Attachment BR-201B4

Revised Draft
Biological Resources Assessment for the Cosumnes Power Plant, Sacramento County, California

Prepared for

Sacramento Municipal Utility District

P.O. Box 15830
Sacramento, California 95852-1830

February 27, 2003

CH2MHILL

2485 Natomas Park Drive
Sacramento, California 95833

CH2M HILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA
95833-2937
Tel 916.920.0300
Fax 916.920.8463

February 27, 2003

Ken Fuller
USFWS
2800 Cottage Way. W-2605
Sacramento, CA 95825-1846

SUBJECT: Revised Biological Resources Assessment
Cosumnes Power Project

Dear Mr. Fuller:

Enclosed for your immediate review is a hardcopy of the Revised Biological Resources Assessment (BRA) for the Cosumnes Power Project (CPP).

The prior draft of the Preliminary Draft BRA was sent to you on January 17,.2003. The BRA has been revised to reflect additional comments and suggestions provided by USFWS, ACOE, CDFG, NMFS, and CEC.

This document is intended to address both state and federal sensitive species. The California Department of Fish and Game will also be reviewing this document. We appreciate your review of the attached materials for compliance with Section 7 of the Endangered Species Act and Fish and Game Sections 2081.

Should you have any questions regarding this request, please do not hesitate to contact me at (916)286-0305 or Mr. Kevin Hudson at (916)732-7101.

Sincerely,
CH2M HILL

E.J. Koford
Sr. Biologist
CH2M HILL

cc: K.Hudson (SMUD)
D. Gifford (CDFG)
K. Chew (CEC)

Contents

Section Page

Appendices

Tables

Figures

This page left blank

1.0 Introduction

The Sacramento Municipal Utility District (SMUD) proposes to develop a 1,000-megawatt (MW) natural gas-fired power plant (the Cosumnes Power Plant [CPP]) and 26-mile natural gas pipeline in southern Sacramento County (the proposed action). The purpose of this biological resources assessment (BRA) is to review the proposed CPP project in sufficient detail to determine to what extent the proposed action may affect any of the threatened, endangered, proposed, or sensitive species, critical habitat for winter-run Chinook salmon and Delta smelt or Essential Fish Habitat (EFH) for Pacific Salmon.

This biological resources assessment (BRA) is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536(c) 50 CFR 40214). The U.S. Army Corps of Engineers is the lead federal agency for the proposed project and will oversee compliance with federal laws, ordinances, regulations, and standards (LORS) for the project, as well as any mitigation and protection measures for sensitive biological resources.

The lead state agency for the CPP project is the California Energy Commission (CEC) that oversees licensing and compliance of LORS for thermal power plants under its jurisdiction. An Application for Certification (AFC) for CPP was prepared under Title 20 of the California Code of Regulations and was submitted to the CEC on September 13, 2001. The AFC process under CEC regulations is the functional equivalent to the California Environmental Quality Act (CEQA) EIR. The CEC is the lead state agency for the project and will oversee compliance with state and federal LORS required for the project, as well as any mitigation and protection measures for sensitive biological resources. The AFC presents a detailed description of the project and addresses potential project impacts to sensitive biological resources in the project area. This BRA further refines the analysis of impacts to special-status species that occur, or could potentially occur, in the CPP project area. This BRA also addresses state-listed species as it may be used during consultation with the California Department of Fish and Game (CDFG) under Fish and Game Code Section 2081 or 2080.1.

Organization of BRA

Information on special-status species in the action area, the project's potential effects on these species, and proposed mitigation (Sections 2-6 of the BRA) is provided in two parts. Part one addresses terrestrial species. The BRA sections discussing these species are identified as Section 2A-6A. The second part of the BRA contains the pertinent information on aquatic species. BRA information on aquatic species is contained in Section 2B-6B. These sections follow the sections on the terrestrial species. Section 1 which addresses the Project Location, Lists of Special Status Species, Critical Habitat, Essential Fish Habitat, Consultation History, Description of the Proposed Action Area, and Project Schedule includes both terrestrial and aquatic species.

1.1 Project Location and Description of Proposed Action

The project has temporary disturbances and permanent features. The project site is a permanent feature on a 30-acre parcel and is hereafter referred to as the "site." The CPP project site is located 25 miles southeast of the City of Sacramento, on the eastern edge of the Sacramento Valley in Sacramento County (see Figure 1, all figures are located at the end of the document). The project would be located on a 30-acre parcel about 1,500 feet south of the existing non-operational Rancho Seco Plant (Rancho Seco or RSP) on a portion of a 2,480-acre site owned by SMUD (Figure 2). This location will allow the reuse of existing water systems, switchyards, and transmission lines that are already in place at Rancho Seco. The project is at 150 feet elevation, at the base of the foothills that rise to the Sierra Nevada east of the project. The 0.3-mile water supply line and 0.4-mile electrical transmission line connecting existing RSP features and the CPP site are in the same location and habitat as the project site. Construction of the interconnecting buried water supply line is a temporary disturbance. Stringing the transmission lines would be a temporary disturbance, while the transmission tower footings would be a permanent feature. There would be a temporary, 20-acre construction laydown area just south of the project site. Use of this area would require re-aligning portions of two ephemeral drainages to go around the laydown area and to align with the drainages north of Clay East Road. The construction access road built on SMUD-owned property would be a permanent feature. The site is located on the Goose Creek quadrangle, United States Geological Survey (USGS) at Section 29, Township 6N, Range 8E.

Power Plant

CPP will consist of a nominal 1,000-megawatt (MW) combined-cycle natural gas-fired power plant. The plant will be constructed in 2 phases, each consisting of 500 MWs. Each phase will have 2 combustion turbines, one condensing steam turbine, and 2 heat recovery steam generators (HRSGs). Construction of CPP will require that 30 acres of annual grassland be leveled and elevated for the CPP footprint and an electrical switchyard (Figure 2). A construction access road will also be built, which will be used for plant deliveries during operation. These features will result in the permanent loss of annual grassland that includes seasonal wetland and vernal pool habitats. Preparation of the CPP site also requires permanent realignment of two intermittent swales. The swales currently run from south to north through the center of the site, primarily flow only during the rainy season, and will be realigned to the west and east sides of the site, where meandering flow will join with Clay Creek to the north of the site. Swales in the laydown area would be realigned to match with the swales circumventing the power plant site.

Gas Pipeline

Natural gas for the facility will be delivered via a new 24-inch-diameter pipeline extending 26 miles from SMUD's existing transmission backbone pipeline network that currently terminates at the Carson Ice-Gen Facility in Elk Grove. The new gas pipeline crosses several roadways and is adjacent to railroad rights-of-way in the south County, crosses under several foothill streams and irrigation ditches typical of the Sacramento Valley, and then lies adjacent to the road right-of-way (ROW) along Twin Cities Road and Clay East Road, in

predominantly hay fields, alfalfa fields, and vineyards. The gas pipeline alignment is located in the Clay, Galt, Elk Grove, Bruceville, and Florin quadrangles.

Construction of the natural gas pipeline would require 3 construction methods, the conventional open-cut trench method, horizontal directional drill (HDD), and jack-and-bore. The open-cut trench method requires a 35 to 65-foot wide construction zone that includes area for a 3 to7-foot-wide, 7-foot-deep trench, separate topsoil salvage and trench spoil piles and vehicle/equipment access along the entire alignment. The HDD method would be used to install the natural gas pipeline under the Cosumnes River, Badger Creek, Laguna Creek, portions of the Cosumnes Preserve, and Highway 99. The HDD will require the use of a bentonite lubricant during the drilling process. Bentonite is a non-toxic clay material often used in farming and wetland construction. Jack-and-bore is used for crossing under small obstacles such as roads and railroad tracks, and consists of digging two pits and using a hydraulic jack to bore the pipe underneath the obstacle.

In order for the new 26-mile gas line to supply sufficient fuel for Phase 2 of the project, two gas compressor stations will be constructed as part of CPP's Phase 2 activities. One gas compressor will be located near the Carson Ice-Gen site at an existing valve station, in the Sacramento Regional Waste Water Treatment Plant buffer lands (Figure 3). Two existing gravel access roads lead into the site; one from the west and the other from the south. The new compressor is anticipated to be skid mounted, approximately 10 feet x 20 feet x 8 feet high, surrounded on four sides by a block wall for noise attenuation, in an existing fenced enclosure.

The other gas compressor will be added in an existing gas interconnection facility in Winters, CA where the SMUD pipeline ties-in to PG&E's main backbone Line 400 (Figure 4). The Winters Compressor Station is located on Road 29 in the SE 1/4 of Section 29, T9N, R1W in Yolo County. The new compressor is anticipated to be skid mounted, approximately 10 feet x 20 feet x 8 feet high, surrounded on four sides by a block wall for noise attenuation. The existing inter-tie station is currently surrounded by a slatted fence enclosure. The area is surrounded by orchards, with the nearest residences about 0.1 mile away.

Other Project Features

The CPP project will include the following associated features:

- A stormwater detention basin and discharge outfall structure to Clay Creek (a tributary to Hadselville Creek and Laguna Creek) will be located in the northwest corner of the CPP site. The outfall from the basin would be designed to incorporate measures to reduce contaminants, consistent with stormwater requirements, and with a flow dissipater structure or equivalent to reduce velocity and potential scouring from the outfall. Construction of the 100-foot-long stormwater discharge pipeline would result in temporary disturbance to 0.3 acre of pasture, annual grassland, and seasonal swale in the 30 acres. The open-cut trench method would be used to construct the stormwater discharge pipeline.
- New triple circuit 0.4-mile long 230-kV transmission lines will extend north northeast from the proposed switchyard at the CPP site to the existing Rancho Seco Plant's 230-kV switchyard. Approximately 4 new steel pole transmission towers will be required.

- An existing 66-inch diameter buried pipeline conveys water from Folsom-South Canal to the Rancho Seco Plant. Water for cooling CPP will be supplied by a new 0.3-mile 20-inch diameter pipeline connection to the existing water facilities at Rancho Seco. FSC diverts water from the American River at Lake Natoma. Phase 1 of the plant would use approximately 220 acre-feet per month, or 1,719 gpm or 3.7 cubic feet per second. Phase 2 of the plant would use approximately 220 acre-feet per month or 1,719 gpm, or 3.7 cubic feet per second. The water pipeline connection will require a 65-foot-wide construction corridor resulting in temporary disturbance to 1.3 acres of pasture, annual grassland, and seasonal swales.
- A Zero-liquid Discharge (ZLD) system will process all of the wastewater produced by the plant, returning a relatively high quality distillate stream for reuse in the plant and producing a solids waste stream suitable for disposal in a landfill. Wastewater will be processed in two steps; first a brine concentrator will concentrate the wastewater to approximately 15 percent salt concentration and produce a clean distillate stream. The second step will further process the remaining wastewater, producing a clean distillate stream and a salt cake. ZLD systems will be used for both Phase 1 and Phase 2 of CPP.
- Domestic water and process makeup water will be supplied by diverting a portion of the cooling water from the Folsom-South Canal to a package treatment plant.
- A temporary 20-acre construction laydown area would be located in annual grassland immediately south of the CPP site, south of Clay East Road. Two swales, an east and a west swale, currently run through the portion of land selected for the laydown area. The laydown area will be arranged in a polygon shape to avoid alteration of the swales, except where the northward flow approaches Clay East Road. Here, the earth will be graded to direct flow toward a new culvert system that directs natural drainage under Clay East Road and around the plant site. The laydown area will be revegetated to annual grassland after construction is complete.

Climate

The region's climate is Mediterranean, characterized by hot, dry summers and cool, wet winters. Summer high temperatures frequently exceed 100 degrees Fahrenheit (°F); winter temperatures are generally mild, with fewer than 20 freezing days per year. Rainfall averages 16.7 inches per year, most of which falls between November and March.

1.2 Time Line and Implementation Schedule

SMUD expects to begin construction of the CPP facility in the first quarter of 2003 and begin operation of Phase 1 in 2005. The natural gas pipeline construction would encompass 2 dry seasons, between spring of 2003 and summer 2004, when low water flows are expected in the Cosumnes River and tributaries, and to reduce potential environmental impacts to aquatic species. The CPP would have an operational life of approximately 30 years and would operate 7 days per week, 24 hours per day.

1.3 Action Area

The action area for the CPP project includes the Cosumnes River, the lower American River (Nimbus Dam downstream to the Sacramento River confluence), Sacramento River downstream of the confluence with the American River, and the Sacramento County portion of the Central Valley. The Cosumnes River is affected because the pipeline crosses the mainstream and several tributaries to the Cosumnes. Because the project would use water diverted from the American River, the lower American River and Sacramento River are also considered part of the action area. The Central Valley contains habitat for large numbers of migratory birds that winter in the cultivated agricultural fields, pastures, and Sacramento-San Joaquin delta areas. The Central Valley also contains a wide variety of vegetation communities that support special-status plants and wildlife. Vegetation communities in the project area include annual grasslands with swales and seasonal wetlands, grazed pastures, cultivated agricultural land, wetlands, and cottonwood, Valley oak, and willow riparian habitats. Wetland and waters of the U.S. include vernal pools, intermittent and perennial streams (Clay, Badger, and Laguna creeks), swales, and the Cosumnes River. In addition to named streams and creeks, the gas pipeline would cross 37 swales, irrigation ditches, drainages or other aquatic features that could be considered functionally equivalent to "streams" under the definitions implied by the State of California. Therefore, CPP has obtained Streambed Authorization pursuant to Section 1601 of CDFG code to cross these features.

Portions of the natural gas pipeline from the Sacramento Regional Wastewater Treatment Plant to the town of Franklin are in residential and commercial areas in the cities of Sacramento and Elk Grove. The pipeline runs close to and parallel to the railroad tracks or existing roads through most of this area.

A portion of the Cosumnes River and Cosumnes River Preserve are included as part of the action area. The Cosumnes Preserve was developed to protect the natural river ecosystem including riparian and freshwater marsh habitats. The Preserve maintains one of the last remaining valley oak riparian forests in California and portions of the Preserve have been selected as a national Natural Landmark. The Cosumnes River is one of the last rivers in California without dams; it routinely overflows its banks and provides sediments and nutrients to adjacent flood plains, riparian habitats, and wetlands. Portions of the Cosumnes Preserve are managed by the California Department of Fish and Game (CDFG) and other portions by The Nature Conservancy.

Cooling water for the project would come from FSC, which originates at Lake Natoma downstream of Folsom Reservoir on the American River.

The CPP project will result in direct and indirect impacts to biological resources in the action area. These impacts include temporary and permanent disturbance to Central Valley habitats and wildlife. The CPP project impact areas will temporarily affect approximately 240 acres for pipeline construction and laydown areas, and permanently convert 30 acres of habitat in the Central Valley to industrial use.

1.4 List of Special-Status Species

A list of special-status species that could occur in the project area was compiled from consultations with U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), CDFG, and the California Natural Diversity Data Base (CNDDB; CDFG 2002) (Appendix A). Recorded locations of special status species, according to the CNDDB search are shown in Figures 5 through 9. For the purposes of this analysis, only those species identified by the agencies as species of concern for the CPP project are fully addressed in this biological assessment. Any special-status species whose habitat is present in the CPP project area was evaluated for potential impacts from construction, operation, and maintenance activities. Other special-status species that were included on the USFWS, CDFG, and NMFS lists whose habitats or known boundaries of distribution do not occur in the project area are included in Table 1 (found at the end of this BRA), but were not evaluated further.

