E-12: Line 406/407 Biological Assessment

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

Yolo, Sutter, Sacramento, and Placer Counties, California

May 2008

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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 to provide greater capacity and service reliability to the existing natural gas transmission and distribution pipeline system and to extend natural gas service to planned residential and commercial developments in the region. This project involves the construction of approximately 40 miles of new 30-inch-diameter and approximately 2.5 miles of 10-inch-diameter natural gas transmission pipeline that will be constructed in three phases: Line 406, Line 407 West, and Line 407 East/Powerline Distribution Feeder Main.

Numerous sensitive and special-status species protected by the Federal Endangered Species Act, the Migratory Bird Treaty Act, and the Natomas Basin Habitat Conservation Plan may exist within the project action area, and may be impacted by project construction activities. Project effects to special-status species and their habitats can be minimized or avoided with the implementation of the recommended construction practices and avoidance measures outlined in this report.

Project construction will result in temporary effects to approximately 455 acres of land including nonnative grasslands, rice fields, irrigated row and field crops, orchards, oak and riparian woodlands, freshwater emergent wetlands, seasonal wetlands and swales, vernal pools and swales, and developed or ornamental habitats. The construction of five permanent structures (pressure limiting, pressure regulating, and metering stations, and main line valve lots) will permanently remove approximately 0.7 acre of grassland habitat and approximately 0.4 acre of agricultural habitat. Approximately 2 acres of orchards will be permanently affected where a 30-foot-wide permanent easement centered on the pipeline will be maintained by PG&E to keep the area free of deep-rooted vegetation for safety purposes. Orchard trees will not be allowed to be replanted in this area. All other project effects will be temporary and all disturbed areas will be restored to preconstruction conditions following installation of the pipeline.

The following determinations have been made for federally listed species, critical habitat, and Essential Fish Habitat with the potential to occur in the project action area:

- Conservancy fairy shrimp (*Branchinecta conservatio*): The proposed project may affect but is not likely to adversely affect the federally endangered Conservancy fairy shrimp.

- Vernal pool fairy shrimp (*Branchinecta lynchi*): The proposed project may affect but is not likely to adversely affect the federally threatened vernal pool fairy shrimp.

- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*): The proposed project may affect but is not likely to adversely affect the federally threatened valley elderberry longhorn beetle.

- Vernal pool tadpole shrimp (*Lepidurus packardi*): The proposed project may affect but is not likely to adversely affect the federally endangered vernal pool tadpole shrimp.

- Green sturgeon (*Acipenser medirostris*): The proposed project may affect but is not likely to adversely affect the federally threatened green sturgeon.

- California Central Valley steelhead (*Oncorhynchus mykiss*): The proposed project may affect but is not likely to adversely affect the federally threatened California Central Valley steelhead.

- Critical habitat for the California Central Valley steelhead: The proposed project may affect but is not likely to adversely affect critical habitat for the California Central Valley steelhead.

- Central Valley spring-run chinook (*Oncorhynchus tshawytcha*): The proposed project may affect but is not likely to adversely affect the federally threatened Central Valley spring-run chinook.

- Critical habitat for the Central Valley spring-run chinook: The proposed project may affect but is not likely to adversely affect critical habitat for the Central Valley spring-run chinook.

- Sacramento River winter-run chinook (*Oncorhynchus tshawytcha*): The proposed project may affect but is not likely to adversely affect the federally endangered Sacramento River winter-run chinook.

- Critical habitat for the Sacramento River winter-run chinook: The proposed project may affect but is not likely to adversely affect critical habitat for the Sacramento River winter-run chinook.

- Essential Fish Habitat for chinook salmon: The proposed project may affect but is not likely to adversely affect Essential Fish Habitat for chinook salmon.

- California tiger salamander (*Ambystoma californiense*): The proposed project is likely to adversely affect the federally threatened California tiger salamander.

- Giant garter snake (*Thamnophis gigas*): The proposed project is likely to adversely affect the federally threatened giant garter snake.

- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*): The proposed project may affect but is not likely to adversely affect the candidate for federal listing western yellow-billed cuckoo.

- Bald eagle (*Haliaeetus leucocephalus*): The proposed project may affect but is not likely to adversely affect the federally de-listed bald eagle.

1. INTRODUCTION

Pacific Gas and Electric Company (PG&E) has identified the need for additional natural gas supply to meet load growth from existing customers and new development planned in California's Central Valley within Placer, Sutter, Sacramento, and Yolo counties. To meet this demand, PG&E is planning to construct the Line 406 and Line 407 Pipeline Project (project). This project involves construction of a new natural gas transmission pipeline that will connect PG&E's existing Lines 400 and 401 in Yolo County and existing Line 123 in Placer County, and a new distribution feeder main that will supply natural gas to developments in northern Sacramento County. The project will consist of three main segments: Line 406, Line 407 West, and Line 407 East/Powerline Distribution Feeder Main (DFM).

