon EFH excludes areas upstream of longstanding naturally impassible barriers (i.e., natural waterfalls in existence for several hundred years), but includes aquatic areas above all artificial barriers except specifically cited impassible dams (NMFS, 2006c).

RECOVERY PLAN FOR THE SACRAMENTO/SAN JOAQUIN DELTA NATIVE FISHES

The Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (Recovery Plan) includes recovery and restoration objectives for eight species of fish that utilize the Sacramento/San Joaquin Delta for a significant segment of their life history. The Recovery Plan includes six of the sensitive species that have a potential to occur near the project area; Central Valley spring-run chinook salmon, Central Valley fall- and late-fall-run chinook salmon, winter-run chinook salmon, Sacramento splittail, Delta smelt, and Green sturgeon.

The Recovery Plan delineated actions believed to be necessary for the restoration and recovery of the eight species. Recovery and restoration criteria were designed to monitor the effectiveness of the recovery actions, to determine when a species has stabilized to a secure level, and to determine when a species qualifies for delisting.

Though the Recovery Plan was designed to monitor and restore the eight species, many of them have had further declines in numbers and have been elevated in listing status since the plan was published.

STEELHEAD RESTORATION AND MANAGEMENT PLAN FOR CALIFORNIA

The purpose of the Steelhead Restoration and Management Plan for California (Plan) is to assure the maintenance, restoration, and enhancement of California's steelhead stocks. The Plan provides guidelines for steelhead restoration and management to be integrated into current and future planning processes for specific river and stream systems. It also identifies those needs specific to steelhead and is intended to augment current anadromous fish restoration plans. The Plan focuses on restoration of native and wild stocks of steelhead, as these stocks have the greatest value for the species as a whole in terms of maintaining genetic and biological diversity.

The Plan focuses on the following five strategies to restore native stocks of steelhead:

- Restore degraded habitat
- Restore access to historic habitat that is presently blocked
- Review angling regulations to ensure that steelhead adults and juveniles are not over-harvested
- Maintain and improve hatchery runs, where appropriate
- Develop and facilitate research to address deficiencies in information on freshwater and ocean life history, behavior, habitat requirements, and other aspects of steelhead biology

The Plan includes recommendations for the management of American River stocks of steelhead, which include those in Steelhead Creek and Dry Creek south of the project area.

RESULTS

RESULTS OF LITERATURE REVIEW

A total of eight special-status fish species were found in CNDDB records and listed by the USFWS or NMFS that have the potential to occur within a 10-mile radius of the project area. Of these, the delta smelt, was ruled out from potentially occurring in the project area due to its range and the lack of suitable habitat in the survey area. Table 1 lists the sensitive species identified in the literature review, including their listing status, habitat associations, and potential for occurrence based on the field survey results. The following section includes descriptions of the special-status species that were found during the records search.

Table 1: Special-status Fish Species Habitat Associations and Potential to Occur

Species	Listing Status[1]	Habitat Association/Life History	Potential to Occur in Project Area
Green sturgeon (*Acipenser medirostris*)	FT; CSC	Anadromous species; large portions of life history are spent in the ocean. Migrations by adults into freshwater occur between late February and late July, with a spawning period generally ranging from March to July. Spawning takes place in deep, fast-moving water with temperatures between 46.5 and 57 degrees Fahrenheit (deg. F). Preferred spawning substrate is likely large cobble, but can range from clean sand to bedrock. Juveniles typically migrate out to sea before the end of their second year, primarily during summer and fall.	Likely to occur in the Sacramento River near the project between February and July.
Delta smelt (*Hypomesus transpacificus*)	FT; ST; CH	Delta smelt are usually found in estuarine waters with temperatures ranging from 43 to 82.5 deg. F, and salinities between 2 and 7 parts per thousand (ppt), but rarely above 18 ppt. Delta smelt spawn in freshwater at temperatures from about 44.5 to 59 deg. F between February and June. Spawning takes place in dead-end sloughs and shallow edge waters of channels in the western Delta. Eggs are adhesive and stick to hard substrates, such as rocks, gravel, tree roots, and submerged branches. Critical habitat has been designated in the Sacramento-San Joaquin Delta for Delta smelt, but does not occur in the project area.	Not likely to occur in the project area due to lack of suitable habitat. Species known range is approximately 11 miles downstream of the project.
River lamprey (*Lampetra ayresii*)	CSC	Lampreys are anadromous, entering the ocean in late spring and spending three to four months in saltwater before migrating back to freshwater in autumn. Spawning takes place between February and May in tributary streams to select larger rivers (Sacramento/ San Joaquin). Presumably, adults need clean, gravelly riffles in permanent streams for spawning. Ammocoetes require sandy, silty backwaters or stream edges in which to bury themselves, where water quality is continuously high and temperatures do not exceed 77 deg. F.	Likely to occur in the Sacramento River year-round and potentially the Yolo Bypass near the project area during wet months.