Federal Threatened (FT), Endangered (FE), Proposed Threatened (PT) or Proposed Endangered (PE) Species:

Sacramento Orcutt Grass *(Orcuttia viscida)* FE

Vernal pool tadpole shrimp (*Lepidurus packardi)* FE

Vernal pool fairy shrimp (*Branchinecta lynchi*) FT

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) FT

Spring-run chinook salmon (*Oncorhynchus tshawytscha*) FT

Winter-run chinook salmon (*Oncorhynchus tshawytscha*) FE

Sacramento splittail (*Pogonichthys macrolepidotus*) FT

Central Valley steelhead (*Oncorhynchus mykiss*) FT

Giant garter snake (*Thamnophis gigas*) FT

Bald Eagle (*Haliaeetus leucocephalus*) FT (proposed Delist)

Federal Candidate Species (C) and Species of Concern (SC)

American Peregrine Falcon *(Falco peregrinus anatum)* SC, SE

Sacramento Orcutt Grass *(Orcuttia viscida)C, SE*

Legenere (*Legenere limosa*) SC

California linderiella (*Linderiella occidentalis*) SC

Fall/late fall -run chinook salmon (*Oncorhynchus tshawytscha*) C

California tiger salamander (*Ambystoma californiense*) C

Western pond turtle (*Clemmys marmorata*) SC

Western burrowing owl (*Athene cunicularia*) SC

Tricolored blackbird (*Agelaius tricolor) SC*

State* Threatened (ST), Endangered (SE), Species of Special Concern (SSC), Fully-Protected (FP)

Swainson's hawk (*Buteo swainsoni*) ST

Greater sandhill crane (*Grus canadensis tabida*) ST, FP

*These species are state-only listed species, fully-protected species, and other California species of special concern that may or may not have federal status (see Table 1).

The assessment also addresses Pacific salmon, including winter-run, spring-run, fall/late-fall run Chinook salmon since the proposed project area occurs in the area designated as Essential Fish Habitat for the species.

1.5 Critical Habitat

The project site does not include designated critical habitat for any terrestrial species listed above. Critical habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp has been proposed in south Sacramento County that includes portions of the pipeline and project site.

Critical habitat for Sacramento River winter-run chinook salmon includes the Sacramento River (including the river water and river bottom) and adjacent riparian zone (FR Vol. 58 No. 114). The American and Cosumnes rivers are not designated as critical habitat for winter-run Chinook salmon.

Critical habitat for Central Valley spring-run chinook salmon and Central Valley steelhead was identified by NMFS to include all river reaches accessible to listed chinook salmon in the Sacramento River and its tributaries. Critical habitat designated for these two species has been withdrawn by NMFS pending additional analyses.

Critical habitat for delta smelt has been designated by USFWS to include the Sacramento River, downstream of the confluence with the American River, and the Sacramento-San Joaquin Delta.

Critical habitat has not been designated by USFWS for Sacramento splittail.

1.6 Essential Fish Habitat

In the project area, the Sacramento River, lower American River, and Cosumnes River are located in the area identified as Essential Fish Habitat for Pacific salmon. Fall-run Chinook salmon are known to inhabit the Cosumnes and lower American rivers. Winter-run, spring-run, late-fall run/fall-run Chinook salmon are known to inhabit the Sacramento River.

1.7 Consultation to Date

- March 7, 2001. Informal consultation with Chris Nagano, USFWS regarding special status species listing.

- April 30, 2001 Consultation Letters to USFWS, CDFG, and ACOE regarding project scoping.
- July 17, 2001. Letter from CDFG responding to request for consultation and acknowledging need for 1600 permits and CEQA assessment.
- August 24, 2001, pre-consultation technical assistance with NMFS concerning potential impacts to winter-, fall/late fall-, and spring-run chinook salmon, Central Valley steelhead, critical habitat
- December 11, 2001, pre- consultation technical assistance with Madeline Martinez of NMFS regarding potential project impacts and need for mitigation.
- January 11, 2002. Letter from USFWS commenting on AFC for project.
- January 17, 2002. Letter from Applicant to USFWS responding to concerns of January 11, 2002 and requesting meeting.
- February 7, 2002 Pre-consultation meeting with ACOE, USFWS, (CEC was also present) pre-consultation meeting to brief ACOE, USFWS about project. Invited participants CDFG and NMFS did not attend. Objective was to identify permit requirements application requirements and appropriate mitigation for project.
- February 20, 2002 Revised Species List for the Cosumnes Power Plant Gas Pipeline sent to Debra Crowe from Harry Mossman.
- April 5 and 8, 2002, Keith Whitener, The Nature Conservancy, Cosumnes River Preserve fisheries biologist, discussions of potential impacts to fish in Cosumnes River and Badger Creek from wastewater discharge and construction of pipeline through preserve.
- April 5, 2002, Mike Eaton, Cosumnes River Preserve Manager, discussion to determine potential impacts to Cosumnes Preserve from Project.
- May 10, 2002 Progress meeting with Ken Fuller, USFWS concerning wetland mitigation and presentation of final pipeline alignment.
- September 19, 2002 Progress meeting with Ken Fuller, Craig Aubrey, Jason Douglas (USFWS) and Melinda Dorin, Kristy Chew (CEC) to discuss segment 3a realignment, receive preliminary comments on the draft Biological Assessment and clarify determination of upland impacts to Giant Garter Snake, and indirect impacts to vernal pool fairy shrimp.
- October 15, 2002 Progress meeting with Ken Fuller, Craig Aubrey, Jason Douglas (USFWS) and Melinda Dorin, Kristy Chew (CEC) to review draft mapping of impacts to GGS and fairy shrimp and determination of upland impacts to giant garter snake, and indirect impacts to vernal pool fairy shrimp.
- November 6, 2002 Field visit with USFWS
- November 14, 2002 John Baker NMFS, concerning project water supply and potential impacts to fish species under NMFS jurisdiction.

- November 15, 2002 Meeting with ACOE in field to verify wetland delineation of plant site and laydown area.
- December 12, 2002 Letter from ACOE requesting additional data along the pipeline alignment.
- January 14, 2003 Meeting with SMUD, Wayne White, Justin Ly USFWS to identify progress
- February 7, 2003. Submit Final Wetland Delineation report. Accepted by ACOE.

1.8 Current Management Direction

A portion of the CPP natural gas pipeline project is proposed to go through the Cosumnes River Preserve in Sacramento County. The Cosumnes River Preserve is jointly owned by The Nature Conservancy, Bureau of Land Management, Ducks Unlimited, CDFG, Sacramento County Department of Regional Parks, Recreation and Open Space, and California Department of Water Resources (DWR). The overall goals of the Preserve are to restore riparian habitat in the Cosumnes River watershed and to protect and maintain habitat for native plants and wildlife.

This page left blank

2.0A Special-Status Terrestrial Species Accounts and Status in the Action Area

The designation of special-status includes: federal- and state-listed species under either the Federal or the California ESA, species proposed for those listings, federal Species of Concern, California Species of Special Concern, California Fully-Protected Species under the Fish and Game Code, and plant species designated as rare, threatened, or endangered by the California Native Plant Society (CNPS). A comprehensive list of special-status species that could occur in the project area is included in Table 1. Special-status species whose habitat(s) and distribution is present in the CPP project area are addressed in this section and evaluated for project impacts and mitigation. Other special-status species that were included on the USFWS, CDFG, and CNPS lists whose habitats or known boundaries of distribution do not occur in the project area are included in Table 1 and evaluated in Section 2.1 but not evaluated for project impacts and mitigation.

Field surveys that focused on habitat suitability and searches for special-status species were conducted on the entire CPP site, in a mile of the site, and 2,000-foot corridor along the gas pipeline and electric transmission line alignments. Botanical surveys for special-status plants focused on the proposed construction disturbance areas. Figures 5 through 9 show locations of known species occurrences.

Indirect and direct permanent, temporary, and operational project effects were analyzed for impacts to special-status species from the CPP project. Proposed protection and mitigation measures for impacts to special-status species are presented in Section 5.0A Tables 2, 3 and 4 provide summaries of these potential impacts to the wetlands and native vegetation communities in the project area resulting from the construction and operation of CPP and associated linear facilities.

2.1A Terrestrial Species Known or Assumed to Occur in the Project Area

Special-status terrestrial species known to occur or which are assumed to occur in the project area were identified through informal consultation with USFWS and CDFG, discussions with The Nature Conservancy regarding the Cosumnes River Preserve, and field surveys for the project. The species addressed in this BRA are dependent in some way on aquatic habitats such as river, creek, vernal pool, emergent marsh, or the adjacent riparian habitats. The following sections discuss the potential impacts to special-status species from the CPP project.

2.1.1A Federal Listed Terrestrial Species

2.1.1.1 Sacramento Orcutt Grass

The **Sacramento orcutt grass** (*Orcuttia viscida*) is a Federal and state endangered and CNPS 1B species. It is an annual herb that occurs in vernal pool habitats, blooming from May to June after pools dry. CNDDB records show historic occurrences of Sacramento orcutt grass approximately 2 miles from Rancho Seco. This species is seriously threatened by agriculture, urbanization, and grazing where vernal pools are lost or degraded (Skinner and Pavlik, 1994). Initial surveys for this species were done in conjunction with the wetland delineation for the project and specifically for the project site by Davis Environmental Consultants (Davis 2001). Additional surveys were conducted during the blooming period. Orcutt grass was not detected in the project construction areas and therefore the CPP project is not expected to affect the Sacramento orcutt grass.

2.1.1.2A Vernal Pool Tadpole Shrimp and Fairy Shrimp

Vernal pool tadpole shrimp (*Lepidurus packardi*), a federal endangered species and **vernal pool fairy shrimp** (*Branchinecta lynchi*), a federal threatened species (collectively referred to as vernal pool branchiopods) are California endemic species, that live their entire life cycle in temporary pools that fill with rainwater. They occur in ponding areas such as vernal pools, swales, seasonal wetlands, or depressions that hold water for at least 18 days (at 20 °C) or 41 days (at 15° C) during the wet season. Tadpole shrimp require a minimum of 25 days to mature and mean age at reproduction is 54 days (Federal Register Vol 67, No. 185. P 59901). Vernal pool branchiopods lay eggs (cysts) as the pool dries and persist in the encysted egg stage during the summer dry periods. These particular species are endemic to vernal pools and swales in California's Central Valley (Federal Register 1994), but they are also known to inhabit scrapings, tire tracks and other artificial depressions (USFWS 1996). The USFWS in proposing critical habitat for vernal pool crustacea identified the Primary Constituent Elements (PCE) that provide the necessary features of critical habitat. Briefly stated, the two PCE for vernal pool fairy shrimp and vernal pool tadpole shrimp are 1) vernal pools or ephemeral wetlands of appropriate size and depth and 2) the geographic, topographic and edaphic features that support vernal pool complexes (Federal Register Vol 67, No. 185. September 24, 2002). Where topsoil has been removed from the depression by grading or scraping, or where water is prevented from collecting, the population of fairy shrimp in that pool could be lost because the PCEs are no longer present.

Suitable but degraded habitat exists for vernal pool fairy shrimp in the low depressions near or in the Union Pacific railroad right-of-way and Laguna-Stone Lakes Preserve along the gas pipeline and the vernal pool north of the CPP project site. Surveys for listed vernal pool branchiopods were not conducted specifically for the CPP project, as the USFWS indicated during pre-consultation technical assistance that protocol survey results showing absence would not be accepted. Vernal pool branchiopods are presumed to be present in the vernal pools and seasonal depressions at the site and along the gas pipeline alignment that hold water for a long enough period.

Construction of the CPP footprint may result in the direct loss of some ponding habitats. In addition, the gas pipeline construction corridor contains seasonal ponding areas that could support protected vernal pool species. The CPP project may adversely affect vernal pool

tadpole shrimp, vernal pool fairy shrimp, and vernal pool plants that may occur in the wetlands. Mitigation is proposed for the loss of wetlands along the pipeline and on the site (see Section 5.0A).

2.1.1.3A Conservancy Fairy Shrimp

The **Conservancy fairy shrimp** (*Branchinecta conservatio*) is a Federal endangered branchiopod. Conservancy fairy shrimp inhabit relatively large vernal pools and are known from six disjunct populations in Tehama, Butte, Solano, Glenn, Merced, and Ventura counties (Federal Register 1994). This species is not known to occur in Sacramento County.

Reasons for decline of the Conservancy fairy shrimp include loss of vernal pool and other seasonal wetlands to farming and development. The CPP project will not adversely affect Conservancy fairy shrimp.

2.1.1.4A Valley Elderberry Longhorn Beetle

The **valley elderberry longhorn beetle** (VELB) is listed as a federal threatened species. The VELB is dependent on its host plant, elderberry (*Sambucus* sp.). Adults feed on elderberry foliage and flowers.

The VELB requires the presence of mature elderberry plants to complete its 2-year life cycle. The animal spends most of its life in the larval stage, living in the stems of an elderberry plant. The adult stage is short-lived. Females lay eggs in crevices of the bark in late June. The larvae normally occupy elderberry stems, trunks, and roots greater than 1 inch in diameter. Larvae and pupae remain in the stems for one to 2 years until emergence as adults in the spring. Adult emergence is from April through June, about the same time the elderberry produces flowers. External sign of the species on elderberry shrubs is limited to exit holes created by adults chewing their way out of the stems after pupation.

The VELB's range extends throughout California's Central Valley and associated foothills. Waterways that drain to the Sacramento-San Joaquin delta and support elderberry plants are considered habitat for VELB. Sacramento County is included in the list of 31 counties that have VELB in all or portions of their areas.

Seven isolated (not associated with riparian vegetation) blue elderberry shrubs (*Sambucus mexicanus*) are located along the gas pipeline alignment. Two are located on the eastern edge of the UPRR between Laguna and Elk Grove Boulevard, two are located along the UPRR at the point where the pipeline crosses under the UPRR approximately 70 feet south of Elk Grove Boulevard, and three are located adjacent to the north levee road of the Cosumnes River. The former four are potentially within 100 feet of construction and will require special monitoring and avoidance measures described in Section 5.0A. The latter 3 are located over a portion of the line that would be installed by HDD and therefore would not be affected. Sixteen more elderberries were located in riparian habitats in the Cosumnes River Preserve at distances between 150 and 500 feet from the pipeline. These will be avoided by construction. The riparian habitats of the Cosumnes Preserve, including elderberry plants, will be avoided by using horizontal directional drill (HDD) to place the gas pipeline under sensitive areas. If a frac-out (e.g. inadvertent returns of drilling mud enter the waterway through a fissure or crack in the soils) were to occur from HDD, the

elderberry shrubs would most likely not be affected, as clean up of the drilling mud would not remove shrubs.

The CPP project may affect, but will not adversely affect VELB.

2.1.1.5A Giant Garter Snake

The **giant garter snake** (*Thamnophis gigas*), a Federal and California threatened species, is one of the largest garter snakes in North America. It is olive to dark brown with pale yellow stripes running down the back and both sides. It is highly aquatic, requiring marsh habitat (including flooded rice fields). The snakes also require a consistent source of small fish, amphibians, or other aquatic prey species in slow moving sloughs, creeks, rivers, ponds, and irrigation canals. Giant garter snake habitat is defined as any wetland, canal, or slough suitable for foraging (containing fish and amphibians), and upland habitat (defined as areas within 200 feet of aquatic habitats) (Hornaday 1997) within 5 miles of a recorded locality. The Cosumnes River, Badger Creek, and irrigated crops, canals and associated upland areas support aquatic species that provide forage for giant garter snakes.