On behalf of PG&E, TRC prepared this Biological Assessment (BA) to determine to what extent the proposed action may affect any of the federally threatened, endangered, proposed, candidate, or special-status species, critical habitat, Essential Fish Habitat (EFH), or other species protected by the Natomas Basin Habitat Conservation Plan that may occur in the project action area (the project action area is defined in detail in Section 3 below). The purpose of this BA is to review existing resource information; to summarize the results of the field surveys performed in the project area; to determine if species or their habitats addressed in this BA are likely to be adversely affected by construction, operation, or maintenance of the project; and to describe impact avoidance and minimization measures that would reduce or avoid potential adverse project effects to these species and their habitats. This BA has been prepared according to the legal requirements set forth under Section 7 of the federal Endangered Species Act (FESA) (16 U.S.C. 1536 [c], C.F.R. Sec. 402.12), and presents technical information upon which later determinations regarding project effects will be developed for compliance with the California Environmental Quality Act (CEQA).

Rare plant and wetland delineation surveys were conducted by CH2M HILL and Garcia and Associates (GANDA) for the Line 406 project segment. Gallaway Consulting, Inc. (Gallaway) conducted rare plant, valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and wetland delineation surveys in the Line 407 East and West segments. Gallaway conducted wet-season surveys and Brent Helm conducted dry-season surveys for vernal pool invertebrates in the Line 407 East project segment (no suitable habitat was found in other project segments). TRC conducted a habitat assessment for special-status fish species and EFH for all project segments. PG&E biologists conducted reconnaissance-level surveys for amphibian, reptilian, avian, and mammalian species for all project segments. These surveys are described in detail in Section 4 of this report.

2. PROJECT DESCRIPTION

PROJECT LOCATION AND REGIONAL CONTEXT

The proposed Line 406 and Line 407 Pipeline Project is located in California's Central Valley north of the City of Sacramento, and runs from just north of the town of Esparto east to the City of Roseville. It encompasses a distance of approximately 42 miles within the Esparto, Madison, Woodland, Verona, Grays Bend, Taylor Monument, Rio Linda, Citrus Heights, Pleasant Grove,

and Roseville U.S. Geological Survey (USGS) 7.5-minute quadrangles. Land use in the area is predominantly agricultural, though a number of new residential and commercial developments are planned for construction in close proximity to the project. The project area includes Sections 10-12 of Township (T) 10N, Range (R) 1W; Sections 1-3 and 7-10 of T10N, R1E; Section 1 of T10N, R3E; Section 6 of T10N, R4E; Section 36 of T11N, R3E; Sections 31-36 of T11N, R4E; and Sections 31-36 of T11N, R5E (see Figure 1).

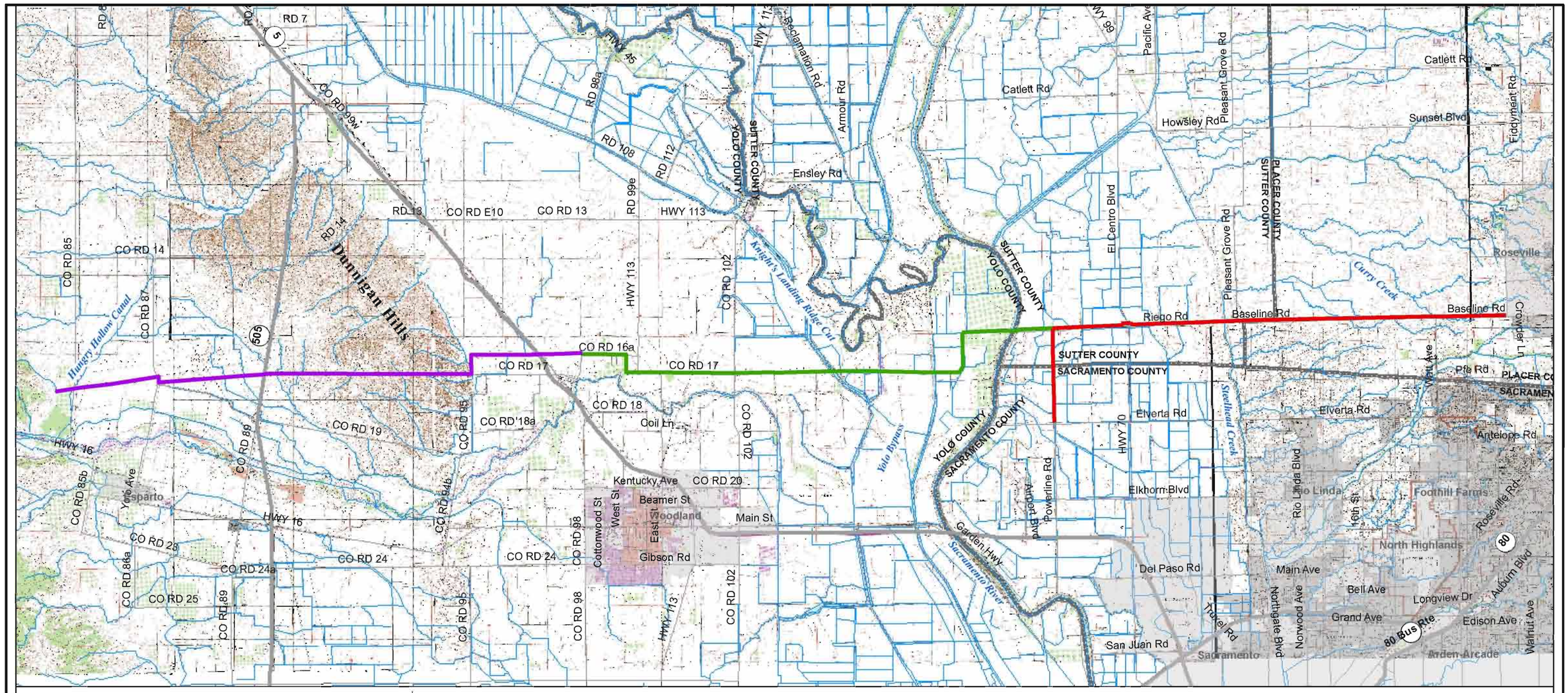
The project area ranges in elevation from approximately 15 - 250 feet, and consists of flat to rolling hill topography (see Attachment A for photos of the project area). The climate in the project area is moderate, with average temperatures ranging seasonally from approximately 33 to 97 degrees Fahrenheit (deg. F), and an average precipitation of approximately 41 inches. The Sacramento River runs north to south through the project area. West of the Sacramento River, row and grain crops, orchards, and annual grasslands in the Dunnigan Hills dominate the landscape, with limited rural development scattered throughout. East of the Sacramento River, the Natomas Basin encompasses an area of agricultural land dominated by rice production. The East Main Drainage Canal (Steelhead Creek) runs along the eastern edge of the Natomas Basin, and separates rice crops to the west from annual grasslands and rural development to the east. Large residential and commercial developments are planned for portions of Sutter County within the Natomas Basin and in the western parts of Placer County that will significantly modify a landscape currently dominated by agricultural use and nonnative annual grasslands.