Species	Listing Status[1]	Habitat Association/Life History	Potential to Occur in Project Area
Central Valley steelhead (*Oncorhynchus mykiss*)	FT; CH	Steelhead trout in the Central Valley enter freshwater from the ocean when winter rains provide large amounts of cold water for migration and spawning. Steelhead typically spawn in clean gravel within tributaries to mainstem rivers and return to the ocean after spawning, if possible. For one to two years after hatching, juvenile steelhead are found in cool, clear, fast-moving permanent streams and rivers where there is ample riparian cover or undercut banks, and where invertebrate life is abundant. Steelhead prefer temperatures in the range of 59 to 64.5 deg. F, but can withstand temperatures between 34 and 81 deg. F for short periods. Temperatures beyond this range are lethal to trout species. Critical habitat for the Central Valley steelhead has been designated in the Sacramento River, Yolo Bypass, and in Steelhead Creek approximately 6 miles south of the project crossing site.	Likely to occur in the Sacramento River year-round and potentially the Yolo Bypass and Steelhead Creek near the project area during wet months.
Central Valley fall- and late-fall-run chinook (*Oncorhynchus tshawytscha*)	FC; CSC; EFH	Fall-run chinook migration into freshwater occurs in late summer and early fall. Valley reaches of rivers are often too warm to support salmon in summer. Spawning typically occurs on gravel bars within a few days or weeks of entering freshwater. Adults die after spawning. Late-fall-run chinook are the largest and most fecund salmon species in California. They typically enter the river as four- to five-year-old fish beginning in October, and hold in freshwater for one to three months before spawning. Adapted for spawning in reaches of mainstem rivers, such as the upper Sacramento, which remain cold and deep enough in summer months for rearing of juveniles. Juveniles typically migrate to the ocean after 7 to 13 months in freshwater. Optimal temperatures for growth and survival of chinook range between 41 and 66 deg. F. At around 71 to 73 deg. F, major mortality is experienced in wild populations.	Likely to occur in the Sacramento River year-round and potentially the Yolo Bypass near the project area during wet months.

Species	Listing Status[1]	Habitat Association/Life History	Potential to Occur in Project Area
Central Valley spring-run chinook (*Oncorhynchus tshawytscha*)	FT; ST; CH; EFH	Spring-run chinook salmon enter the Sacramento River as immature fish in spring and early summer and migrate into headwaters where they hold in pools until they spawn. Juveniles emerge from early November through the following April, and typically rear in freshwater for 3 to 15 months. Juveniles emigrate from the tributaries to estuarine waters and the ocean between mid November and June. Some fish remain in the stream until the following October and emigrate as yearlings, usually with the onset of storms starting in October through the following March. Optimal temperatures for growth and survival of chinook range between 41 and 66 deg. F. At approximately 71 to 73 deg. F, major mortality is experienced in wild populations. Critical habitat has been designated in the Sacramento River and in the Yolo Bypass.	Likely to occur in the Sacramento River year-round and potentially the Yolo Bypass near the project area during wet months.
Sacramento River winter-run chinook (*Oncorhynchus tshawytcha*)	FE; SE; CH; EFH	Winter-run chinook typically migrate upstream as immature fish during winter and spring, then spawn several months later in summer. Most winter-run chinook return to freshwater as three-year-olds, and spawn in clear, cool water released from Shasta Reservoir. Juveniles remain in fresh water for 5 to 10 months, followed by an intermediate time in estuarine waters before entering the ocean. Optimal temperatures for growth and survival of chinook range between 41 and 66 deg. F. At around 71 to 73 deg. F, major mortality is experienced in wild populations. Critical habitat for winter-run chinook has been designated in the Sacramento River from Kenswick Dam to the San Francisco Bay.	Likely to occur in the Sacramento River year-round and potentially the Yolo Bypass near the project area during wet months.