The Sacramento County rice production zone and the eastern portion of the Sacramento-San Joaquin river delta from the Laguna Creek-Elk Grove region south to Stockton supports populations of giant garter snake (Federal Register 1993, Thelander 1994). The CNDDB has a record of giant garter snakes occurring in the large marsh at the confluence of the Cosumnes River and Badger Creek west of Highway 99 and another in a marshy ditch south of Arno Road just east of Highway 99. Cosumnes Preserve staff report giant garter snakes occur in the preserve but Laguna Creek has not been surveyed.

Giant garter snakes hibernate in underground burrows in upland areas adjacent to aquatic habitats during the winter months, typically from November through March (USFWS 1999). During the hibernation period they are susceptible to earth moving activities while in underground burrows. The snakes are normally active (breeding or feeding) from early March through September but have been observed above ground as early as February and as late as October in some areas (Wylie 1997). For consultation purposes, the USFWS typically refers to the winter hibernation period as October 1 to May 1 as this is the period when most, if not all, snakes are in hibernation.

Reasons for population decline include loss of forage habitat in natural steams and wetlands and supporting upland habitat, disruption during basking and hibernation, direct loss of individuals through predation by native and introduced species, and degradation of water quality. The proposed action may result in temporary impacts to the giant garter snake during earth moving activities, such as construction of the CPP gas pipeline trench.

There is no suitable giant garter snake habitat at the CPP project site, and none was reported during field surveys for tiger salamander and other amphibians (Jennings 2002). Along the gas pipeline, giant garter snake are known to occur in the Cosumnes River and Badger Creek and are assumed to be present in nearby tributaries with appropriate cover, hydrology and prey. Roads and railroads are believed to be effective barriers where the pipeline parallels a railroad berm or heavily traveled highway. The CPP project was designed with a concern to avoid aquatic habitat to the extent feasible.

Giant garter snakes have been documented to move up to 5 miles over a period of a few days in response to dewatering of habitat (Wylie *et al. 1997 in* USFWS 2002). Telemetry studies also indicate that active snakes use uplands extensively –more than 31 percent of the observations were in uplands (Wylie 1999 *in* USFWS 2002).

> "Almost all snakes observed in uplands during the active season were near vegetative cover, where cover exceeded 50 percent in the area within 0.5 m of the snake. Less than 1 percent of observations were of snakes in uplands with less than 50 percent cover nearby (Wylie 1999 *in* USFWS 2002). "

The draft recovery plan for the snake designated four recovery units for the snake. The pipeline for the CPP project is within the Sacramento County Valley Recovery Unit, which comprises seven populations. "Five of the six remaining population within the recovery unit are very small, highly fragmented and isolated, and, except for the Badger Creek / Willow Slough population, threatened by urbanization. This latter population is within a small isolated area…these subpopulations are largely protected from threats to the species..." (USFWS 2002)

The portion of CPP gas pipeline extending through the Cosumnes Preserve could temporarily affect giant garter snakes or their habitat during HDD and / or trench construction activities. If a frac-out were to occur in giant garter snake habitat, potential impacts could occur if drilling mud fills shelter burrows used by snakes and trapping them. To mitigate the potential impacts of a "frac out," a detailed Contingency Plan for HDD has been developed and is presented in Appendix C. Construction under and near the Cosumnes River will be scheduled during the dry months to minimize potential impacts to snakes.

2.1.1.7A Bald Eagle

The **bald eagle** (*Haliaeetus leucocephalus*) is a Federal threatened species and state endangered species. They nest near large bodies of water in California at low elevations and require a continuous supply of fish and / or waterbirds for prey. The bald eagle builds a large stick nest in old growth tree stands with 40 percent canopy cover near a permanent water source. They do not generally nest near human disturbance. The nearest record for nesting bald eagles was reported in 1992 approximately 5 miles east northeast of Rancho Seco. The bald eagle winters in the Central Valley of California.

Bald eagle population declines have been attributed to pesticide use and to a lesser extent, direct loss of individuals due to shooting, electrocution and traffic. Through recovery efforts implemented since its listing under the Endangered Species Act, the bald eagle population has increased in the lower 48 states (Federal Register 1999.) The USFWS proposed to delist the species in 1999.

Impacts to wintering bald eagle could result from disturbance to winter roosts or collisions with the electric transmission line or HRSG stacks. The CPP project will not contribute to the pesticide load in the region. There are no known communal winter roosts in the project area. Design of a 230-kV transmission line with conductor spans greater than 6 feet would minimize the potential for electrocution. The CPP project may affect, but will not adversely affect the bald eagle.

2.1.2A State Listed Terrestrial Species

2.1.2.1A Swainson's Hawk

The **Swainson's hawk** (*Buteo swainsoni*) is a California threatened species and nests in the Sacramento Valley from April through September. They migrate in September and October to winter in Central and South America where they forage in agricultural fields and return to their breeding grounds in the Central Valley in March and April. They nest in riparian areas close to open grasslands and agricultural crops that support prey. Swainson's hawks prey on large insects, small mammals, snakes, and other small reptiles and amphibians up to 10 miles from active nest sites (CDFG 1992).

Pesticide use in South America has contributed to the decline in Swainson's hawk populations when the birds feed on contaminated insects (Stockton Record, March 15, 1996). The Swainson's hawk is declining in California due to pesticide use on wintering grounds and loss of nesting and foraging habitat in the Central Valley.

Swainson's hawks are sensitive to disturbance during nesting and CDFG recommends a 0.5-mile buffer between construction and active nests. There are several known and potential nest sites from 2001 surveys conducted by CDFG within 0.5 mile of the proposed gas pipeline (Gifford 2002), but none near the project site (see Figures 5 through 9). Potentially suitable nest trees occur along the gas pipeline route in the Cosumnes Preserve. A Swainson's hawk could nest in any of these in any year. No Swainson's hawks were observed foraging on the project site during field surveys.

The proposed action will have no affect on the wintering grounds of the Swainson's hawk. However, the proposed CPP project may impact the Swainson's hawk through loss of foraging habitat (annual grassland on the CPP site) and potential disturbance to nest sites during the breeding season (March 1 through August 15) along the gas pipeline alignment. Noise from construction of the CPP project features may cause disturbance to nesting Swainson's hawks if active nest sites are within 0.5 mile of construction areas.

In general, construction of the pipeline will avoid the Swainson's hawk nesting season (March to August) whenever feasible. In locations where this is not practical, SMUD will consult with CDFG to develop site-specific mitigation measures to avoid and minimize potential adverse impacts, as described in Section 5.0A.

Impacts to Swainson's hawk could also occur from collisions with the electric transmission line or HRSG stack. Protection and mitigation measures for Swainson's hawk are presented in Section 5.0A. With implementation of these measures, the CPP project may affect but is not likely to adversely affect Swainson's hawk.

2.1.2.2A Greater Sandhill Crane

The **greater sandhill crane** (*Grus canadensis tabida*) is a California threatened and Fully-Protected species. It breeds in Siskiyou, Modoc, Lassen, Plumas, and Sierra counties during the summer, nesting in remote wetlands and shortgrass prairies. Sandhill cranes winter in the Cosumnes River Preserve from approximately September 15 to March 15 of each year. They occur in large flocks on the preserve, and fly out daily to surrounding farmland to feed. They were observed on the parcels east of the Cosumnes River proposed for the pipeline construction during early spring of 2002. They arrive at the Cosumnes in

September and October and return north in early spring. The CPP pipeline is within the sandhill crane migratory route and wintering area.

Greater sandhill crane populations have declined because of loss of nesting habitats, loss of winter forage habitats, and direct mortality due to collisions with man-made structures. Sandhill cranes are generally absent from the area where new transmission lines and the stacks would be, so the risk of collision is low.

Pipeline construction in the vicinity of waterways is generally planned for the dry months to avoid adverse impacts to water quality and to avoid the period when sandhill cranes are present in the area. However, to the extent there could be some overlap in construction activities, there would be no construction in the rice fields and the Cosumnes Preserve within 5 miles of Interstate 5 (which is the greatest concentration area) and from one day to the next, construction would proceed slowly south. Sandhill cranes would temporarily avoid the immediate vicinity of construction for a distance of approximately 0.25 miles, but would be able to use that area after construction has passed through. Sandhills are strong fliers and use the Central Valley as far south as Stockton and as far north as Sacramento. There is ample area for these birds to forage during construction, if both occur contemporaneously. No wintering forage habitat (rice fields and row crops) or nesting habitat will be lost for these species from the proposed action. The CPP project may affect, but is not likely to adversely affect greater sandhill crane.

2.1.1.3A American Peregrine Falcon

The **American peregrine falcon** (*Falco peregrinus anatum*) is a California endangered species. It was delisted as a Federal endangered species in 1999. It usually breeds in woodlands, forests and coastal habitats near wetlands, rivers, or lakes. They nest on protected cliffs and ledges for cover, and occasionally use tree cavities and tall buildings for nest sites. American peregrine falcon are not known to nest in the CPP area but may use the Central Valley as winter foraging habitat, feeding on small birds. The CPP project area and Cosumnes Preserve contains suitable winter foraging habitat.

Reasons for the decline of the peregrine falcon are pesticides, and loss of nesting and hunting (foraging) habitat. The proposed action will not contribute to the pesticide load in the region, no nesting habitat will be lost, and only temporary wetland losses (foraging habitat) will occur. Impacts to wintering American peregrine falcon could occur from collisions with the electric transmission line or heat recovery steam generator (HRSG) stack. The CPP project may affect, but is not likely to adversely affect peregrine falcon.

2.1.3A Non-Listed Terrestrial Species of Concern

2.1.3.1A California Hibiscus

The **California hibiscus** (*H. californicus*) or rose mallow (*Hibiscus lasiocarpus*) is a CNPS list 2 species. It is not currently a Federal or state listed species. California hibiscus is restricted to mesic, warm, low elevation sites, typically in riparian settings. California hibiscus is known to occur in the Cosumnes Preserve.

Reasons for decline of this species include development, agriculture, channelization of the rivers, and loss of wetlands (CNPS 1994, CDFG 1984). The natural gas pipeline route will avoid potential habitat for California hibiscus in riparian areas by using HDD.

Potential impacts to individual hibiscus plants could occur if a frac-out were to occur where this species is located. Drilling mud (bentonite) could temporarily cover plants. The hibiscus is a perennial and would most likely recover from the temporary impact in the next season. The CPP project may affect but is not likely to adversely affect California hibiscus.

2.1.3.2A Legenere

Legenere (*Legenere limosa*) is a CNPS list 1B species that occurs in southern Sacramento and northern San Joaquin valleys. It requires moist ground in vernal pools, lakes, ponds, and sloughs (Nakamura and Kierstead-Nelson 2001). Legenere is an herbaceous annual that blooms May to June after the pools are dry. Flowers are white to yellow. Legenere is threatened by grazing and loss of habitat from development.

Legenere occurs near the CPP pipeline construction corridor. A large vernal pool north of Arno Road and Highway 99 supports an abundance of this species (Marty 2002). In 2000, legenere covered 75% of the pool bottom.

The CPP project proposes to avoid the vernal pool at Arno Road by placing the pipeline on the south side of Arno Road. The CPP is not likely to adversely affect legenere.

2.1.3.3A California Tiger Salamander

The **California tiger salamander** (*Ambystoma californiense*) (CTS) is a federal Candidate species and California Species of Special Concern. CTS is known from the San Francisco Bay area, the San Joaquin Coast Ranges, the Central Valley from Yolo County south to Kern County, and the mountains and foothills of Santa Barbara and San Luis Obispo Counties, where it is found in annual grassland and oak woodland habitats (Zeiner 1988). They normally are not found in water bodies that support predatory fish species such as bass, catfish, and trout, as the fish will prey on CTS larvae. Other habitats include permanent ponds, slow moving streams, vernal pools, and other seasonal ponds that hold water for 4 to 6 consecutive months below 1,000 feet in elevation for breeding. Adults commonly use ground squirrel burrows or cracks during aestivation (summer dormancy). CTS can travel 0.5 mile or more from aestivation sites to breeding ponds. Migration to breeding ponds occurs following warm winter and spring rains from October through May (Jennings 1994). CTS that use permanent ponds containing predatory fish or frogs as breeding habitat will most likely be unsuccessful as the larvae get eaten (CDFG 1999). CTS may require 2 or more years to become sexually mature and can live for 25 years or more.

CNDDB records show historic occurrences of CTS along Twin Cities Road near Rancho Seco, and in Borden Ranch 1.25 miles south of Rancho Seco. CTS larvae were found in a constructed vernal pool approximately 0.25 mile east of Rancho Seco Reservoir in 2002 (Ellen Davis; Davis Environmental Consulting, personal communication). Dr. Mark R. Jennings (Rana Resources) conducted field surveys for CTS in the CPP project area in April 2002 but detected no CTS along the gas pipeline. Breeding habitat in these areas primarily consists of stock ponds, vernal pool, or other seasonal pools.

The CPP site does not contain suitable breeding habitat for CTS and none was found during field surveys (Jennings 2002). In general vernal pools along Arno Road, Twin cities and near the Cosumnes look potentially suitable. However, Jennings noted "the presence of abundant bullfrog populations …severely restricts the ability of these species to successfully reproduce and survive in the restricted aquatic habitats available. Jennings further observed "extensive habitat degradation along the proposed corridor route, due to established roads (where animals can be run over), man-made canals, vineyards, feed lots, residential landscaping and other agricultural activities. The railroad right-of-way in survey area 4 [near Twin Cities road] was disturbed several times by individuals during the month of April by driving ATVs and other vehicles through vernal pools on both sides of the railroad tracks as they dried. Thus any organisms present in these pools are already being negatively affected by human activities.

The CPP project will not result in the loss of CTS breeding habitat and is not likely to adversely affect California tiger salamander.

2.1.3.5A Western Pond Turtle

The **western pond turtle** (*Clemmys marmorata*) is a Federal Species of Concern and state Species of Special Concern. Western pond turtles require permanent or nearly permanent water, such as ponds, lakes, streams, or irrigation canals. Western pond turtles were observed in a perennial pond in the Cosumnes River Preserve immediately west of Highway 99 and in the concrete box culvert in Clay Creek 0.25 mile northwest of the CPP site access road. They could also occur in Badger, Clay, Hadselville, and Laguna creeks and the Cosumnes River. In addition, stock ponds in the vicinity could support this species.

Reasons for decline of these turtles include loss of dispersion corridors, wetlands, and shallow, slow moving aquatic habitats. Avoidance of the habitats during construction of the natural gas pipeline by directional drilling underneath the waterways or keeping trench work outside open water areas is expected to eliminate direct impacts to pond turtles. The CPP project may affect, but is not likely to adversely affect western pond turtles.

2.1.3.6A Western Burrowing Owl

The **Western burrowing owl** (*Athene cunicularia*) is considered a federal Species of Concern and a California Species of Special Concern. Burrowing owl habitat consists of open grassland or prairie with short vegetation and an abundance of mammal burrows. Burrowing owls prey on small mammals, insects, and crayfish, and can feed on carrion. Short vegetation may increase prey availability, enhance predator detection by the owls, and attract burrowing mammals that provide nest sites for burrowing owls. The species is typically migratory but may use burrows in the project area and along the pipeline both during the breeding season and winter.

Potentially suitable habitat occurs along the railroad tracks west of Franklin Boulevard, along Twin Cities Road, and at the project site. Burrowing owls tend to use the same burrows from year to year, such that the presence of burrowing owls usually indicates they will be back in following years. One owl pellet was reported adjacent to a burrow approximately 300 feet northwest of the proposed CPP site in 2001. No owls were observed on, or adjacent to, the project site during protocol surveys in May 1 and 3, 2002. Only one pair of owls was observed along the pipeline, located at Sims road in the Sacramento

Regional Wastewater Plant bufferlands. Owls could potentially colonize any suitable squirrel burrows in any year, but presently there is no evidence of any owls along the pipeline corridor with the exception of the pair at Sims Road. The CPP project is not likely to adversely affect western burrowing owls.