PROJECT COMPONENTS

The project will consist of approximately 40 miles of 30-inch-diameter pipeline and approximately 2.5 miles of 10-inch-diameter pipeline, and will be constructed in three phases. Line 406 will be approximately 14 miles long and will connect existing Lines 400 and 401 with existing Line 172A in Yolo County. Line 407 West will be approximately 13.5 miles long and will connect Line 172A with future Line 407 East near the junction of Powerline Road and Riego Road in Sutter County. Line 407 East will be approximately 12 miles long and will connect Line 407 West with existing Line 123 in Placer County. The Powerline Road DFM will consist of approximately 2.5 miles of 10-inch-diameter pipeline that will extend south from the connection of Lines 407 East and 407 West down Powerline Road to West Elverta Road. This DFM will supply planned development in northern Sacramento County and will be constructed in conjunction with Line 407 East. These pipeline segments are described in more detail below.

Line 406

The Line 406 project area consists of nonnative grasslands and agricultural lands comprised predominantly of row crops and orchards. The topography of this segment is generally flat with the exception of approximately 4 miles through the Dunnigan Hills, where the topography consists of rolling nonnative grassland hills with a maximum elevation of 250 feet. There are no major rivers that will be crossed by the Line 406 segment, though this segment will cross Hungry Hollow Canal, Goodnow Slough, Acacia Canal, and other smaller irrigation canals and ditches that run perpendicular to the alignment. Scattered oak (*Quercus* spp.) and eucalyptus (*Eucalyptus globulus*) trees that exist in this segment may provide nesting habitat for avian species such as



Line 406 and Line 407 Pipeline Project
Figure 1
Overview Map

Line 406
Line 407 West
Line 407 East

Highway
Major Road
Hydrology

County Boundary
Incorporated Area

N
W
E
S

0 4 8 Miles

Scale 1:160,000

BACK PAGE OF FIGURE 1

the Swainson's hawk (*Buteo swainsoni*) that are known to occur in the project area from California Natural Diversity Database (CNDDB) records and field surveys.

Line 407 West

The Line 407 West project segment will span agricultural land made up of row crops and orchards, and will cross three large waterways, including Knights Landing Ridge Cut, the Yolo Bypass, and the Sacramento River. Two conservation areas are also crossed by this segment: the River Ranch Conservation Bank and the Natomas Basin Conservancy. The topography of this segment is flat.

The Yolo Bypass is a flood-control system that covers approximately 93 square miles of land along the west bank of the Sacramento River. This bypass was designed to manage floodwaters from the Sacramento River over a broad floodplain, and shifts annually with the seasons between agricultural production and carrying Sacramento River overflow. The Sacramento River and Yolo Bypass provide important habitat for numerous federally and state-listed fish species, including California Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley fall- and late-fall-run chinook (*Oncorhynchus tshawytscha*), Central Valley spring-run chinook, and Sacramento River winter-run chinook. Some of these species may occasionally stray into Knights Landing Ridge Cut, which connects the Sacramento River and Yolo Bypass, especially during high flows. Additionally, riparian habitat adjacent to these larger waterways may provide nesting and foraging opportunities for avian species such as Swainson's hawk, northern harrier (*Circus cyaneus*), and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*).

Line 407 East and Powerline Road DFM

The Line 407 East project segment will cross agricultural land and nonnative grassland, and will also include the Powerline Road DFM that will run entirely through rice fields. These segments are located in Sutter, Sacramento, and Placer counties, and will cross numerous irrigation canals. Additionally, Line 407 East will cross two small intermittent waterways, Steelhead Creek, and Curry Creek.