Species	Listing Status[1]	Habitat Association/Life History	Potential to Occur in Project Area
Sacramento splittail (*Pogonichthys macrolepidotus*)	CSC	Sacramento splittail are primarily freshwater fish, but are tolerant of salinities of 10 to 18 ppt. They are commonly found in temperatures ranges from 41 to 75 deg. F, but can tolerate temperatures up to 91.5 deg. F for short periods. Adults move upstream during the winter and spring to forage and spawn. Spawning occurs between late February and early July in areas of flooded vegetation (Yolo and Sutter bypasses, low-lying parts of delta islands, and river mouths), though it is most frequent in March and April. Most splittail larvae remain near the spawning sites for 10 to 14 days before moving into offshore habitats.	Likely to occur in the Sacramento River in the winter and spring and potentially the Yolo Bypass near the project area during wet months.

Sources: CDFG (1996); McEwan (2001); Moyle (2002); NMFS (2006a); NMFS (2006b)

[1] Listing Status

Federal Listing

FE	Federally endangered
FT	Federally threatened
CH	Designated critical habitat
EFH	Essential fish habitat
FC	Federal candidate species

State Listing

SE	State endangered
ST	State threatened
CSC	California species of concern

Green Sturgeon

The green sturgeon (*Acipenser medirostris*) is a federally threatened species, and is a California species of concern. The green sturgeon is the most marine of the sturgeon species, coming into rivers mainly to spawn, and remaining in fresh water for up to two years in their early life stages. Spawning takes place in deep, fast-moving water with temperatures between 46 and 57 degrees Fahrenheit (deg. F). Larval and juvenile green sturgeons remain near estuaries in early life stages, but they migrate considerable distances as they grow. Juveniles typically migrate out to sea before the end of their second year, primarily during summer and fall (Moyle, 2002).

Delta Smelt

The delta smelt (*Hypomesus transpacificus*) is a federally and state-threatened species with critical habitat designated in the Sacramento/San Joaquin Delta. Delta smelt are slender-bodied fish, approximately 2 to 3 inches long, belonging to the Osmeridae family. They have a steely blue sheen on the sides and may seem almost translucent. Smelts live together in schools and feed on zooplankton. Delta smelt are a euryhaline species (able to adapt to a wide range of salinities), and have been collected from estuarine waters with up to 14 parts per thousand (ppt) salinity. For a large part of their one-year life span, delta smelt live along the freshwater edge of the mixing zone, where the salinity is approximately 2 ppt (USFWS, 2007).

Shortly before spawning, adults migrate upstream from the brackish-water habitat associated with the mixing zone and disperse widely into river channels and tidally influenced backwater sloughs. They spawn in shallow, fresh, or slightly brackish water upstream of the mixing zone, mostly in backwater sloughs and channel edgewaters. Although spawning has not been observed in the wild, the eggs are thought to attach to substrates, such as cattails, tules, tree roots, and submerged branches (USFWS, 2007).

River Lamprey

The river lamprey (*Lampetra ayresi*) is a California species of concern. River lampreys are small (average length of spawning adults is approximately 6.7 inches) and predaceous, with an oral disc that is generally at least as wide as the head. Adult river lampreys are dark on the back and sides, silvery to yellow on the belly, and the tail is darkly pigmented. As the lamprey becomes sexually mature, the gut degenerates and the two dorsal fins grow closer together, eventually joining. Ammocoetes (juvenile lampreys) can be recognized by their pale heads (especially around the gill openings), a prominent line behind the eye spot, and a tail in which the center tends to be lightly pigmented (Moyle, 2002).