2.1.3.7A American Bittern

The **American bittern** (*Botaurus lentiginosus*) is a Federal Species of Concern. The American bittern is found throughout the Central Valley most times of the year in tall emergent marsh habitats. It builds nests on the ground from reeds and grasses in dense marsh areas. It feeds on a variety of species, including fish, snakes, amphibians, invertebrates, crayfish, insects, birds, and small mammals. American bittern are known to nest and forage in the Cosumnes Preserve, along irrigation canals, streams, ponds, and rivers in the project area. The water bodies with emergent wetland vegetation along the CPP pipeline area are suitable nesting habitat for the American bittern and the canals provide a variety of prey.

Reasons for decline of the American bittern include loss of emergent wetland habitats throughout California. Irrigation canals containing prey species and tall emergent vegetation found in agricultural fields are used as alternative habitat. Impacts to the American bittern from the CPP project include the potential for nest disturbance during construction near irrigation canals. Avoidance of the habitats during construction of the natural gas pipeline by directional drilling underneath the waterways or keeping trench work outside open water areas is expected to eliminate direct impacts to bittern. Preconstruction surveys will be conducted in the project disturbance areas for American bittern nest sites as well as other nesting species. The worker awareness training program will include instruction on avoidance of all nest sites in construction zones and notification procedures if nest sites are located.

2.1.3.8A Grasshopper Sparrow

The **Grasshopper sparrow** (*Ammodramus savannarum*) is a Federal Species of Concern. It builds nests of grasses and forbs on the ground at the base of tall, dense grass clumps in open grasslands. The distribution of grasshopper sparrows includes the eastern portion of Sacramento County in its summer, nesting range (Zeiner 1990a, Peterson 1990). The grasshopper sparrow occurs in Sacramento County as a winter migrant. The grasshopper sparrow is not known to nest in the project area.

Reasons for decline of grasshopper sparrow include loss of open grassland habitat from conversion to farming, houses, and other development. Impacts to nesting grasshopper sparrows are not anticipated from the CPP project; however, the worker awareness training program will include instruction on avoidance of all nest sites in construction zones. The CPP project is not likely to adversely affect the grasshopper sparrow.

2.1.3.9A White-Faced Ibis

The **White-faced ibis** (*Plegadis chihi*) is a Federal Species of Concern and California Species of Special Concern. It nests in small colonies in freshwater marshes, ponds and rivers in isolated areas in southern California, the Klamath basin, and the Central Valley. It feeds on crustaceans and other invertebrates in muddy emergent marshes and croplands. White-faced ibis are occasional visitors of the Cosumnes Preserve.

Reasons for decline of the white-faced ibis population include loss of wetlands used as nesting and forage habitats. Impacts to the white-faced ibis could occur from collisions with the electric transmission line or HRSG stack. The CPP project may affect, but is not likely to adversely affect white-faced ibis.

2.1.3.10A White-Tailed Kite

The **White-tailed kite** (*Elanus leucurus*) is a California Fully-Protected species. It is a year-round resident of the Central Valley, coastal range, and foothills. It is common in agricultural areas, feeding on small mammals, inspects, birds, reptiles, and amphibians. It nests in riparian and / or isolated tall trees and shrubs near foraging areas. White-tailed kites are known to nest in the Cosumnes Preserve and could nest in trees near the site and along the gas pipeline alignment.

Reasons for decline of the white-tailed kite include loss of riparian nesting habitats and open forage areas. Impacts to the white-tailed kite could occur from collisions with the electric transmission line or HRSG stack. With implementation of protection measures, the CPP project may affect, but is not likely to adversely affect white-tailed kite.

2.1.3.11A Special Concern Bats

Myotis Bats

The **Small-footed myotis bat** (*Myotis ciliolabrum*), long-eared myotis bat (*M. evotis*), fringed myotis bat (*M. thysanodes*), long-legged myotis bat (*M. volans*), and Yuma myotis bat are Federal and State Species of Concern. These bats roost in crevices, buildings, spaces under bark, and in caves in undisturbed areas (Zeiner, et al., 1990b). These species avoid the arid Central Valley, remaining in the foothills, feeding on insects and spiders over trees and water. Potential suitable habitat exists in the Cosumnes Preserve riparian corridor. The Cosumnes Preserve riparian corridor will be avoided with use of the HDD construction method for the gas pipeline. No impacts to these species of myotis bats are anticipated from CPP project activities as no potential roost structures or riparian trees will be affected.

Big-Eared Bats

The **Pacific western big-eared bat** (*Plecotus townsendii townsendii*) and Pale Townsend's big-eared bat (*Plecotus townsendii pallescens*) are Federal and State Species of Concern. They are found throughout California and require caves and buildings or other structures for roosting. They are extremely sensitive to disturbances at roost sites (Zeiner, et al., 1990b). Big-eared bats hibernate during cold weather, from October to April. They feed on flying insects by gleaning from foliage. Potential suitable habitat exists in the Cosumnes Preserve riparian corridor. The Cosumnes Preserve riparian corridor will be avoided with use of the HDD construction method for the gas pipeline. No impacts to bats are anticipated from CPP project activities as no potential roost structures or trees will be affected.

Greater Western Mastiff Bat

The **Western mastiff bat** (*Eumops perotis californicus*) is a federal Species of Concern and California Species of Special Concern. It prefers semi-arid to arid habitats, including annual and perennial grasslands. It roosts in crevices of rock outcrops and buildings (Zeiner, et al., 1990b). The western mastiff bat stays active all year long, going into daily torpor from December through February, and resuming feeding during the night. It forages up to 7 hours per night and does not retain night roosts like many bat species. Potential suitable

habitat exists in the Cosumnes Preserve riparian corridor. The Cosumnes Preserve riparian corridor will be avoided with use of the HDD construction method for the gas pipeline. No impacts to bats are anticipated from CPP project activities as no potential roost structures or trees will be affected.

Pale Townsend's big-eared bat

The **Pale Townsend's big-eared bat** is a Federal Species of Concern and California Species of Special Concern. This species requires caves, and buildings or other structures for roosting and is extremely sensitive to disturbances of roost sites (Zeiner 1990b). Suitable habitat exists in riparian areas in the Cosumnes Preserve area.

Reasons for decline of pale Townsend's big-eared bat include loss of breeding and roost habitat in areas with suitable habitat. No impacts to bats are anticipated from CPP project activities as no potential roost structures or trees will be affected.

2.2A Area of Disturbance—Terrestrial Species

Permanent and temporary surface disturbances were evaluated for the Central Valley habitats that could support special-status species. Table 2 presents the overall, total acreage of permanent and temporary surface disturbance used to evaluate mitigation requirements.

More specific assessment of areas of impacts by habitat types is provided for the gas supply pipeline in Table 3 and for the CPP site and laydown area in Table 4. The total acreage in survey area reflects values in the Final Wetland Delineation report for the project (CH2M HILL, 2003).

TABLE 2.
Total Area in Acres of Temporary and Permanent Surface Disturbance During Construction and Operation of CPP.

Feature	Size of Disturbance	Duration (if temporary)	Habitat Type	Temporary (acres)	Permanent (acres)
Project Site and Detention Basin	Polygon of CPP site and detention basin		Annual Grassland with open water, streams, seasonal marsh, swales, wetlands, and vernal pools	NA	30
Site Construction Laydown	Polygon	32 months	Annual Grassland with seasonal stream and swale, and vernal pools	20	0.62
Site Construction Access Road	0.5 mile x 24' wide permanent, additional 0.5 mile x 25' for construction	12 months	Annual grasslands and wetland swales	1.5	1.5
Gas Pipeline	Polygons for construction corridor over 26 miles (encompasses 26 miles x 35' permanent easement [(26 x 5280 x 35)/ 43560 = 110 acre easement])	22 month	Ruderal, roadside, agricultural, annual grassland, along with jurisdictional wetlands including marsh, seasonal swales, wetlands, vernal pools, ditches, and ponded features. HDD drilling beneath river, creek, and riparian woodland habitats.	212	0
Gas Valving Stations	Two sites 50 x 50, one site 100 x 100		Ruderal, roadside, annual grassland, agricultural		0.34
Gas Pipeline Gas Compressor Stations	Two sites of 150' x 150' contained in existing fenced/ disturbed areas.		Fenced gravel area at existing interconnection		0
230-kV Transmission Line	Corridor 0.4 mile suspended lines, 150' wide temporary construction corridor	8 weeks	Annual grassland with seasonal swales and creek and degraded vernal pools	7.3	
Transmission Tower Footprints	Six towers with 6' in diameter, permanent concrete footings.		Annual grassland		0.004
Water Supply	0.4 mile x 75' temporary construction width.	4 weeks	Annual grassland with seasonal swales and creek and degraded vernal pools	3.7	0
Water Pump Station	(existing)				0
Total				**244.5**	**32.46**

TABLE 3
Summary of Wetland Areas within the Temporary Natural Gas Pipeline Construction Area

Project Feature and Wetland Type	Total Acreage in Survey Area	Temporary Impact Area
Natural Gas Pipeline Alignment Total Survey Area: 679 acres		
Rivers and Creeks (Jurisdictional)	2.907	0.013
Riparian Woodlands (Jurisdictional)	2.542	0
Freshwater Marsh (Jurisdictional)	2.310	0.106
Vernal Pools (Jurisdictional)	0.625	0.029
Seasonal Swales (Jurisdictional)	0.588	0.185
Seasonal Wetland (Jurisdictional)	5.300	0.891
Drainage Ditches (Jurisdictional)	10.687	0.515
Ponded Features (Jurisdictional)	0.023	0.011
Seasonal Swales (Not jurisdictional)	0.213	0.013
Seasonal Wetland (Not jurisdictional)	0.565	0.401
Drainage Ditches (Not jurisdictional)	10.390	3.079
Ponded Features (Not jurisdictional)	0.782	0.457
Ponds (Not jurisdictional)	0.618	0.331
Subtotal Jurisdictional Wetlands	24.982	1.749
Total Non-jurisdictional Wetlands and Non-wetland Features	12.568	4.280

TABLE 4
Summary of Wetland Features for the Cosumnes Power Plant Project: Plant Site and Laydown Area

Project Feature and Wetland Type	Total Acreage in Survey Area	Temporary Impact Area	Permanent Impact Area
Laydown Site Survey Area: 49 Acres			
Vernal Pools (Jurisdictional)	0.375	0	0.055
Seasonal Swales (Jurisdictional)	0.908	0	0.431
Seasonal Stream (Jurisdictional)	0.350	0	0.132
Subtotal Jurisdictional Wetlands	1.633	0	0.618
Plant Site Total Survey Area (from DEC 1999, 2000):310 Acres			
Open Water (Jurisdictional)	0.723	0	0
Perennial Stream (Jurisdictional)	2.429	0.110	0
Placer Tailings (Jurisdictional)	4.832	0	0
Seasonal Marsh (Jurisdictional)	0.751	0.285	0
Seasonal Stream (Jurisdictional)	1.724	0.114	0.135
Seasonal Swales (Jurisdictional)	4.882	0.024	0
Seasonal Wetland (Jurisdictional)	4.197	0.255	0.900
Vernal Pools (Jurisdictional)	0.925	0.033	0.027
Subtotal Jurisdictional Wetlands	20.463	0.711	1.062

This page left blank

3.0A Cumulative Effects-Terrestrial Species

Some impacts associated with the CPP, which when considered in conjunction with impacts attributable to other projects (either in the vicinity or with similar characteristics), could have the potential to result in collectively adverse effects to the environment that are of greater significance than the individual impacts of the CPP project.

For purposes of this Biological Assessment, cumulative effects we use the definition at 50 CFR 402.02. That is, "…those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur in the action area of the Federal action subject to consultation."

3.1A Projects Considered as part of Cumulative Effects

Non-Federal projects identified in the vicinity of the proposed action include:

- An application for biosolids storage on 3 parcels on the north side of Twin Cities Road (06/11/97), adjacent to and east of Clay Station Road. Mr. Gary Silva stores and applies biosolids to cattle pastures in this area.

Non-Federal projects identified in the vicinity of the proposed pipeline action include:

- An application to create two lots on the Buzdas property (9/25/00).
- An application to create a residential accessory dwelling (8/30/00).
- An application to create a residential accessory dwelling (Leonard no date).
- An application for Lakepoint Apartments –pending (no date)
- An application to rezone Park to "O" (1/27/99).
- An application from JDS Laguna Sub. Extension of Time (9/21/01).
- An application for RV and Boat storage use permit (12/31/97).
- An application for Harris ranch #1 – now City of Elk Grove recorded 4/4/2000.
- Improvement plans for Franklin Boulevard- Poppy Ridge to Elk Grove Boulevard, including Future Laguna Estates, Elk Grove Greens, Jungkeit Dairy, and Franklin Meadows – filed with City of Elk Grove June 2002

3.2A Cumulative Effects of All Projects

With the exception of the biosolids storage, all these projects cover a small area (one lot to 10 acres) and would not cause loss of habitat for any animals at the project site or pipeline.

Biosolids applications north of Twin Cities Road would not cause any change in land use or habitat.

The CPP project is not anticipated to result in significant impacts related to biological resources. However, the CPP project would convert annual grassland habitat on the site to industrial development. This is the general trend in the Central Valley, and it incrementally reduces the value of habitat available to native wildlife species including migratory bird species.

The CPP project would also temporarily disturb habitat associated with construction of the linear CPP project components. This disturbance would result in the temporary reduction of habitat quality. Temporary activities could result in incidental death of wildlife and the disruption or failure of breeding efforts. Construction limits, environmental awareness training, biological monitoring, habitat compensation, and habitat restoration would mitigate temporary disturbances.

The project has the potential to increase slightly the risk for bird collisions with new electric transmission lines and towers in the Sacramento County portion of the Central Valley.

4.0A Direct and Indirect Effects of the Proposed Action-Terrestrial Species

Impacts to the species under discussion can be short-term (one or two reproductive seasons), or long-term (affecting several generations). They can be direct (an immediate affect to an individual, population or its habitat), or indirect (an affect that may occur over time or result from other actions).

4.1A Effects to Federal Listed Species

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

Construction of the project site would permanently fill habitat or potential habitat for fairy shrimp and vernal pool tadpole shrimp. Primary constituent elements (PCEs) affected would be 1) vernal pools or ephemeral wetlands of appropriate size and depth and 2) the geographic, topographic and edaphic features that support vernal pool complexes. The project would directly and permanently fill vernal pools and seasonal wetlands that support fairy shrimp as listed in Table 5.

TABLE 5.
Acreage of Potential Fairy Shrimp Habitat Types Directly and Indirectly affected by the Cosumnes Power Plant Project. And Summary of Areas Within Critical Habitat Units.