The Line 407 East segment will be constructed in an area that is planned for major business, industrial, and residential development, including the Sutter Pointe Specific Plan area and the Placer Vineyards Specific Plan, and portions of the line will be constructed in a future landscape buffer adjacent to Riego Road and Baseline Road. Vernal pools in the grasslands of Line 407 East may provide habitat for the Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lapidurus packardi*), and western spadefoot toad (*Spea hammondii*).

Rice fields are located within the Natomas Basin in the western portion of the Line 407 East segment and along the Powerline Road DFM segment, and provide important habitat for the giant garter snake (*Thamnophis gigas*) (GGS) and avian species such as the white-faced ibis (*Plegadis chihi*) that may utilize rice fields for nesting and foraging. Irrigation canals in this project segment may provide basking and foraging habitat for the northwestern pond turtle (*Clemmys marmorata marmorata*).

Additional Project Components

The project will include the construction of additional appurtenances necessary for operation of the four pipeline 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 will be constructed at the connection of Lines 400 and 401 and Line 406, and will have four sides of approximately 134 feet, 142 feet, 209 feet, and 285 feet in length.

- The Yolo Junction Pressure Limiting Station will be constructed at the connection of Line 406 and Line 172A near Interstate 5 (I-5), and will cover an area of approximately 100 feet by 127 feet.

- The Riego Road Regulating Station will be constructed within a yard measuring approximately 100 feet by 100 feet at the intersection of Riego and Powerline roads.

- 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 102 feet.

- The Baseline Road Pressure Limiting Station will be constructed at the connection of Line 407 and Line 123 at Baseline Road and Watt Avenue and will be approximately 84 feet by 145 feet.

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

GENERAL CONSTRUCTION METHODS

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 DFM ROW will consist of 25 feet of temporary construction workspace and 35 feet of permanent easement. These rights-of-way will typically provide sufficient space for trenching, pipe stringing, and welding operations, and a passing lane for construction vehicles to pass ongoing construction operations without leaving the ROW. Additional workspace may be required in some places as described below. In certain areas where sensitive environmental or land-use issues are determined to exist, the ROW will be narrowed to avoid these features.

The permanent ROW will be allowed to return to its previous land use following restoration of the workspace in all areas except in a small area of orchard where a 30-foot-wide swath centered

on the pipeline will be kept clear of deep-rooted vegetation (such as orchard trees) for safety purposes.

Pipeline Construction

The natural gas pipeline will be designed to comply with all applicable regulations and ordinances—most notably, California Public Utilities Commission General Order 112E, which incorporates, in its entirety, Department of Transportation (DOT) Code of Federal Regulations (CFR) 49 part 192, "Transportation of Natural or Other Gas by Pipeline: Minimum Federal Safety Standards." Guidelines will be prepared to assist the contractor in the installation of the pipeline and provide quality assurance measures for inspections. All aspects of construction, commissioning, and acceptance testing will be inspected by professional pipeline inspectors. The pipeline installation procedure is a sequence of the following seven operations, described in chronological order.

Clearing and Grading

Clearing and grading operations involve preparation of the ROW, including vegetation removal, debris disposal, and land leveling. Limited grading is anticipated because of the level topography of most of the project area. PG&E will typically strip and salvage topsoil from the entire ROW. Erosion controls will be installed as needed immediately following initial disturbance of the soils and will be maintained throughout construction to contain excavated material within the approved temporary use areas. Methods from PG&E's *Water Quality Construction Best Management Practices Manual* (Attachment B) will be used in construction and maintenance of erosion control and grading activities.

Trenching

Trenching will be accomplished with either a bucket-wheel ditching machine or conventional track-mounted excavators, beginning with removing the topsoil and segregating it on the edge of the ROW for replacement following construction. The excavated subsoil will be maintained in a separate windrow, or linear pile, to be used as trench backfill following installation of the pipe. The trench will be approximately 8 feet deep and typically 4 feet wide in order to maintain a typical minimum of 4 to 5 feet (typically 5 feet in agricultural areas) of cover over the pipe.

Stringing

Stringing operations involve trucking lengths of pipe (joints) to the ROW and positioning the pipe along the ROW with a crane or sideboom, parallel to the centerline of the trench. Temporary gaps in the strung pipe will be maintained for access, as needed.

Pipe Installation

Pipe installation operations involve bending, welding, joint coating, and lowering-in of the pipe. Once bent (if necessary), the pipe joints will be welded together as continuous segments next to the trench. Each weld will be visually inspected and radiographically tested. Prior to lowering-in, the pipe coating will be electronically tested to confirm that it is intact, and will be repaired as

necessary. The excavated trench bottom will be filled with select fine material (fines) to provide bedding for the pipe. Sideboom tractors will be used to lower the welded pipe segments into the trench. Inspections will be made to ensure that the trench is deep enough, the bottom is free of damaging debris, the pipe is properly placed, all bends conform to the trench, and that the external coating is not damaged.