The ammocoetes begin their transformation into adults during the summer at approximately 4.7 inches total length (TL). The process of metamorphosis may take 9 to 10 months, the longest known for any lamprey. Lampreys in the final stages of metamorphosis congregate immediately upriver from salt water and enter the ocean in late spring. Adults apparently only spend three to four months in salt water, where they grow rapidly, reaching 9.8 to 12.2 inches TL (Moyle, 2002).

River lampreys prey on a variety of fishes in the 4- to 12-inch TL size range, but the most common prey seems to be herring (*Clupea* spp.) and salmon. Unlike other species of lamprey in California, river lampreys typically attach to the back of the host fish, above the lateral line, where they feed on muscle tissue. Feeding continues even after the death of the prey. The effect of river lamprey predation on prey populations is minimal. River lampreys can apparently feed in either salt or fresh water (CDFG, 1995).

Adults migrate back into fresh water in the fall and spawn during the winter or spring months in small tributary streams. While maturing to reproductive age in streams, river lampreys shrink in length by about 20 percent. They dig saucer-shaped depressions in gravelly riffles for spawning. Adults die after spawning. Ammocoetes remain in silt-sand backwaters and eddies and feed on algae and microorganisms. The duration of the ammocoete stage is not known, but it is probably three to five years, making the total life span of the river lamprey approximately six to seven years (Moyle, 2002).

Central Valley Steelhead

Central Valley steelhead (*Oncorhynchus mykiss*) are similar to some Pacific salmon species in their ecological requirements. They are born in freshwater, migrate to the ocean where most of their growth occurs, and return to freshwater to spawn. Unlike Pacific salmon, steelhead are iteroparous (i.e., can spawn more than one time). They can spawn up to four times, but mortality rates between fish of succeeding ages are high, typically 50 to 75 percent, so that very few fish spawn so often (Moyle, 2002).

In California, peak spawning occurs from December through April in small streams and tributaries with cool, well-oxygenated water. The length of time it takes for eggs to hatch depends mostly on water temperature. Steelhead eggs hatch in approximately 30 days at 51 deg. F. Fry usually emerge from the gravel four to six weeks after hatching, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time. Juvenile steelhead can spend one to three years in freshwater before migrating to the ocean. Once at sea, they spend one to four years before returning to spawn (McEwan, 2001).

Central Valley steelhead are considered "winter" steelhead, because they enter streams between August and October and hold in freshwater until tributary flows are high enough to enter for spawning. They typically spawn shortly after reaching spawning grounds, often traveling long distances to reach ideal spawning habitat (Moyle, 2002).

Critical habitat for the Central Valley steelhead has been designated by the NMFS in the Sacramento River, the Yolo Bypass, and in lower Steelhead Creek approximately 6 miles south of the project crossing site (Figure 1-2 and 1-3 in Appendix A). Central Valley steelhead are federally listed as threatened (NMFS, 2005).

Central Valley Fall- and Late-fall-run Chinook

Chinook salmon (*Oncorhynchus tshawytscha*), the largest of the salmon species, belong to the family Salmonidae, and are one of eight species of Pacific salmonids in the genus *Oncorhynchus*. Chinook salmon are anadromous (i.e., adults migrate from a marine environment into the

freshwater streams and rivers of their birth to spawn) and semelparous (i.e., spawn only once and then die).

Adult female chinook will prepare a nest, or redd, in a stream area with suitable gravel composition, water depth, and water velocity. Suitable gravel is usually a mixture of gravel and cobble with low silt content. The adult female chinook may deposit eggs in four to five nesting pockets within a single redd. After spawning, adult chinook guard the redd from 4 to 25 days before dying. Chinook salmon eggs hatch between 90 to 150 days after deposition, depending upon water temperatures. Eggs are deposited at a time to ensure that young salmon fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth (NMFS, 2006b).

Juvenile chinook may spend from three months to two years in freshwater after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature. Coastwide, chinook salmon remain at sea for one to six years, although typically remain for two to four years, with the exception of a small proportion of yearling males (jack salmon), which either mature in freshwater or return after two to three months in saltwater (NMFS, 2006b).