Habitat Type	Direct (Acres)	Direct within Critical Habitat (Acres)	Indirect (Acres)	Indirect within Critical Habitat (Acres)
Vernal Pool	0.138	0.109	2.101	0.526
Created Vernal Pool	0	0	1.253	0
Swale	0.819	0.533	0.835	0.004
Seasonal Stream / Pool	0.033	0.033	0	0
Degraded Seasonal Wetland	0	0	1.805	1.805
Seasonal Wetlands	1.242	0.747	0.748	0.013
Drainage Ditches	0.076	0.076	0	0
Ponded Features	0.659	0.498	0.135	0.054
Total for all habitat types	**2.967**	**1.996**	**6.877**	**2.402**

Details supporting this table are provided under separate cover: ***Vernal Pool Invertebrate Habitat Assessment for the Cosumnes Power Plant and Associated Linear Features. Technical Memorandum from Russ Huddleston to EJ Koford, CH2M HILL. January 17, 2003..***

Indirect impacts to fairy shrimp habitat, defined according to the USFWS (1997) as changes in hydrology within 250 feet of project construction (including project site, laydown area, water supply line, transmission towers, stormwater detention basin and access road), total 2.31 acres. (See Appendix B for a more complete discussion of how indirect impacts are quantified).

Pipeline construction would temporarily directly disturb 1.66 acres of vernal pools, degraded vernal pools, constructed vernal pools, railroad and roadside pools and non-jurisdictional pools that would be habitat for fairy shrimp. Trenching through vernal pools and similar fairy shrimp habitat would be a direct adverse affect on the fairy shrimp species. Indirect impacts to fairy shrimp habitat from pipeline construction, defined according to the USFWS (1997) as changes in hydrology within 250 feet of project construction are estimated at 4.57 acres. With additional field verifications, this area may be adjusted down slightly, but is the best current estimate.

The project site and pipeline were designed to avoid, to the extent feasible potential habitat for fairy shrimp and the relatively low area indicated here shows that the applicant was relatively successful at doing so. Previous studies for the SMUD Cogeneration Pipeline Project indicated that after gas pipeline construction, both vernal pool fairy shrimp and vernal pool tadpole shrimp had re-established themselves in 90 percent of pools in the right-of-way (Correspondence from SMUD to Wayne White May 30, 1997; ENV 97-168). Based on this information, it is reasonable to expect that most of the fairy shrimp habitat temporarily disturbed by construction will re-establish after construction. SMUD will compensate through preservation, restoration and construction for residual impacts as described in Section 5.0A below. The proposed action is likely to affect, but would not adversely affect continued existence of vernal pool fairy shrimp and vernal pool tadpole shrimp.

Valley Elderberry Longhorn Beetle

There are no elderberry bushes on or near the project site. There are ten elderberry bushes along the pipeline construction corridor exclusive of any that occur within the Cosumnes River riparian corridor. Elderberry shrubs along the corridor would be flagged and avoided to prevent any adverse impact to valley elderberry longhorn beetles, if they occur there. The Cosumnes River riparian corridor will be avoided by using HDD methods. Therefore any elderberry shrubs that occur in the Cosumnes River riparian zone would be avoided unless there is an HDD “frac-out.” In the event of a “frac-out” the contingency plan included in Appendix C would be implemented to minimize and remediate for any adverse impact. Without the elderberry shrubs present in the project area, and by avoiding elderberry shrubs along the pipeline construction corridor, the beetle would not be directly or indirectly affected.

Giant Garter Snake

The USFWS November 13, 1997, *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Project with Relatively Small Effects on the Giant Garter Snake* identifies three levels of impacts, or effects to snake habitat based upon the amount, nature, and duration of potential effects. Level 1 effects are temporary, restored within the same construction season as occurrence, and do not exceed 20 acres. Level 2 effects are temporary, affect less than 20 acres, and are restored within 2 snake construction seasons. Level 3 effects result from the permanent or significant loss (at least 3 years to restore) of less than 3 acres of habitat. If any of the criteria for a given effect level are exceeded, then the effects may be considered equivalent to the next highest level. For the current project, all pipeline construction is considered to be a temporary impact, that would last for duration of 1 to 16 weeks before filling the trench and restoring topography and vegetation. Once in place, the pipeline would be below ground and have no surface effect.

The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period (i.e., early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters (USFWS 1997). The USFWS defines a disturbance areas for giant garter snake that may exceed project boundaries because a 200-foot radius (61 meters) from the edge of giant garter snake aquatic habitat is incorporated to include essential habitat components and determine potential take. Disturbance may be temporary and/or permanent and should consider: (1) opportunities to avoid habitat within the project area; (2) area of dewatering and period of time dewatered; and (3) temporary haul roads and equipment staging areas. The 200-foot buffer (61 meters) is also used to evaluate aquatic habitat disturbance during temporary alterations, i.e. upstream and downstream from berms placed for temporary dewatering.

USFWS defines temporary impacts as project activities which temporarily remove essential habitat components, but can be restored to preproject conditions of equal or greater habitat values. Projects, which are to be considered temporary impacts, must be able to implement the project and restore the affected habitat within two seasons (a season is May 1 to October 1).

There are no recorded records or suitable habitat for the giant garter snake on or near the project site (Clay east road and Rancho Seco) and therefore no adverse effects are expected from this portion of the project. The CNDDB records GGS localities near Arno Road and Badger Creek (about 1.5 mile north of the pipeline), just south of Arno Road near 99 (1500 feet south of pipeline), west of Southern Pacific in Badger Creek/Horseshoe lake (800 feet SW of pipeline), and Franklin Blvd about 1 mile north of Core Rd (900 feet west of pipeline).

According to the USFWS any irrigation ditch or canal that contained water between May and November in this area was to be considered aquatic habitat. The USFWS based its determination that suitable snake habitat west of the Folsom South Canal may be inhabited by snakes upon: (1) knowledge of the species' range and distribution; (2) presence of habitat within the proposed project's action area; (3) the movement capabilities of the snake; and (4) known snake locality records. Any areas within 200 feet of the aquatic feature that were not covered by paved roads, row crops, vineyards, urban development or entirely void of vegetation were to be considered upland foraging habitat for giant garter snake. Based on the habitat mapping and field surveys, a 200 foot buffer was drawn on either side of the pipeline construction corridor (65 feet wide), and any potential GGS habitat that comprised adequate water and vegetation was mapped using orthogonal photography and measured using GIS. The result was a combined area of 41 acres of disturbance area, of which 0.6 acres is aquatic and 40.3 upland habitat. There would be no permanent impacts to GGS habitat.

Trenching for the gas pipeline in the vicinity of the Cosumnes and Badger Creeks could potentially disturb or injure giant garter snakes during construction. Implementation of avoidance and mitigation measures specified in Section 5.1A and 5.8A would reduce those impacts. Impacts would result only during construction and would be temporary. The

proposed action is likely to adversely affect giant garter snakes. Mitigation measures would reduce those impacts such that the giant garter snake would not be adversely affected.

Bald Eagle

Bald eagles may occasionally forage in the project area, and are known winter migrants in the area. There are no records of nests 1 mile of the project or pipeline. Bald eagles could be injured or killed by collision with transmission lines or HRSG towers of the project. Designing transmission lines to APLIC standards for "raptor-proofing" would reduce impacts. The proposed action would not adversely affect bald eagles.

4.2A Federal Candidate and Special Concern Terrestrial Species

Legenere

Legenere is not known from the project site or vicinity. A large population is known from a vernal pool complex north of Arno Road, east of Highway 99. The construction corridor was revised during scoping to be on the south side of Arno road specifically to avoid this sensitive area. With the construction corridor on the south side of Arno road, the proposed action would cause no adverse impacts to legenere.

California Linderiella

California Linderiella is not known to occur on the project site, but is likely to occur in the vicinity and in any fresh water habitats (vernal pools, seasonal swales, railroad ditches) suitable to support fairy shrimp. As noted above, the project site and pipeline corridor have been selected to minimize potential impacts to these aquatic species and the construction corridor was revised during scoping to be on the south side of Arno road specifically to avoid sensitive area for this and other vernal pool species. With the mitigation and compensation measures specified in Section 5.0A for vernal pool fairy shrimp and vernal pool tadpole shrimp, the proposed action would affect, but would not adversely affect California linderiella.

Western Pond Turtle

Western pond turtle occur in the perennial portion of Clay Creek north of the project site, and seasonally move into other ponds and water in the area. Western pond turtle also occur in and near the fish ponds along Arno Road, in the Cosumnes River, Badger Creek and Laguna Creek along the pipeline. Construction in or close to these waterways would potentially crush or kill western pond turtles. Except for egg laying, turtles tend to remain in perennial water. Construction near water is proposed to occur during the dry season to avoid potential adverse impacts to water quality and animals that depend on water quality, including turtles. The careful siting of the project site and pipeline avoiding most aquatic features, the use of HDD to cross under the Cosumnes River and Badger Creek, environmental awareness training and monitoring would reduce impacts to western pond turtles. The proposed project may affect, but is unlikely to adversely affect western pond turtle.

Western burrowing owl

Habitat on the project site and along the pipeline corridor appears suitable to support foraging uses by western burrowing owl. Surveys during 2002 did not detect any nests on the project site. One pair of owls was observed near the pipeline construction corridor at Sims Road, in the Sacramento Regional Wastewater Plant Bufferlands.

Tricolored Blackbird

Tricolored blackbirds are known to forage on the project site south of Rancho Seco, although the nesting location appears to be somewhere over the hills south of the project. There are no known nesting sites on the project site or in 0.2 miles of the proposed pipeline. The proposed project would reduce incrementally the available foraging habitat for this species of concern. Through consultations with CDFG and field surveys, the project will avoid modifying any tricolor blackbird nesting habitat. The proposed project would affect, but is not likely to adversely affect tricolored blackbird.

This page left blank

5.0A Mitigation and Protection Measures

Impacts to special-status plants and wildlife from construction and operation of the CPP project include direct but temporary habitat disturbance, permanent habitat loss, and potential nest disturbance. Mitigation measures were developed through informal consultation with the USFWS, CDFG, and USACE. The following sections present protection measures found to be effective in avoiding and minimizing impacts to special-status species, construction timing restrictions, and habitat compensation for permanent loss of habitats.

A summary of the mitigation measures for the CPP project is presented in Table 6. Additional detailed mitigation measures are presented in the following sections for each special-status species affected by the CPP project.

TABLE 6.
Summary of Mitigation Measures for Impacts to Sensitive Biological Resources In the CPP Project Area.

Biological Resource	Mitigation Measures
Habitats	**Minimize impacts through:**
Annual grassland	Habitat restoration:
Crop land	Long-term monitoring
Wetlands	Recontour topography of potential fairy shrimp habitats.
Plants	**Avoid and minimize impacts through** :
California hibiscus	Proper siting Salvage and transplant if in construction zone
Wildlife	**Protection and Mitigation Measures:**
Tadpole shrimp, fairy shrimp	Worker Environmental Awareness Training
Valley elderberry longhorn beetle	Avoid habitat where practical
Tiger salamander	Off-site habitat compensation for temporary and permanent impact
Giant garter snake	Preconstruction surveys, fencing and avoidance
Swainson's hawk	Construct during dry season, HDD and stormwater BMPs
Sandhill crane	Preconstruction surveys, silt fencing, seasonal constraints
Burrowing owl	
Western Pond turtle	Pre-construction consultation with CDFG, survey and monitor if < 0.5 mile
Nesting and migratory birds	Construct HDD under waterways from July through September Nest avoidance and tree removal from October to February Constrain construction schedule appropriately Salvage and relocate individual wildlife Slope trenches to allow wildlife to escape

5.1A General Protection and Mitigation Measures of the CPP Project for Terrestrial Species

Many of the potential impacts to biological resources would be avoided through implementation of general conditions that guide good work practices. The following

measures would be implemented for all project impact areas. These measures would help to avoid and minimize incidental mortality and injury to plants and wildlife. The CPP project would:

1. Prepare a Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP) that outlines how the protection and mitigation measures will be implemented. The BRMIMP is a document required by the CEC that also describes the responsibilities of the Compliance Manager who oversees all compliance measures required for the project, the Designated Biologist who will oversee compliance with biological mitigation measures, and the Biological Monitor who oversees construction activities on the ground. The Designated Biologist submits daily logs and monthly compliance reports to the CEC. Any necessary monitoring reports are submitted to the CEC and relevant agencies.

2. Provide worker environmental awareness training for all construction personnel that identifies sensitive biological resources that may occur in construction areas and that addresses measures required to minimize project impacts during construction and operation.

3. Implement preconstruction surveys and resource relocation, if necessary, for sensitive species in impact areas prior to beginning ground disturbing activities. Biological monitors would be present onsite during all construction activities in sensitive habitat to identify sensitive resources and provide relocation as necessary.

4. Avoid and minimize impacts to sensitive habitats and species during construction by designating exclusion zones with fencing and/or signage that restricts disturbance to minimal area.

5. Provide mitigation construction monitoring by qualified biologists during construction activities near sensitive habitats and resources and prohibit ground disturbance until area is cleared by the biological monitor.

6. Require that construction activities be limited to existing roads, access points, and construction zones developed in coordination with qualified biologists as specified in final approved construction plans and documents. Prohibit ground disturbance until cleared by the biological monitor. Where possible along linear pipeline alignments, use the alignment itself as the access route. Prohibit access to construction zones from off-road routes. Prohibit off-road traffic outside designated project areas.

7. Allow only permitted, authorized vehicles that have been inspected to ensure fire safety requirements on the construction sites; equip vehicles with catalytic converters with shielding or other acceptable fire prevention features.

8. Prohibit camping, firearms, trash-burning fires, warming fires, or pets in the construction zone at any time.

9. Monitor construction sites daily to pick up trash and litter. Place all food-related trash and litter in closed containers and dispose of daily.

10. Prohibit refueling or storage of hazardous materials within 200 feet of flagged sensitive plant species or sensitive wildlife habitat features (den, burrows, etc.), and within 100

feet of "waters of the U.S." or waters of the state. For portable equipment that use fuels or lubricants, use Visqueen or other containment material under the equipment to capture leaks or spills.

11. Prohibit intentional killing or collection of either plants or wildlife at construction sites.

12. Prepare construction monitoring and compliance reports that analyze the effectiveness of the mitigation measures.

13. Open trench work requires special attention in sensitive wildlife areas. A qualified biologist would be present during construction activities in suitable sensitive species habitat areas for the purpose of clearing, removing, salvaging, or excluding additional individuals from the construction area. To minimize mortality in pipeline trenches, egress ramps will be constructed at either end of the open trench to allow wildlife escape routes. Where feasible, open trenches would be covered at the end of each construction day; where this is not feasible because extensive or wide open trenches are exposed, open trenches would be surveyed prior to the start of construction each morning by qualified biologists for the purpose of capturing and removing any trapped wildlife.

5.2A Timing Restrictions During Construction

The following timing restrictions and acceptable work windows for construction in sensitive areas (see Table 7) were developed by the natural resource agencies to avoid and minimize impacts to special-status species. Note that some areas of the project will be required to postpone activities until the appropriate times. In addition, there could be small work windows where 2 or more species have overlapping windows.

TABLE 7.
Established Work Windows for Special-Status Species in the CPP Project Area.

Species name	Possible Location (mile post)	Active Period	Preferred Biological Construction Window
Vernal pool crustaceans	At CPP site and along gas pipeline	November to April	May through October
Valley elderberry longhorn beetle	Along UPRR and Cosumnes River	Spring to Fall	January through December
California tiger salamander	Farm ponds in south county area that persist for more than 12 weeks.	April to October	November through March in known locations
Giant garter snake	Cosumnes River and Preserve, Badger and Laguna Creeks	May to October	May 1 through October 1
Western pond turtle	UPRR and Franklin Rd crossing	April to October	November to March
Swainson's hawk	Areas with nest trees and Cosumnes Preserve	March 1 to August 15	August to February near active nest sites
Burrowing owl	Any potential nest burrows	March to August	September to February near active nest sites

5.3A Habitat Compensation

Habitat compensation may be required for the following species:

- Vernal pool fairy shrimp and tadpole shrimp
- Giant garter snake
- Swainson's hawk

Based on an evaluation of the opportunities and constraints of mitigation, SMUD proposes to implement one or more of the following measures to compensate for permanent loss of wetlands and habitat for special-status species from construction of the CPP facility. Final habitat compensation requirements will be determined through formal consultations with USFWS and CDFG with oversight from CEC.