Backfilling

Backfilling the trench involves replacing the excavated subsoil into the trench and re-spreading the topsoil to return the surface to its original grade. In non-agricultural areas, the topsoil may be mounded slightly over the trench to accommodate any future settling of the trench backfill. Backfilling will typically occur within 72 hours of pipeline installation to minimize potential impacts to wildlife that may fall into the trench. At the conclusion of each day's trenching activity, the end of the trench will be left ramped at an approximate 2 to 1 slope to allow any wildlife that may have gotten into the trench to escape. Since bores are done by different crews than the trenching, and on separate schedules, a short portion of the trench will be left open at these and other tie-in locations until work by both crews is complete. A similar wildlife escape ramp will be maintained at these bore sites until all crews have completed their work.

The trench will be backfilled using the material originally excavated from the trench. In rocky areas, a padding machine will be used to sift the fines from the trench spoil windrow. In locations where the originally excavated material is not suitable, granular backfill material from approved borrow sites may be required. All disturbed sites will be restored to original or future grade, with allowance for settling. The criteria for determining potential settling will be based on soil texture, coarse fragment content, and relative compaction.

Hydrostatic Testing

The new pipeline will be strength tested by means of a hydrostatic test. The pipeline will be filled with water pressurized to approximately 1.5 times the operating pressure and held for a minimum of eight hours. Following testing, the pipe is typically flushed to remove dirt and other debris. Test water intake and discharge will be performed in accordance with all applicable regulations and permit requirements. Test water will be discharged at a rate or in a manner that minimizes erosion, using an appropriate energy dissipater.

Restoration

The permanent easement and temporary use areas will be restored. All construction material and debris will be removed and disposed of at appropriate permitted landfills. All work areas will be graded and restored to as close to preconstruction contours as is feasible. PG&E will prepare and implement a postconstruction erosion control and ROW restoration plan.

Additional Construction Considerations

Construction in Rice Fields

Pipeline construction is planned through approximately 7 miles of rice fields in the Natomas Basin, which provide habitat for the federally threatened GGS. Construction in rice fields can

pose significant scheduling challenges because of the active period of the GGS and the flooding regime necessary for rice production. The construction window in GGS habitat set by the U.S. Fish and Wildlife Service (USFWS) is May 1 through October 1, while rice fields are frequently flooded by May 1 or shortly thereafter and may not be harvested until the end of September. To construct the pipeline in the rice fields during the active farming period, the ROW will need to be isolated from the adjacent fields and not flooded. This will be achieved by constructing temporary earthen isolation berms to segregate the active rice fields from the ROW. Ideally, installation of the berms would be performed by the farmers during normal field-preparation activities around late March or early April to avoid disturbance of rice farming activities after the fields have been laid out for the growing season. However, this timing is likely to be prior to the authorized construction season for giant garter snake. Depending on the weather, harvest timing, and property owner cooperation, construction of the berms may be split into two parts to address this scheduling challenge, as described in the following sections.

Fall ROW Isolation

The ROW may be isolated after rice harvest in the fall prior to construction (i.e., September and early October prior to construction the following May) to resolve the scheduling challenge. The edge of the pipeline ROW through rice fields will be adjacent to field edges or canals. The berms may be constructed by pushing up soil from adjacent areas, as is traditionally done, or by using the topsoil removed from the ROW to form them. Where irrigation flows must be maintained across the ROW, rigid culverts will be installed across the full width of the ROW as part of the preconstruction work. Sand bags will be used to seal around the ends of the culvert, thereby isolating the flowing water from the work area while the crossing is trenched.

By having the ROW isolated the prior fall, pipeline construction can begin on May 1 (or as soon as the field is sufficiently dry) without interfering with the rice field preparation, planting, and flooding schedule.

Spring ROW Isolation

If it is not feasible to isolate the ROW in the fall prior to construction, PG&E will work with the farmers to install the berms during their normal field preparation in the spring. If the farmers are not willing or able to install the berms prior to May 1, PG&E may request that they delay field flooding until the berms are installed, or PG&E may request special authorization from the USFWS to have the construction contractor install berms prior to May 1.

All temporary isolation berms and rigid culverts installed to segregate the ROW from flooded rice fields will be removed after the fields have been drained in late August or September following construction.

Dewatering

The portion of the project east of the Sacramento River runs through the Natomas Basin, which has a relatively high water table, and construction activities in this portion of the project are likely to encounter groundwater. Additionally, numerous water features surround the project in the form of irrigation ditches, canals, and creeks, which will require boring or drilling to cross

them with minimal impact. Dewatering will be performed in compliance with the Central Valley Regional Water Quality Control Board General Order for Dewatering and Other Low Threat Discharges to Surface Waters.

Waterbody and Road Crossing Procedures

Specific crossing methods have been identified for most of the water features and roads that will be crossed by Lines 406 and 407. Where water features are open cut, PG&E will employ dry-crossing techniques (flumed or dam and pump around) where water is present. Where feasible and warranted to avoid impacts to resources, bore or horizontal directional drilling (HDD) techniques will be employed (these methods are described in detail below). Table 1 outlines the crossings that will be required for the project.

Major crossings include Interstate Highway 505 (I-505), I-5, Knights Landing Ridge Cut, the two levees of the Yolo Bypass, the Sacramento River, State Route (SR) 70/99, Steelhead Creek/East Levee Road/Western Pacific Railroad, Curry Creek, and sensitive vernal pool complexes in western Placer County. All of these major crossings will be horizontally directionally drilled. Smaller features such as roads, irrigation ditches, canals, creeks, vernal pools, and other natural wetland features will be crossed using conventional open cut or bore techniques, as described in more detail below.