The Central Valley fall- and late-fall-run chinook designation actually consists of two distinct migrations of chinook, which are candidates for listing by the NMFS and are California species of concern. Fall-run chinook are adapted for spawning in lowland reaches of large rivers and their tributaries. They migrate from the ocean in late summer and early fall in mature condition and typically spawn within a few days or weeks of reaching the spawning grounds. Juveniles emerge in spring and move downstream to rear in mainstem rivers or estuaries before heading out to sea (Moyle, 2002).

Late-fall-run chinook typically migrate into rivers between October and April, and hold in the river for one to three months before spawning. They are adapted for spawning and rearing in mainstem rivers, such as the upper Sacramento, which remain cold and deep enough in summer for rearing of juveniles. Juveniles grow rapidly and head out to sea after 7 to 13 months in freshwater (Moyle, 2002).

EFH has been designated for all species of chinook salmon managed by the NMFS and the Pacific Fisheries Management Council under the Pacific Coast Salmon Plan of 1997, and Amendment 14 to the Pacific Coast Salmon Plan of 2000. Within the project area, EFH includes all watercourses accessible to chinook salmon. The Central Valley fall- and late-fall-run chinook salmon evolutionary significant unit is listed as a species of concern by the NMFS and CDFG.

Central Valley Spring-run Chinook

Central Valley spring-run chinook (*Oncorhynchus tshawytscha*) are listed by the NMFS and the CDFG as threatened. Critical habitat for the species has been designated in the Sacramento River and Yolo Bypass (Figure 1-2 in Attachment A).

Central Valley spring-run chinook salmon are similar in many of their life history characteristics to other chinook salmon runs in the Central Valley, with the exception of their run timing, their spawning period, and the amount of time spent in the river by juveniles before migrating out to

sea. Spring-run chinook salmon enter the Sacramento River as sexually immature fish in spring and early summer, usually between March and September. They move upstream and enter tributary streams, holding in headwater pools until they spawn typically between late August and October. Adults die after spawning. Juveniles typically rear in freshwater for 3 to 15 months. Juveniles typically emigrate from the tributaries to estuarine waters and the ocean between mid November and June (Moyle, 2002).

Sacramento River Winter-run Chinook

Winter-run chinook (*Oncorhynchus tshawytscha*) in California are unique to the Sacramento River. They are listed by the NMFS and CDFG as endangered and critical habitat has been designated in the Sacramento River (Figure 1-2 and 1-3 in Appendix A). Winter-run chinook salmon are similar in many of their life history characteristics to other chinook salmon runs in the Central Valley, with the exception of their run timing, their spawning period, and the amount of time spent in the river by juveniles before migrating out to sea.

Winter-run salmon typically migrate upstream as immature fish during winter and spring, then spawn several months later in summer. Most winter-run chinook return to fresh water at three years old, and spawn in the upper Sacramento River in clear, cool water released from Shasta Reservoir. Adults die after spawning. Juveniles remain in fresh water for 5 to 10 months, followed by an intermediate time in estuarine waters before entering the ocean. Optimal temperatures for growth and survival of winter-run chinook salmon range from between 41 and 66 deg. F. At around 72 to 73.5 deg. F, major mortality is experienced in wild populations (Moyle, 2002).

Sacramento Splittail

The Sacramento splittail (*Pogonichthys macrolepidotus*) is a California species of concern that is adapted to survival in a wide range of salinities and temperatures, as well as severe conditions in highly alkaline waters. Splittail are primarily freshwater fish, but are tolerant of salinities of 10 to 18 ppt. Splittail are commonly found in temperatures ranging from 41 to 75 deg. F, but can tolerate temperatures up to 91 deg. F for short periods. Splittail of all sizes can also tolerate low dissolved-oxygen levels, making them well suited to the slow-moving sections of rivers and sloughs. Splittail are most commonly found in the Suisun Bay and Marsh region in dead-end sloughs that typically have small streams running into them (CDFG, 1995).