- Acquire, preserve, create and restore, in perpetuity, vernal pool habitat according to the area shown in Table 9, for special-status species if determined necessary through formal consultation with USFWS, and CDFG.
- Provide an endowment fund for the third-party costs of management and monitoring of the preserved habitats in perpetuity.
- Provide the title to preserved lands to the Sacramento Trust for Open Lands, or similar third-party organization to hold and manage the trust and endowment fund in perpetuity.
- Provide funding to the USFWS Species Account equivalent to the affected giant garter snake habitat or purchase credits in an approved GGS mitigation bank or acquire and manage a GGS mitigation area upon approval of USFWS.
- Provide equivalent of 30 acres of habitat for Swainsons' hawk foraging congruent with areas managed for vernal pools, and subject to the Sacramento Trust for Open Lands or equivalent third-party organization as described above.

5.4A Mitigation for Impacts to Waters of the U.S.

Construction in the bed or banks of any stream or riparian habitat would potentially cause increases in erosion, contamination, hydrologic changes, or vegetation removal that would reduce the ecological and functional values of the stream or wash. In addition to the general mitigation measures to protect biological resources, the following specific measures would be taken to minimize impacts to "waters of the U.S." and/or state waters.

For any location where project construction would fill jurisdictional waters, or occur in the "bed and banks" of streams, the applicant would obtain and comply with the applicable conditions of permits issued from the USACE (Section 404, Clean Water Act) and the CDFG (Streambed Alteration Agreement, Section 1601 as applicable). The terms and conditions of these permits may require payment of in-lieu fees to be used towards the purchase or restoration of "waters of the U.S.," including wetlands, in the regional vicinity of the CPP project. The final mitigation requirements for impacts to jurisdictional waters would be determined through continuing consultation with USACE, USFWS, and CDFG.

Implementation of the conditions associated with these permits would be sufficient to protect the biological resources or mitigate for loss of biological resources at these locations. The application provided to the USACE would provide sufficient analysis of alternatives to identify the least environmentally damaging practicable alternative, as specified under Section 404(b)(1) guidelines.

5.5A Mitigation for Vernal Pool Plants and Invertebrates

The grassy plateau east of Rancho Seco supports many vernal pools in a nearly natural state. Between the project site and Rancho Seco, there is a complex of degraded swales that have some vernal pool characteristics that are crossed by existing power lines and underground pipelines, and may support vernal pool fauna. New transmission lines and water supply lines for the CPP project would also cross through this area. This particular complex of vernal pools is at a lower elevation than those east of the reservoir, and appear to support sparse vegetation and turbid water indicating a degraded condition.

The swale north of CPP site contains vernal pool tadpole shrimp that could be directly affected. Because the species is readily transferred among pools in close proximity, any vernal pools and 250-foot buffer areas around the pools in the project vicinity are considered by the USFWS as potential habitat.

The gas pipeline alignment crosses many railroad-berm ponded areas in the vicinity of Franklin Boulevard, Twin Cities Road, and elsewhere that have hydrology similar to vernal pools, and vernal pool plants and invertebrates may be present. The gas pipeline was realigned to avoid a large vernal pool complex in the Cosumnes Preserve at Arno Road.

For guidance on appropriate and consistent mitigation, the USFWS has a programmatic opinion (1-1-96-F-1) for projects in conjunction with 404 permits. The general guidance of that document addresses direct and indirect impacts to fairy shrimp habitat. This project is not expected to be appended to the programmatic opinion, but the guidance is useful for determining potential mitigation consistent with other projects.

USFWS guidance (USFWS 1996) directs the mitigation ratios shown in Table 8:

TABLE 8.
USFWS Mitigation Ratios for Fairy Shrimp

	Bank	Non-bank
Preservation (for direct or indirect impacts)	2:1	3:1
Creation (for direct impacts only)	1:1	2:1

The guidance indicates mitigation ratios for non-bank mitigation may be adjusted to approach those for banks if the [USFWS] considers the conservation value of the non-bank mitigation area to approach that of [USFWS]-approved mitigation banks.

The USFWS guidance of 1996 did not address temporary impacts, potentially because at the time there were no data on recovery of temporarily disturbed vernal pools. In 1997, SMUD

submitted monitoring data on the Cogeneration Natural Gas Pipeline and Procter and Gamble Cogeneration Projects that showed 91% recovery of fairy shrimp after pipeline construction. Based in part on those data, and a confirmation of the actual disturbance during construction, the USFWS issued an amendment to the Formal Section 7 consultation reducing the mitigation from an approximately 200-acre mitigation bank on Rancho Seco, to a 9.65-acre site. The mitigation site and a buffer around the site were set aside by recording a conservation easement on the mitigation site and buffer. The mitigation site supports a population of Sacramento Orcutt grass, as well as listed crustaceans. Based on the evidence that >90% of pools recover from temporary disturbance from pipeline construction, we believe a lower preservation ratio for temporary impacts is appropriate. The referenced pipeline was 25 miles long with approximately 26 miles of lateral lines, and was compensated with 9.65 acres of preserved habitat. Therefore, SMUD requests the ability to conduct post construction surveys and discuss those results with the USFWS toward reducing mitigation requirements should SMUD achieve similar recovery levels.

With respect to vernal pool mitigation, there is a particular opportunity in this project to benefit and enhance regional resources for fairy shrimp and other vernal pool organisms. As described previously, there are 3 degraded seasonal wetlands (DSW 1, 2, and 3) located approximately 0.2 mile north of the project site near Rancho Seco Plant. These pools would not be directly affected by any project construction. These pools were evidently excavated during construction of Rancho Seco, and were used to recapture concrete washwater. When active the pools were lined with plastic, and the washwater may have contained TSP, EDTA, or mild acid. Tadpole shrimp have been observed in DSW 2, but vegetation is depauperate and there are scraps of plastic and trash that degrade the quality of this habitat. SMUD proposes that restoration of these pools, totaling 1.80 acres should be a component of wetland mitigation for this project.

Based on wetland surveys, aerial photograph review, and a concerted effort to avoid through siting and alternative construction, SMUD has quantified the area of potential impact (see Table 9) and recommends the following mitigation measures:

1. Design the project and pipeline corridor to avoid to the extent practical all vernal pools, man-made ditches and railroad ditches that could potentially support vernal pool invertebrates.

2. In the vicinity of vernal pools, minimize construction corridor width to avoid to the extent practical disturbing vernal pools.

3. Conduct preconstruction habitat assessments within the project construction zones to identify and quantify areas where vernal pool species could occur.

4. Identify and report observations of vernal pool invertebrates during the course of surveys for other species.

5. Implement stormwater pollution prevention plan to reduce the potential for contaminants to enter waters or depressions where vernal pool invertebrates may occur.

6. After construction, restore the surface topography to pre-construction shape. This method has been shown to be effective in restoring at least 90% of vernal pool invertebrate habitat.

TABLE 9.
Proposed Mitigation Area For Potential Impact to Fairy Shrimp

Location	Affected Area (acre)	Permanent, Direct or Indirect	"Bank" Compensation Ratio #:# Preservation (P) #.# Creation (C)	"Non Bank" Ratio #:# Preservation (P) #.# Creation (C)	Total "Bank" Compensation Area (Acres)	Total "Non Bank" Compensation Area (Acres)
Project Site, transmission line, water line, access road and laydown area.	1.310	Direct, Permanent	2:1 P 1:1 C	3:1 P 2:1 C	2.6 P 1.3 C	3.9 P 2.6 C
Project Site, transmission line, water line, access road and laydown area.	2.306	Indirect	2:1 P	3:1	4.6 P	6.9 P
Pipeline Direct	1.657	Direct	2:1 P 1:1 C	. 3:1 P 2:1 C	3.3 P 1.7 C	4.9 P 3.3 C
Pipeline Indirect	4.571	Indirect	2:1 P	3:1 P	9.1 P	13.7 P
Total Impact Area					**19.7 P 3.0 C**	**29.5 P 5.9 C**

Proposed Mitigation for Potential Impact to Fairy Shrimp, presuming Non-Bank Ratios.

	Preservation Acres	Creation Acres
Restore Degraded Swales South of Rancho Seco	NA	1.8
Rancho Seco Mitigation Area	10.6	4.1
Off-site Credits (Wildlands or Equivalent)	18.9	0
Total Compensation	29.5	5.9

7. In order to compensate for impacts of the proposed project on vernal pool species, SMUD proposes to provide mitigation by one or a combination of the following methods:

   a) Purchase off-site mitigation credits in a USFWS-approved mitigation bank. Calculating from the anticipated impacts provided in Table 9 above, SMUD will purchase 19.7 preservation acre credits and 3.0 creation acre credits at an approved mitigation bank. The number of acres required to be purchased is based upon mitigation bank ratios of 2 preserved acres to 1 disturbed acre (2:1) plus 1 created acre to 1 disturbed acre (1:1) for direct impacts and 2 preserved acres to 1 disturbed acre (2:1) for indirect impacts (See Appendix B).

   b) Protect and manage in perpetuity with a conservation easement and perpetual endowment vernal pool habitat at SMUD's conservation area known as Rancho Seco Mitigation Area, nearby SMUD owned property and the restoration area north of the proposed project site ("SMUD Owned Mitigation Areas"). To the extent insufficient acreage is available at the SMUD Owned Mitigation Areas, SMUD will supplement SMUD owned property with the purchase off-site mitigation credits in a USFWS-approved mitigation area or mitigation bank. Given the proposed project impacts provided in Table 9 above and discussions with the Service regarding the available acreage in the SMUD Owned Mitigation Areas, SMUD will provide mitigation as follows.

      1. SMUD will provide approximately 10.6 preserved acres within nearby SMUD owned property. (Mitigation provided at non-bank ratio of 3:1, preservation acres for each impacted acre.)

      2. SMUD will provide 4.1 restored acres within the Rancho Seco Mitigation Area and 1.8 restored acres north of the proposed project site. (Mitigation provided at non-bank ratio of 2:1, creation / restoration acres for each directly impacted acre.)

      3. SMUD will purchase 18.9 non-bank preservation acre credits off-site at a service approved location or SMUD will purchase 12.6 preservation acre credits at a service approved mitigation bank.

      SMUD will perform restoration, initial monitoring and development of the management plan for SMUD Owned Mitigation Areas in accordance with the Biological Opinion and the Service approved plans for the initial five year period. Once these phases are complete, SMUD will record a conservation easement over all non-bank areas. At that time SMUD believes that the Sacramento Valley Open Space Conservancy would be willing to accept and hold a conservation easement over these lands.

5.6A California Tiger Salamander

Surveys for California tiger salamander on the project site and along the gas pipeline construction corridor detected no tiger salamanders, and an abundance of bullfrogs, crayfish, bass and other salamander predators. Although there are known records of salamanders in ponds east of Rancho Seco (approximately 1 mile east of the project site), it appears that their presence on the site and along the pipeline is unlikely. Measures already noted above to avoid and minimize impacts to aquatic habitats will have additional benefits for any tiger salamanders that may be in the project area.

5.7A Protection for Western Pond Turtle

Appropriate breeding habitat for western pond turtle is present along the waterways of Clay Creek, Laguna Creek, Badger Creek and the Cosumnes River. Underground burrows on the gas pipeline alignment could provide upland aestivation and shelter habitat and possible nesting habitat for turtles. The USFWS, CDFG, and the CEC were consulted for appropriate measures that would minimize impacts to listed species. Protection measures were developed for CPP to prevent sediments and construction debris from entering waterways as described in the erosion control and restoration plan. The mitigation and protection measures proposed for the project to avoid impacts to special-status salamanders and turtles include:

1. Conduct preconstruction habitat assessments within the project construction zones to locate areas where turtles could occur.
2. Find and relocate individual animals prior to ground disturbance activities
3. Set up construction zone limits at the creek banks, using silt fencing to restrict access by salamanders and turtles into construction areas.
4. Relocate any turtle, or other wildlife to safe areas outside the construction zone limits
5. Provide a qualified Biological Monitor during construction within potential western pond turtle habitats
6. Monitor stormwater discharge from the site for water quality parameters identified in the NPDES permit that protect beneficial uses

5.8A Protection Measures for Giant Garter Snake

Appropriate aquatic habitat for giant garter snake (GGS) comprises dense cattail or bulrush cover, with downed woody debris and partial shading to provide thermal cover. Wetland habitats on the project site do not have permanent water and dense cover that would support fish or highly aquatic species such as the giant garter snake; however, it is recorded from Badger Creek, near the Cosumnes River confluence and from a drainage canal near Franklin and Eschinger Roads, and could occur in connected waterways that support appropriate habitat. The gas pipeline crosses or passes close to wetland and marsh habitats ranging from completely aquatic sites (Cosumnes River, Badger Creek, Laguna Creek), cattail and bulrush marsh (Cosumnes River), farm ponds (Arno Road, Valensin Road), roadside ditches and

swales (near town of Franklin), and vernal pools. Most of these lack the hydrology or vegetation to support GGS.

Giant garter snakes are actively foraging in warm months from May 1 through October 1 and typically hibernate in underground burrows (hibernacula) from October through April and are highly susceptible to earth moving equipment during this time. Impacts to giant garter snakes can occur from the excavation of streams and/or irrigation canals and hibernacula during hibernation periods.

The USFWS has a Programmatic Agreement for impacts to GGS that defines impacts as level 1, 2 or 3, based on whether there are permanent impacts, and the area of temporary impacts. Mitigation measures proposed here are consistent with those allowed under the programmatic agreement (1997).

Level 1 project impacts result in minimal environmental effects, such as repair, rehabilitation, or replacement of previously authorized structures, survey activities, temporary recreational structures, utility lines installation by boring underneath irrigation canals or creek channels, and temporary cofferdams. Level 1 projects include those routinely authorized under Nationwide Permit number 12 (Installation of Utility Lines), and 33 (temporary construction, access and dewatering). The work must not result in any permanent loss of habitat and the temporary disturbance area would not exceed 20 acres of habitat (including both uplands and aquatic habitat). Level 2 and 3 are for projects that last more than one season and projects with varying levels of permanent impacts. CPP would affect approximately 41 acres of habitat, including 40.3 acres of potential upland habitat but would have no permanent impacts, nor last more than one season. Therefore the impacts are most similar to a Level 1 project.
CPP would implement the following mitigation for the CPP project, as described in the programmatic consultation:

- Restore temporary impacts areas to giant garter snake habitat
- Monitor for one year post-construction with photo documentation report due one year from the restoration implementation showing pre- and post-project area photos

In addition, in areas identified as potential GGS habitat (defined as within 200 feet of suitable aquatic habitat, and shown on project maps) CPP will require that the following terms and conditions shall be applied:

1) Vehicles will be confined to existing roads, approved access roads, or the ROW, and will not travel in excess of 20 miles per hour on approved access roads or the ROW.

2) Refueling and hazardous materials storage will be restricted to areas at least 100 feet from wetlands, streams, or drainages. When Avoidance of 100 feet is not possible, refueling and hazardous materials storage will be limited to designated areas that are protected with berms lined with non-porous material to ensure that accidental spills will not contaminated the water body. All hazardous spills will be cleaned up immediately and disposed of properly.