Open Cut

For crossings where it is feasible and all required permits have been obtained, PG&E plans to open cut features such as county roads and 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. If open-cut construction of a county road cannot be completed in one day, the trench will be covered with plates during non-working hours until construction is complete.

If construction in a waterway is to take place after May 1 in GGS habitat, workspaces are typically required by the USFWS to remain dry for a minimum of 15 consecutive days prior to excavation or fill, and preconstruction surveys for the snake are typically required before construction can begin.

Bores

Traditional bores are used for crossing short distances (approximately 300 feet maximum) under roadways or smaller waterways. They involve digging a bore pit on one side of the crossing and a receiving pit on the other. The bore pit is excavated to a depth equal to the required depth of the pipeline. A boring machine is then lowered to the bottom of the bore pit and placed on tracks or similar supports. The boring machine cuts a shaft under the crossing using a cutting head mounted on an auger. The auger typically rotates in a casing, or oversized section of pipe, and removes the cuttings of the bore into the bore pit. Once the bore is complete, the pipeline is then pushed through the casing and tied into the other segments of trenched pipeline.

Table 1: Water Feature and Road Crossings

Feature Name or Type [1]	Project Segment/ Crossing #	Proposed Crossing Method [2]	Wetland Feature #/ Wetland Map #
Hungry Hollow Canal	Line 406/#1	Open Cut	Hungry Hollow Canal/ L406 Map 3A
County Road (CR) 85	Line 406/#2	Open Cut	n/a
CR 87	Line 406/#3	Open Cut	n/a
CR 88A	Line 406/#4	Open Cut	n/a
Unnamed Drainage Canal	Line 406/ #5	Open Cut	Unnamed Canal 1/ L406 Map 3D
Unnamed Drainage Canal	Line 406/ #6	Open Cut	Unnamed Canal 2/ L406 Map 3E
Interstate 505/ CR 90A/ Unnamed Drainage Canal	Line 406/#7	Horizontal directional drill (HDD)	Unnamed Canal 3/ L406 Map 3E
Goodnow Slough	Line 406/#8	Open Cut	Goodnow Slough/ L406 Map 3F
Seasonal Wetland Swale/ Erosional Channel	Line 406/#9	Open Cut	Seasonal Wetland Swale #2/ L406 Map 3H
CR 17	Line 406/#10	Open Cut	n/a
CR 96/ Acacia Canal	Line 406/#11	Open Cut	Acacia Canal/ L406 Map 3K
CR 97F/ Interstate 5/ CR 99W/ Railroad	Line 406/#12	HDD	n/a
CR 97	Line 406/#13	Open Cut	n/a
CR 98	Line 407 West/#1	Open Cut	n/a

Feature Name or Type [1]	Project Segment/ Crossing #	Proposed Crossing Method [2]	Wetland Feature #/ Wetland Map #
CR 16A	Line 407 West/#2	Open Cut	n/a
State Route (SR) 113	Line 407 West/#3	Bore	n/a
CR 100	Line 407 West/#4	Open Cut	n/a
CR 101	Line 407 West/#5	Open Cut	n/a
CR 102	Line 407 West/#6	Bore	n/a
CR 17	Line 407 West/#7	Open Cut	n/a
Knights Landing Ridge Cut/ Riparian Wetland/ Unnamed Drainage Canal	Line 407 West/#8	HDD	OW08, OW07, WF121w, OW01/ L407 Map 14
West Levee Yolo Bypass/ Unnamed Irrigation Canal	Line 407 West/#9	HDD	OW19, OW06/ L407 Map 16
East Levee Yolo Bypass/ Tule Canal	Line 407 West/#10	HDD	OW05/ L407 Map 18
Unnamed Drainage Canal in Farm Field	Line 407 West/#11	Open Cut	OW13/ L407 Map 22
Unnamed Drainage Canal at CR 16	Line 407 West/#12	Open Cut	OW14/ L407 Map 23
Unnamed Drainage Canal at CR 16	Line 407 West/#13	Open Cut	OW15/ L407 Map 23
Sacramento River	Line 407 West/#14	HDD	OW22/ L407 Map 25
Riego Road	Line 407 West/ #15	Open Cut	n/a
Unnamed Drainage Canal at Riego Rd.	Line 407 West/#16	Open Cut	NJ04/ L407 Map 26