Splittail are benthic foragers that feed extensively on opossum shrimp (*Neomysis mercedis*). However, detritus material typically makes up a high percentage of their stomach contents. They will feed opportunistically on earthworms, clams, insect larvae, and other invertebrates. They are preyed upon by striped bass (*Morone saxatilis*) and other predatory fishes.

Adult splittail move upstream during the winter and spring to forage and spawn in flooded areas. Spawning takes place between late February and early July in areas of flooded vegetation (e.g., Yolo and Sutter bypasses, low-lying parts of Delta islands, and river mouths). Most splittail larvae remain in shallow, weedy areas near the spawning sites for 10 to 14 days before moving out into deeper habitat as swimming abilities increase (Moyle, 2002).

Splittail are relatively long-lived (about five to seven years) and are highly fecund (up to 100,000 eggs per female). Their populations fluctuate on an annual basis depending on spawning success and strength of the year class. Both male and female splittail mature by the end of their second year, although occasionally males may mature by the end of their first year and females by the end of their third year (Moyle, 2002).

RESULTS OF FIELD SURVEY

The Sacramento River is the only waterway in the project area that was observed to have year-round flows and access to special-status fish species within the project area, and that is likely to support special-status fish species at the time of construction of the Line 406 and Line 407 project. Other waterways that may support special-status fish species during wet portions of the year include the Yolo Bypass (including Tule Canal), Knights Landing Ridge Cut, and potentially Steelhead Creek; however, suitable flows and/or habitat were not observed in these waterways during the field survey, and thus, these waterways are highly unlikely to support the aforementioned species in the project area during the dry months when construction of the Line 406 and Line 407 Pipeline Project is scheduled to take place. During the surveys, only very low flows were observed in the Yolo Bypass (Tule Canal), Knights Landing Ridge Cut, and Steelhead Creek, and water quality was observably poor with stagnant pools and large growths of aquatic vegetation, in addition to numerous bullfrogs and other species that would likely prey on any surviving juvenile fish that remain in these waterways after winter flows subside.

Steelhead Creek flows to the American River and portions of this creek approximately 6 miles downstream of the project (at the confluence of Dry Creek) are listed as critical habitat for the Central Valley steelhead. The lower portions of this waterway are also known to support the Central Valley fall/late fall-run chinook salmon, which is a candidate for listing and for critical habitat. Within the project area, however, the conditions of Steelhead Creek are not likely to support migrating, spawning, or rearing special-status fish due to poor-quality habitat. No suitable spawning habitat was observed in the upper reaches of Steelhead Creek, nor was any in-stream cover observed that would support juvenile rearing. Fish may occasionally stray into the portions of Steelhead Creek near the project site, but only during wet months. These strays are not likely to successfully spawn or rear in the portions of Steelhead Creek near the project site. During the surveys, flows in Steelhead Creek were very low, with numerous stagnant pools near the project crossing site. Water quality was observably poor, with algal and vegetative growth covering a good portion of the ponded surface.

Numerous irrigation canals and small ephemeral waterways were observed in the project area. Some of the irrigation canals had substantial flows at the time of the field survey. However, these waterways are not likely to support the special-status fish species that were identified during the literature review because access to these waterways by the species is limited or nonexistent, and habitat features that would support the survival of these species (riparian cover, instream structures, suitable substrate, undercut banks, etc.) were not observed. The small ephemeral creeks that were observed in the Line 406 and Line 407 project area are not likely to support special-status fish species at any time of the year due to lack of access, variable seasonal flows, and lack of suitable spawning, rearing, or foraging habitat.

DISCUSSION AND RECOMMENDATIONS

POTENTIAL EFFECTS TO SPECIAL-STATUS SPECIES

Direct Effects

Direct effects to special-status fish species, including direct mortality or loss of habitat, could occur if fish are present in waterways that will be crossed during construction and if construction methods require instream work.

Direct effects to critical habitat designated in the Sacramento River for the winter-run chinook, and in the Sacramento River and Yolo Bypass for the Central Valley steelhead and spring-run chinook, could result if project activities impact water quality or any of the components of the critical habitat (spawning, rearing, foraging, etc.).