3) Construction areas and ROWs will be flagged in order to clearly delineate the boundaries of construction activities. All construction activities will occur within the boundaries of the construction areas and ROWs.

4) All construction personnel will receive environmental awareness training from a Service-approved biologist prior to commencing construction activities. In addition to the topics discussed in the Plan, the training will instruct workers to recognize the snake and its habitat(s), provide procedures for observations of live and dead snakes in the project area, and describe the terms and conditions of this biological opinion. Any construction personnel who do not attend the initial worker environmental awareness training will be provided worker environmental awareness training prior to entering project work sites and/or participating in project activities. Additional worker environmental awareness training will be provided as needed as outlined in the Plan. Proof of environmental awareness training will be submitted in writing to the USFWS, Endangered Species Division.

5) A Service-approved biologist will survey open trenches each morning prior to commencing construction activities.

6) Twenty-four hours prior to construction activities, the construction area will be surveyed for snakes by a Service-approved biologist. If a lapse in construction activity of two weeks or greater occurs, surveys of the project area will be repeated.

7) A Service-approved biologist will be on-site during construction activities in potential snake habitat to perform supplemental surveys prior to construction and to monitor compliance with the biological opinion. If a snake is encountered during construction, activities will cease immediately until the Service-approved monitoring biologist has determined that appropriate corrective measures have been completed or has determined that the snake will note be harmed. If a snake becomes trapped inside any exclusion fence, it will be moved by a Service-approved biologist to the nearest available suitable habitat (< 300 feet). Any sightings, incidental take, or handling of snakes shall be reported to the USFWS within twenty-four hours by telephone to (916) 414-6600.

8) A monitoring report shall be prepared for each snake survey conducted and will be delivered to the Chief of the Endangered Species Division, Sacramento Fish and Wildlife Office, 2800 Cottage way, Room W-2605, Sacramento, California 95825-1846.

9) Construction activities in snake habitat will be conducted between May 1 and October 1.

10) At the conclusions of each day's trenching activity, the end of the trench will be ramped at an approximate two to one slope to allow any snakes that fall into the trench to escape. Trench backfilling will occur within 72 hours of pipeline installation to minimize the potential for snakes to fall into the trench. Immediately following trench backfilling, clean-up activities will be initiated.

11) Vegetation will be cut at ground level whenever possible, leaving existing root systems intact. Vegetative debris will be removed from wetlands and waterways for disposal, unless otherwise requesting in writing by property owners or habitat managers.

12) No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes will be placed on the project site when working in 200 feet of snake aquatic or rice habitat. Possible substitutes include coconut coir matting, tackified hydroseeding compounds, or other materials approved by the Service.

13) During construction, all surface debris will be carefully removed to avoid contact with or disturbance of snakes. Construction material and debris will be managed to avoid providing cover for the snake.

14) All construction debris and stockpiled materials will be removed at the conclusion of construction.

15) A post-construction monitoring report prepared by the monitoring biologists will be forwarded to the USFWS within 60 calendar days of the completion of construction activity or within 60 days of any break in construction activity lasting more than 60 days. This report will detail: (1) dates that construction occurred; (2) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (3) an explanation of failure to meet such measures, if any; (4) known project effects on federally listed species, if any; (5) occurrences of incidental take of federally listed species, if any; and (6) other pertinent information.

16) Non-agricultural lands in the project area will be replanted. Plantings will consist of wetland emergents, (b) low-growing cover on or adjacent to banks, and (c) upland plantings / seed mix to encourage use by other wildlife and to discourage invasion by noxious weeds. To the extent feasible, cuttings, plantings, plugs, or seeds from local sources will be obtained. This will first consist of stockpiling, then replacing the topsoil from the existing banks, which will contain rhizomes and seeds of the existing fresh emergent wetlands habitat. This will be supplemented on an as-needed basis. The goal will be to restore conditions similar to that of adjacent habitats.

17) Emergent wetland plants used for habitat restoration will, at a minimum, consist of California bulrush (*Scirpus californicus*), and cattail (*Typha latifolia*).

18) Cover species on or adjacent to the bank may include California blackberry(*Rubus vitifolius*) and wild grape (*Vitis californica*), along with the seed mix below.

19) The upland seed mix will consist of 20-40% native seeds (e.g annual fescue [*Vulpia spp.]*, California brome (*Bromus carinatus*], blue wildrye [*Elymus glausus*] and needlegrass [*Nassella spp.]*, 2-10% native forms, 5% rose clover (*Trifolium hirtum*), and 5% alfalfa (*Medicago sativa*). Approximately 40-68% of the seed mix may be non-invasive European annual grasses (e.g. wild oats [*Avena sativa*], wheat [*Triticum* spp.] and barley [*Hordeum vulgare*]. Aggressive, invasive non-native grasses will not be included in the mix. This seed mix is applicable to snake habitat in the project area.

20) Monitoring of the restoration areas will be provided as prescribed by Service guidelines. Monitoring reports for restored areas will be submitted to the Chief of the Endangered Species Division: (1) upon completion of restoration implementation and (2) one year from restoration. Monitoring reports will include photo documentation, a map illustrating the locations of restoration activities, when restoration was completed, what materials were used, plantings, and justifications of any substitutions. Monitoring reports will be submitted to the Chief of the Endangered Species Division, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Room W-1605, Sacramento, California 95825-1846.

21) In order to compensate for temporary impacts of the proposed project on the snake, SMUD proposes to provide 41 acres of mitigation by one or a combination of the following methods:

a) Prior to start of construction on the gas pipeline west of Folsom South Canal, pay a fee to the USFWS Endangered Species Fund for use in purchasing, enhancing, and managing habitat for endangered species. The amount would be equivalent to 41 acres at a rate of $37,500.

b) Prior to start of construction on the gas pipeline west of Folsom South Canal, purchase credits in a USFWS-approved mitigation bank. Such an approved mitigation bank might include one operated by Wildlands, Inc. Payment to Wildlands would fulfill SMUD's responsibility for snake compensation.

c) Purchase or dedicate through a conservation easement and management plan 41 acres of GGS habitat acceptable to the Service within the Sacramento Valley Recovery Area. To ensure timely purchase and/or dedication of such acreage, SMUD will place one million five hundred thirty-seven thousand five hundred dollars ($1,537,500) in an escrow or trust account prior to the initiation of construction. In addition, SMUD will comply with the following milestones:

1. Prior to starting construction of the gas pipeline west of Folsom South Canal SMUD will nominate a 41-acre parcel(s) for Service review.

2. If the Service rejects SMUD's proposed parcel(s) the Service will provide specific comments to allow SMUD to find suitable parcel(s). SMUD will then have two additional months to supply the Service with new parcel(s) for Service review.

3. Once the Service approves SMUD's proposed parcel(s) (the "Property"), SMUD will purchase or show reasonable progress toward purchase of the Property within three months of Service approval.

4. Within six months after purchase of the Property, SMUD or a management entity such as Wildlands will submit a management plan and conservation easement for Service review.

5. Within six months of Service approval of the management plan and conservation easement, SMUD will record the conservation easement and fund the ongoing management endowment. This action will transfer the easement and management of the property to a conservation entity capable of holding a conservation easement or a mitigation bank type company such as Wildlands.

   SMUD will use the funds placed in the escrow or trust account to acquire the Property, develop a conservation easement, and provide for ongoing management of the Property in perpetuity. Any funds not needed to support the requirements of this Paragraph will be returned to SMUD. In no event will SMUD be required to provide funds in excess of $1,537,500 to fulfill its requirements under this option.

6. In the event that SMUD and USFWS are unable to agree upon a suitable property and/or SMUD is unable to purchase the identified property by May 1, 2004, SMUD will complete either item 21(a) or 21(b) by June 1, 2004, unless the USFWS provides an extension to SMUD.

d) Prior to start of construction on the gas pipeline west of Folsom South Canal, protect and manage in perpetuity with a conservation easement and perpetual endowment 41 acres of snake habitat at a Service-approved location (conservation area). This easement shall be recorded at the county recorder's office prior to the above referenced construction. The easement, including a title report for the land area and management plan for the easement, shall be reviewed and approved by the Service prior to recording in the County Recorders Office. A true copy of the recorded easement shall be provided to the Service within 30 days after recordation. SMUD will identify locations to establish the conservation area prior to construction.

5.9A Protection Measures for Valley Elderberry Longhorn Beetle

Valley Elderberry Longhorn Beetles (VELB) require elderberry shrubs to feed, reproduce and grow. According to USFWS protocol shrubs with stalks greater than 1.0 inch in diameter are required for VELB. Shrubs greater than 100 feet from construction are considered avoided. The following measures would be implemented for any shrubs within 100 feet, and that have stalks of greater than 1 inch in diameter.

1. Fence and flag all areas to be avoided during construction activities. In areas where encroachment on the 100-foot buffer had been approved by the Service, provide a minimum setback of at least 20 feet from the dripline of each elderberry plant.

2. Brief contractors on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements.

3. Erect signs every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.

4. Instruct work crews about the status of the beetle and the need to protect its elderberry host plant.

Restoration and Maintenance

1. Restore any damage done to the buffer area (area within 100 feet of elderberry plants) during construction. Provide erosion control and re-vegetate with appropriate native plants.

2. Buffer areas must continue to be protected after construction from adverse effects of the project. Measures such as fencing, signs, weeding, and trash removal are usually appropriate.

3. No insecticides, herbicides, fertilizers, or other chemical that might harm the beetle or its host plant should be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level.

4. The applicant must provide a written description of how the buffer areas are to be restored, protected, and maintained after construction is completed.

5. Mowing of grasses / ground cover may occur from July through April to reduce fire hazard. No mowing should occur within five (5) feet of elderberry plant stems. Mowing must be done in a manner that avoids damaging plants (e.g. stripping away bark through careless use of mowing / trimming equipment).

5.10A Mitigation and Protection Measures for Swainson's Hawk

Swainson's hawks nest in large riparian cottonwoods, oaks, and similar large trees and forage over short-grass prairies and farm fields up to 10 miles from the nest. CDFG records and field observations record no historical nests within 3 miles of the project site. Approximately 5 historical nests occur within 0.5 mile of the pipeline. Swainson's hawks are sensitive to disturbance during nesting and CDFG recommends a 0.5-mile buffer between construction and active nests. Several areas along the gas pipeline route have the potential for nests, particularly in the Cosumnes Nature Preserve. A Swainson's hawk could nest in any of these in any year. If present, construction within short distances could cause modified behavior, reduced feeding efficiency or even nest abandonment.

Mitigation and protection measures for Swainson's hawk include:

- Implement nest surveys within 0.5 mile of project features in early spring 2003 to determine use by Swainson's hawk if construction during the nesting season is anticipated.
- If project features are within 0.5 mile of Swainson's hawk nesting, avoid construction within 0.5 mile during nesting season, if feasible. Consult with CDFG to determine measures that would allow construction within 0.25 mile of an active nest. Typical measures may include:
  - Full-time Biological Monitor while birds are on the nest.
  - Biological Monitor will require construction to cease if a nesting hawk shows signs of distress or abandonment due to construction disturbance.
  - If young are abandoned in the nest, or excluded from nest, salvage young and transport to the UC Davis Raptor Research Center or equivalent for rearing and hacking, with CDFG approval.
  - SMUD will be responsible for all costs associated with rearing and hacking abandoned young.
  - Prepare monitoring report reporting results of monitoring and construction.

CEC has requested that additional compensation habitat be provided to the area displaced by permanent development of the power plant. SMUD has proposed the following:

Provide for 1:1 acres of suitable foraging habitat for Swainsons' hawk at the same location as on-site vernal pool creation and preservation activities. Funding for management and conservation easement to be delegated to the Sacramento Open Lands Trust or equivalent third-party as for fairy shrimp and giant garter snake.

5.11A Protection Measures for Western Burrowing Owl

The burrowing owl is known to nest in the Central Valley. Railroad berms, canal banks and agricultural areas near the project site may contain suitable habitat for burrowing owls, although only one pair was detected in 2002 surveys along Sims Road. Burrowing owl sign was reported from 0.2 mile north of the project site in 2001, but no owls were seen in surveys of the site in 2001 or 2002.

The following measures would minimize the potential impacts to burrowing owls:

- Preconstruction surveys of pipeline and linear facilities would be conducted in the spring to determine whether the ground squirrel burrows are occupied by burrowing owls if construction is planned for the nesting season.
- Protect active nest burrows with a 250-foot buffer during the breeding season (February 1 through August 31) or until young have left the nest.
- Conduct passive relocation prior to construction if winter burrows are found before February 1 and/or restrict construction activities within 150 feet during non-breeding season.
- Provide habitat compensation for any active nest burrow that could not be avoided during construction through consultation with CDFG.

5.12A Protection for Nesting and Migratory Birds

Raptors, herons, egrets, waterfowl, and belted kingfisher are resident and migratory species occurring in the CPP project area, and are protected under the Migratory Bird Treaty Act and California Fish and Game Code. Disturbance of nest sites, which is prohibited under Section 3503.5 of the Fish and Game Code, could result in abandonment of eggs or young.

Preconstruction surveys will be conducted for nesting raptors within 500 feet of construction activities. Resident birds often begin nesting as early as February in California. Nest searches will be conducted in December/January (if not earlier) before site construction begins and the vegetation within laydown and construction areas will be removed and/or mowed by February 1st to minimize the potential for birds to nest in the construction areas. If nests are found with no eggs or young, the nest will be removed. If nesting birds with eggs or young are found during the surveys, the Biological Monitor will coordinate with the Designated Biologist and CDFG for possible relocation or rehabilitation at an approved wildlife rehabilitation center.

Field surveys to identify active raptor nest sites will be conducted in the spring prior to construction. If nest sites are found within 500 feet of construction areas, the Designated Biologist will implement mitigation measures appropriate to the circumstances. In most cases, a construction zone limit will be placed around the nest site at a distance of 500 feet. If an exclusion zone cannot reasonably be implemented at this distance, the following measures may be implemented:

1. SMUD may postpone construction in that area until young are fledged, or
2. Provide a Biological Monitor to monitor the birds on the nest and stop construction if it appears that the birds will abandon the nest or young, or
3. Consult with the CDFG if construction appears to jeopardize the nesting success and provide for the artificial rearing of eggs or young by qualified staff.

5.13A Mitigation for Impacts to Birds from Collisions with Electric Transmission Lines

The Central Valley withinin the Pacific Flyway is used by migratory birds in the area, and a new transmission line in this corridor may result in a minor increase of bird collisions. Special consideration was given to the potential impacts on raptor and migratory bird species. The transmission line route was designed to minimize the length and crossing of open areas (often used as forage during migration) thereby limiting the collision opportunities for resident and migratory birds. To prevent electrocutions, the transmission line will be designed to space conductor wires further apart than the wing span of a large birds (43 inches on the vertical and 60 inches on the diagonal) (APLIC 1996) and is commonly used as mitigation for reducing potential avian electrocutions and collisions. No further mitigation is proposed for impacts from the electric transmission line.

This page left blank

6.0A Conclusion and Determination of Project Effects for Terrestrial Species

Effect determinations for each of the special-status species that could potentially occur in the project action area were discussed in the previous sections. The following paragraphs summarize those effect determinations for the listed and special concern species that are known or are assumed to occur in the project area that could be affected by CPP construction and operation after mitigation and protection measures are implemented.