Feature Name or Type [1]	Project Segment/ Crossing #	Proposed Crossing Method [2]	Wetland Feature #/ Wetland Map #
Powerline Road/ Unnamed Irrigation Canal	Line 407 West/#17	Bore	OW46/ L407 Map 27
Riego Road/ Unnamed Drainage Canal	Powerline Road Distribution Feeder Main (DFM)/#1	Bore	OW122/ L407 Map 27
North Drainage Canal	Powerline Road DFM/#2	HDD	OW44/ L407 Map 28
Unnamed Irrigation Canal at Powerline Road	Powerline Road DFM/#3	Bore	OW38/ L407 Maps 29,30
Unnamed Drainage Canal at Powerline Road	Powerline Road DFM/#4	Open Cut	OW134/ L407 Map 31
Unnamed Irrigation Canal at Powerline Road	Powerline Road DFM/#5	Bore	OW31/ L407 Map 33
West Elverta Road	Powerline Road DFM/#6	Bore	n/a
Unnamed Irrigation Canal at Riego Road	Line 407 East/#1	Bore	OW120/ L407 Map 36
North Drainage Canal	Line 407 East/#2	Bore	OW131/ L407 Map 36
Unnamed Irrigation Canal at Riego Road	Line 407 East/#3	Bore	OW110/ L407 Map 37
SR 70/99/ Unnamed Drainage Canals	Line 407 East/#4	HDD	OW104, OW101/ L407 Map 38
North Main Canal	Line 407 East/#5	Bore	OW129/ L407 Map 39
Pacific Avenue	Line 407 East/#6	Open Cut	n/a

Feature Name or Type [1]	Project Segment/ Crossing #	Proposed Crossing Method [2]	Wetland Feature #/ Wetland Map #
Unnamed Drainage Canal at Riego Road	Line 407 East/#7	Open Cut	OW128/ L407 Map 40
Unnamed Drainage Ditch at Riego Road	Line 407 East/#8	Open Cut	OW127/ L407 Map 41
Seasonal Wetlands	Line 407 East/#9	Open Cut	WF164e, WF162e, WF161e, WF160e, WF159e, WF158e, WF166e, WF157e/ L407 Maps 41, 42
East Levee Road/ Steelhead Creek/ Western Pacific Railroad/ Seasonal Wetland	Line 407 East/#10	HDD	OW176, WF094e/ L407 Maps 42, 43
Seasonal Wetland	Line 407 East/#11	Open Cut	WF155e/ L407 Map 43
Pleasant Grove Road	Line 407 East/#12	Open Cut	n/a
Vernal Pool/ Vernal Swale	Line 407 East/#13	Bore	WF120e, WF119e/ L407 Map 43
Seasonal Wetland	Line 407 East/#14	Open Cut	WF154e/ L407 Map 44
Locust Road	Line 407 East/#15	Open Cut	n/a
Seasonal Wetland	Line 407 East/#16	Open Cut	WF060e/ L407 Map 45
Seasonal Wetland	Line 407 East/#17	Open Cut	WF061e/ L407 Map 45
Seasonal Wetland	Line 407 East/#18	Open Cut	WF062e/ L407 Map 46
Seasonal Wetland	Line 407 East #19	Open Cut	WF179e/ L407 Map 46
Seasonal Wetland	Line 407 East/#20	Open Cut	WF059e/ L407 Map 46
Brewer Road/ Seasonal Wetland	Line 407 East #21	Bore	WF057e/ L407 Map 46

Feature Name or Type [1]	Project Segment/ Crossing #	Proposed Crossing Method [2]	Wetland Feature #/ Wetland Map #
Seasonal Swale	Line 407 East/#22	Open Cut	WF114e/ L407 Map 47
Seasonal Wetland	Line 407 East/#23	Open Cut	WF144e/ L407 Map 47
Riparian Wetland	Line 407 East/#24	Open Cut	WF054e/ L407 Maps 47, 48
Seasonal Swale	Line 407 East/#25	Open Cut	WF050e/ L407 Map 49
Venal Swale/ Seasonal Swale/ Seasonal Wetland/ Vernal Pool	Line 407 East/#26	HDD	WF118e, WF141e, WF048e, WF043e/ L407 Map 49
Seasonal Wetland	Line 407 East/#27	Open Cut	WF048e/ L407 Map 50
Seasonal Wetland/ Seasonal Swale	Line 407 East/#28	Open Cut	WF029e, WF030e/ L407 Map 51
Curry Creek/ Vernal Pool/Vernal Swale	Line 407 East/#29	HDD	OW55, WF180e, WF032e, WF033e/ L407 Map 52
Seasonal Swales	Line 407 East/#30	Open Cut	WF174e, WF173e/ L407 Map 53
Vernal Pool	Line 407 East/#31	Narrow ROW to Avoid	WF167e/ L407 Map 53
Curry Creek/ Vernal Pool Complex	Line 407 East/#32	HDD	WF009e, WF018de, WF011e, WF017e, WF182e, WF183e, WF012e, WF014e/ L407 Maps 53, 54
Seasonal Swale	Line 407 East/#33	Open Cut	WF002e/ L407 Map 54
Seasonal Wetland	Line 407 East/#34	Open Cut	WF007e/ L407 Map 55

[1] Final crossing locations subject to change prior to construction.

[2] Crossing methods will be finalized in coordination with landowners and the appropriate agencies and all permits and easements will be obtained prior to construction. Proposed crossing methods are subject to change if permits cannot be obtained to open cut features.

Jacking is similar to boring except that an open-ended casing is forced, or jacked through, as opposed to drilling. Soils are then removed from the casing. The remainder of the installation procedure is identical to that described for boring.

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. In certain areas, the geologic strata above the bore may be weak and/or unconsolidated and the high pressure of the drilling mud may result 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.