Direct effects to EFH for salmon species could result if construction activities directly impact any of the habitat components of salmon EFH, including spawning and incubation habitat, juvenile rearing habitat, juvenile or adult migration corridors, or adult holding habitat.

Indirect Effects

Indirect effects to special-status fish species, critical habitat, or EFH could result if construction activities during dry months result in impacts to water quality or habitat in the wet season(s) following completion of the project (i.e., spills of hazardous materials in or near seasonally utilized waterways, removal of vegetation or instream structures utilized by rearing juveniles, increased turbidity resulting from unrestored construction areas, etc.). Additionally, indirect effects to habitat downstream of the project could result from a frac-out of drilling mud during the HDD procedure, which could temporarily reduce water quality or habitat value.

RECOMMENDATIONS

To minimize the potential for direct or indirect effects to special-status fish species, critical habitat, and salmon EFH, the following avoidance and minimization measures are recommended:

- Perform all water-crossing construction during dry months when there is less potential for special-status fish species to occur in the waterways.
- Where feasible, employ HDD methods to install the pipeline below watercourses with the potential to support special-status fish species.
- Implement a frac-out plan to manage the inadvertent release of any drilling muds into watercourses with the potential to support special-status fish species in the event of a frac-out.
- Confine all heavy equipment, vehicles, and construction work to approved roads and work areas. Stream channel work areas should be limited to what is absolutely necessary for

construction. To the maximum extent feasible, construction vehicles should be kept out of watercourses with the potential to support special-status species.

- Implement erosion, sediment, material stockpile, and dust control Best Management Practices on-site to minimize the potential for fill or runoff to enter waterways.

- Use caution when handling and/or storing chemicals (e.g., fuel and hydraulic fluid) near waterways, and follow any and all applicable laws regarding hazardous material handling/storage. Service and refueling procedures should take place at least 100 feet from waterways or in an upland area at least 100 feet from waterway boundaries to prevent spills from entering waterways. These activities may be performed closer than 100 feet if a qualified biologist finds in advance that no reasonable alternative exists, and that contractors have taken the appropriate steps (including secondary containment) to prevent spills and provide prompt cleanup in the event of a spill.

- Maintain all construction equipment to prevent leaks of fuels, lubricants, or other fluids into waterways.

- Restore work areas to preexisting contours and conditions upon completion of work to minimize indirect impacts to water quality, critical habitat, and salmon EFH in and around the project area.

CONCLUSION AND DETERMINATION

The Line 406 and Line 407 Pipeline Project will be constructed in the dry season when many of the project area waterways that may support special-status fish species will be dry or will not have sufficient flow or water quality to support the species. Additionally, larger waterways, including the Sacramento River, which may support special-status fish species year-round, and Knights Landing Ridge Cut, Tule Canal, and Steelhead Creek, which may support these species during wet months, will be crossed using HDD methods, thereby significantly reducing potential impacts to special-status fish, critical habitat, and salmon EFH.

Construction through the Yolo Bypass will require traditional trenching methods during dry months, which will temporarily disturb approximately 15 acres of ground that is submerged in wet months when the bypass floods. However, special-status fish species are not expected to be in the area during the construction period, as the bypass dries out in the spring and summer and any remaining water flows into Tule Canal, which will be crossed using HDD methods. Additionally, the area where the pipeline is proposed to cross the bypass is heavily modified on an annual basis by ground-disturbing agricultural practices that take place in the bypass. If the project area within the Yolo Bypass is restored to its preconstruction condition following completion of the project, impacts to special-status species, critical habitat, and EFH are not likely to result.

Since the pipeline will be buried underground and will require minimal aboveground structures (regulator stations and line markers), operation and maintenance of the pipeline are not expected to impact special-status fish species, their critical habitat, or salmon EFH.

Determination Statement

Based on the temporary nature of pipeline construction; the project design, including HDD crossing methods at major waterways with the potential to support special-status fish species; the construction timing during dry months when seasonal waterways are not likely to support special-status fish; and with the implementation of restoration of the pipeline ROW and the avoidance and minimization measures outlined above, the PG&E Line 406 and Line 407 Pipeline Project is not likely to impact special-status fish, their critical habitat, or salmon EFH.

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