Project Access

The main travel routes that will be used for construction access along Line 406 will include County Road (CR) 85, CR 87, CR 88A, CR 17, CR 19, and assorted smaller roads on the east side of I-5. Travel routes that will be used for construction access along Line 407 will include CR 16, CR 16A, CR 17, Baseline Road, Riego Road, and Powerline Road. Streets and roads perpendicular to these main routes that may also be used to access the project area include Watt Avenue, West Elverta Road, Walerga Road, SR 70/99, and SR 113. Access to the Yolo Bypass may be available from CR 16 adjacent to Grays Bend and the western Yolo Bypass levee road. The primary access for equipment will be along the PG&E ROW or via temporary bridges across canals or other water features. No new roads are expected to be required for the project, though

improvements may need to be made to some of the approaches at road or waterbody crossings such as blading or gravelling.

Short-duration traffic control and small-segment lane closures may occur along Baseline Road, Riego Road, and Powerline Road. The California DOT and the counties of Placer, Sutter, Sacramento, and Yolo will be consulted and all required approvals secured prior to construction activities occurring within any roadways.

Staging Areas

The primary staging areas for vehicles, equipment, materials, and other supplies required for the construction of the pipeline and regulator stations will be on the project ROW within the temporary and permanent easements. If the construction contractors choose to stage materials and/or equipment off of the ROW, they will be responsible for securing suitable space in a commercial yard. While these areas have not been identified, it is expected that staging would require a space of approximately 300 feet by 200 feet. Identification of staging areas will include any necessary environmental reviews and surveys, and notifications to and approvals from all required regulatory agencies.

Additional Work Space

Additional ROW space may be required in areas such as directionally drilled crossings, bore locations, ROW access roads, and as needed for laydown of project materials. During HDD operations, up to 125 feet of additional space is typically needed on the drill entry side, adjacent to the ROW, for a length of 200 feet for the rig setup, mud tanks, and power units. On the exit side of the crossing, an additional 50-foot-wide strip, approximately 1.2 times the length of the crossing, is typically needed to string, weld, and coat the pipe section to be pulled through the drilled crossing. Extra workspaces will be shown on design drawings prior to construction. Based on draft design drawings, acreages of the proposed extra workspaces have been calculated and are included in the summary of temporary impacts in this report (see Section 7). Procedures for identifying and approving additional extra workspace that may be requested by the pipeline contractor will include any necessary environmental reviews and surveys, and notifications to and approvals from all required regulatory agencies.

Pipe Storage Yards

Pending successful negotiations, two locations have been identified for potential pipe storage yards. The Arbuckle Yard (owned and operated by Northern Truck and Crane, Inc.) is south of the town of Arbuckle near the intersection of Old Highway 99W and Eddy Road, and the Woodland Yard is north of the City of Woodland near the intersection of Best Ranch Road and CR 100B. The yards were selected based upon their proximity to the project, major highways, and railroad spurs. Both potential pipe storage yards have rail access and consist of active storage yards or previously disturbed areas that were used for equipment storage or factory operations. Pipe will be delivered by rail to these pipe storage yards in 80-foot joints. The Woodland yard will require grading and fencing prior to use. Soil contamination tests will be performed prior to utilizing the yards as necessary to establish a baseline. The Arbuckle Yard is currently in use as a commercial pipe storage yard and will not need any improvements.

The Arbuckle Yard will be utilized during the Line 406 project and is required from January 2009 to June 2010. The total square footage to be temporarily impacted by the Arbuckle yard is 181,962 square feet. The Woodland yard will be utilized from the Line 407 East and West projects and is required from January 2010 to June 2013. The total square footage to be temporarily impacted by the Woodland yard is 277,049 square feet.

Water Sources and Disposal

Water will be used for HDD operations, hydrostatic testing, and dust control. Traditional sources include public/private water systems via fire hydrants, waterways (canals, creeks, or rivers), or water brought in by truck or storage tanks. Potential sources have been identified and are provided in Table 2. Final sources will be determined after design drawings are completed and hydro test procedures are detailed.

Water utilized in hydrostatic testing will be disposed of using one or more of the following methods: Discharge into sanitary sewer systems, storm drains, drainage ditches, creeks, or rivers (carbon filtering or other form of water conditioning may be required). The method used will be determined by the availability and capacity of the systems in the area, requirements of governing agencies, and condition of the water after hydrostatic testing.

CONSTRUCTION SCHEDULE

Construction of the Line 406 and Line 407 Pipeline Project is scheduled to begin in spring 2009, and may continue through 2012, depending on load growth in the project area. Line 406 will be constructed in 2009. The Line 407 East, Line 407 West, and Powerline Road DFM segments are scheduled to be constructed as dictated by the added load on the transmission system. Current projections are that 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.

In the Line 407 East and Powerline Road DFM segments where rice fields provide habitat for the GGS, construction will be conducted between May 1 and October 1, within the work windows outlined by the USFWS. If sensitive environmental resources such as nesting birds are encountered in preconstruction surveys or during construction, construction scheduling in those identified portions of the project may be modified to prevent impacts to sensitive species or sensitive habitat. With the exception of the HDD, construction is expected to be conducted 10 hours per day, 6 days per week, depending on the schedule for the particular phases of construction. HDD operations typically run 24 hours per day to avoid stoppages that may result in the collapse of the hole.