Threatened (T), Endangered (E), Proposed Threatened (PT) or Proposed Endangered (PE) Species

The CPP project overall *may affect, but is not likely to adversely affect*, the federal listed species that are known or assumed to occur in the action area. These listed species include vernal pool tadpole shrimp, vernal pool fairy shrimp, Valley elderberry longhorn beetle, and giant garter snake. With protection and mitigation measures developed through consultation with the USFWS and CDFG, the CPP project avoided and minimized construction and operation impacts to the furthest extent feasible.

The ratio for compensatory habitat purchase and preservation was determined through informal consultation with USFWS and CDFG. The location for the proposed mitigation will support habitat for the special-status species identified in this consultation and will be approved by USFWS and / or CDFG prior to construction.

State Listed only Species

The CPP project *may affect, but is not likely to adversely affect*, Swainson's hawk and greater sandhill crane. With protection and mitigation measures developed through consultation with CDFG, the CPP will provide appropriate off-site habitat compensation for the loss of forage habitat. The location for this proposed mitigation will be approved by CDFG prior to the start of construction.

Candidate Species, Sensitive Species and Species of Concern

The CPP project *may affect, but is not likely to adversely affect*, the species of concern and species of special concern. These species include California tiger salamander, burrowing owl, American bittern, and other nesting or migratory birds in the Pacific Flyway.

Protection and mitigation measures developed for the listed species will provide protection for species of concern that are not protected under the ESA.

This page left blank

7.0A References

Army Corps of Engineers, SAFCA, State of California Reclamation Board [ACOE et al 2001]. 2001. American River Watershed, California, Long-Term Study, Draft Supplemental Plan Formulation Report / Environmental Impact Statement / Environmental Impact Report. September

Avian Power Line Interaction Committee (APLIC). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute / Raptor Research Foundation, Washington, D.C.

California Department of Fish and Game (CDFG). 1994 Draft Staff Report on Burrowing Owl Mitigation. September 13.

CDFG .1984. Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities. May 4.

CDFG. 1992. Mitigation Guidelines for Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California. January.

CDFG. California Natural Diversity Data Base (CNDDB). 2002. Rarefind list and locations of species observed on Goose Creek, Clay, Galt, Bruceville, and Florin USGS quadrangles.

CH2M HILL. 2002. Consumes Power Plant AFC Supplement C (Zero Liquid Discharge Arrangement). Prepared for Sacramento Municipal Utility District, July 18, 2002.

CH2M HILL. 2003. Jurisdictional Waters of the U.S. Report for the Cosumnes Power Plant, Sacramento County, California. Prepared for Sacramento Municipal Utility District. February 7, 2003.

Davis Environmental Consulting. 2001. Wetland Delineation Report for the Proposed South Sacramento Power Plant at Rancho Seco Sacramento County, California. June.

Davis Environmental Consulting. 2001. Special-Status Biological Resources Survey for the Twin Cities Power Plant Project Rancho Seco, California. July.

Deason 2002. Personal communication, Brian Deason, Bureau of Reclamation fisheries biologist, April 12, 2002.

Federal Register. 1993. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Giant Garter Snake. Vol 58, No. 201. Wednesday, October 20, 1993.

Federal Register. 1994. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and the Vernal Pool Fairy Tadpole Shrimp; and Threatened Status for the Vernal Pool Fairy Shrimp. Vol. 59, No. 180. Monday, September 19.

Federal Register. 1999. 50 CFR Part 17, Endangered and Threatened Wildlife and Plants, Proposed Rule to Remove the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife, Proposed Rule, July 6.

Gifford, 2002. Personal communication, Dan Gifford, CDFG biologist, April 17, 2002.

Holland, R. F. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game. 1986.

Jennings, M. 2002. Survey of Amphibians for Cosumnes Power Plant and Gas Pipeline. Prepared May 2002.

Jennings, M. and M. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California.* Prepared for the California Department of Fish and Game Inland Fisheries Division.

Marty, 2002. Personal communication, Jaymee Marty, The Nature Conservancy biologist at Cosumnes Preserve, April 12, 2002.

Moyle, P. 1976. Inland Fishes of California. University of California Press. October.

Moyle, P. et al. 1995. Fish Species of Special Concern in California. Second Edition. Department of Wildlife and Fisheries Biology, University of California, Davis. Prepared for the Department of Fish and Game, Inland Fisheries Division.

Nakamura, G. and Kierstead-Nelson, J. 2001. Illustrated Field Guide to Selected Rare Plants of Northern California. University of California Agriculture and Natural Resources, Publication 3395.

National Marine Fisheries Service (NMFS) 2001. Letter to E.J. Koford, Senior Biologist with CH2MHILL regarding potential for anadromous fish to occur in the CPP project area, dated August 24, 2001.

Pahwa, S. and B. Shipley. 1979. A Pilot Study to Detect Vegetation Stress around a Cooling Tower. Presented at the 1979 Cooling Tower Institute Annual Meeting, Houston, Texas. Paper TP7903.

Peterson, R.T. 1990. A Field Guide to Western Birds: A Completely New Guide to Field Marks of All Species Found in North America West of the 100th Meridian and North of Mexico - Third Edition. Houghton Mifflin Company, Boston.

Sacramento County Office of Metropolitian Water Planning (CCOMWP). 2000. The Water Forum Agreement. City of Sacramento. County of Sacramento. Prepared by EDAW and Surface Water Resources inc. January 2000.

Skinner and Pavlik. 1994. Inventory of Rare and Endangered Vascular Plants of California, CNPS Special Publication No. 1, (Fifth Edition).

Skinner, M.W. and B.M. Pavlik (eds). 1994. California Native Plant Society. CNPS Inventory of Rare and Endangered Vascular Plants of California.

Sacramento Municipal Utility District (SMUD). 1997. Review of Mitigation Bank Requirements for SMUD's Cogeneration Natural Gas Pipeline and Procter and Gamble Cogeneration Projects. Letter to Wayne White, USFWS. May 30.

Stockton Record. 1996. Swainson's Hawks Dying by Thousands in Argentina. March 15, 1996.

Thelander, C., editor. 1994. Life on the Edge, A Guide to California's Endangered Natural Resources: Wildlife. Biosystems Analysis, Inc.

U.S. Environmental Protection Agency. 1991. Air Quality Criteria for Oxides of Nitrogen. Office of Research and Development.

USBR (U.S. Bureau of Reclamation) 1997. Central Valley Project Improvement Act Draft Programmatic Environmental Impact Statement. Sacramento, California. September.

USFWS . 2002. Reinitiation of Formal Endangered Scpes Consultation on the Proposed Wild Goose Gas Storage Project (Regulatory Branch #200100383), Butte and Colusa Counties, California. September 18.

USFWS (U.S. Fish and Wildlife Service). 1999. Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). U.S. Fish and Wildlife Service, Portland, Oregon. ix+ 192 pp.

USFWS. 1998. Amendment of the Formal Section 7 Consultation for the Sacramento Municipal Utility District (SMUD) Cogeneration Pipeline Project, Sacramento California (May 20.)

USFWS 1997. Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effect on the Giant Garter Snake in Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California. November 13. 1-1-F-97-149.

USFWS. 1996. Mitigation guidelines for the Valley Elderberry Longhorn Beetle, U.S. Fish and Wildlife Service, Sacramento, California, 19 September.

Wylie, G. et al. 1997. 1996 Progress Report for the Giant Garter Snake Study. May 1.

Zeiner, D. 1988. California's Wildlife. Volume I. Amphibians and Reptiles. California Statewide Wildlife Habitat Relationships System.

Zeiner, D. 1990a. California's Wildlife. Volume II. Birds. California Statewide Wildlife Habitat Relationships System.

Zeiner, D. 1990b. California's Wildlife. Volume III. Mammals. California Statewide Wildlife Habitat Relationships System.

This page left blank

2.0B Special Status Fish Species Accounts and Status in the Action Area

These sections of the BRA (Sections 2.0B through 6.0B) address the project's potential effects on aquatic species and Essential Fish Habitat (EFH) for Pacific salmon. Specifically, the effects of project construction and operation activity on listed aquatic species and their habitats and EFH for Pacific salmon including natural gas pipeline crossings on the Cosumnes River, Badger Creek, and Laguna Creek were analyzed. In addition, the effects of project operations associated with the use of surface water from the Folsom-South Canal were analyzed for impacts to special-status species. Proposed protection and mitigation measures for potential impacts to aquatic special-status species and EFH are presented in Section 5.0B.

2.1B Chinook Salmon

The **winter-run Chinook salmon** (*Oncorhynchus tshawytscha*) is a federal (59 FR 440) and State endangered species. The **spring-run Chinook salmon** (*Oncorhynchus tshawytscha*) is a federal (64 FR 50393) and State threatened species. Fall and late-run Chinook are not listed for protection under either the California or federal ESA; however, these species are included as Pacific salmon, which support recreational and commercial fisheries. Pacific salmon are known to inhabit the American, Cosumnes, and Sacramento rivers (Moyle *et al.*, 1995; Moyle 2002; Yoshiyama *et al.*, 1998; Snider and Reavis 2000) in the Action Area, and therefore these water bodies have been identified as Essential Fish Habitat (EFH) for Pacific salmon. EFH is the aquatic habitat (water and substrate) necessary to fish for spawning, breeding, feeding, or growth-to-maturity that will allow a level of production needed to support a long-term, sustainable, commercial fishery and contribute to a healthy ecosystem (NMFS 1998).

In the Action Area, winter-run Chinook salmon use the Sacramento River downstream of the confluence with the American River as a migratory corridor for both upstream migrating adults and downstream migrating juveniles (NMFS 1993; NMFS 2000). Juvenile winter-run sized Chinook salmon also have been reported from the lower reach of the American River in the immediate vicinity of the confluence with the Sacramento River (Snider, CDFG, pers. com.). Spawning and egg incubation by winter run salmon does not occur in the project area, but does occur further upstream outside of the project area in the Sacramento River (Reynolds *et al.*, 1990). The Sacramento River has been designated by NMFS as critical habitat for winter-run Chinook salmon (58 FR 33212).

In the Action Area, spring-run Chinook salmon use the Sacramento River downstream of the confluence with the American River as a migratory corridor (Reynolds *et al.*, 1990; Yoshiyama *et al.*, 1998; CDFG 1998) for both upstream migrating adults and downstream migrating juveniles. Juvenile spring-run Chinook salmon may use the lower reach of the American River in the immediate vicinity of the confluence with the Sacramento River as foraging habitat during emigration. Spawning and egg incubation by spring-run salmon

does not occur in the project action area, but does occur further upstream in the Sacramento River and its tributaries (e.g., Mill and Deer creeks; Reynolds *et al.* 1990; Moyle *et al. 1995;* Mills and Ward 1996; Yoshiyama *et al.* 1998; NMFS 2000).

Reasons for decline in the populations of fall-run Chinook include inaccessibility of spawning grounds due to dams and water management projects, entrainment into unscreened agricultural diversions, overfishing, high seasonal water temperatures, and poor water quality (Yoshiyama *et al.*, 1998; CDFG 1993; USBR 1997). Pacific salmon are known to inhabit the Sacramento, American, and Cosumnes rivers (Yoshiyama *et al.*, 1998; Moyle 2002; SWRI 2001; Snider and Reavis 2000), and therefore these areas have been identified as EFH for Pacific salmon, including fall-run Chinook salmon.

The Cosumnes River historically and currently supports a small run of Chinook salmon (Snider and Reavis 2000; Taylor 1974; Kano 1998; NRCS 2002; Reavis 1981;), but since 1987 there were 3 years of no flow during the spawning period that precluded a continual natural run of salmon (USBR 1997). Information on the natural resources and habitat conditions for fish and wildlife, in addition to information on land use, hydrology, soils, sediment, geology, water quality, and cultural resources of the Cosumnes River has been compiled by the Natural Resources Conservation Service (NRCS 2002) in cooperation with the Sloughhouse Resource Conservation District and the Cosumnes River Task Force. Information on Chinook salmon spawning, rearing, and juvenile emigration from the Cosumnes River has been reported by Snider and Reavis (2000), for surveys conducted during 1998-1999 which, in addition to NRCS 2002, Whitener 2002, and others, provides the baseline information for analyzing potential effects. The lower reach of the Cosumnes River is tidally influenced approximately 25 yards upstream from the confluence of Laguna Creek. Most years the mainstem of the Cosumnes River has no flow upstream of Laguna Creek during the dry season (Whitener 2002). Fall-run Chinook salmon may migrate up the Cosumnes River when the river begins to flow again after a series of rain events in November (Snider and Reavis 2000; Whitener 2002). The river can fill as early as mid-October and as late as mid-December, and some years it does not fill at all (Whitener 2002). Downstream emigration of juvenile salmon would occur during the late winter and spring period when water is in the river and when temperatures are appropriate, primarily March and April (Whitener, 2002, Moyle *et al.*, 1995; Snider and Reavis 2000). Flows dry up in much of the river from June to August (Whitener 2002).

Lower American River fall-run Chinook salmon spawning contributed approximately 21 percent (i.e., 41,040 fish) to total fall-run Chinook salmon spawning (i.e., 197,740 fish) in the Sacramento Valley river system of the Central Valley Project, including the Sacramento River and its tributary rivers and creeks, during the 1967-1991 time period which represents the Anadromous Fish Restoration Program (AFRP) restoration goal baseline period (SWRI 2002, unpublished data). Chinook salmon from the American River represent both in-river production and fish produced in the CDFG Nimbus Hatchery. Adult Chinook salmon typically migrate into the lower American River during the fall (September-December) with spawning generally occurring between October and December (SWRI 2001). After hatching, juvenile Chinook salmon emigrate from the American River both as fry, typically during late January-early March, and as smolts during the period from April to early June (SWRI 2001).

Central Valley Chinook salmon populations, particularly winter-run and spring-run Chinook salmon, have experienced declining abundance over the past several decades (Yoshiyama *et al.*, 1998; Moyle *et al.*, 1995). Reasons for decline in populations include dam construction, water diversion, groundwater withdrawal, poor water quality management, loss of spawning grounds, and impingement and entrainment of juvenile fish at water diversions (Yoshiyama *et al.*, 1998; Moyle *et al.*, 1995; Reynolds *et al.*, 1990; CDFG 1993; Mills and Ward 1996).

2.2B Central Valley Steelhead

The **Central Valley steelhead** (*Oncorhynchus mykiss*) is federally listed as threatened (65 FR 42422-42481). Steelhead migrate through the Sacramento / San Joaquin river systems and up the Sacramento, Cosumnes, and American rivers (Reynolds *et al.*, 1990; NRCS 2002). Historically, the majority of anadromous salmonid spawning and rearing habitat within American River was located in the watershed above Folsom Dam. The lower American River currently provides spawning and rearing habitat for steelhead below the Nimbus Dam. The majority of the steelhead run returning to the hatchery is of hatchery origin. The proportion of hatchery origin fish spawning in the river, however, remains uncertain (SWRI 2001). Adult steelhead typically migrate upstream from December through April with juveniles typically emigrating from November through May (SWRI 2001). In the Cosumnes River, steelhead migrate in winter and early spring only when there is sufficient water in the river (Whitener 2002). Reasons for the decline of the steelhead include, but are not limited to, dam construction, water diversion, groundwater withdrawal, poor water quality management, loss of spawning grounds, and impingement and entrainment of juvenile fish at water diversions (McEwan and Jackson 1996; NMFS 1996).

2.3B Sacramento Splittail

The Sacramento splittail (*Pogonichthys macrolepidotus*) is a federal threatened species (64 FR 25). It is endemic to the Central Valley in California and is known to inhabit the Sacramento, lower American, and Cosumnes rivers (SWRI 2001; Moyle *et al.*, 1995; Moyle 2002). In these watersheds, areas inundated by floodwaters provide suitable spawning habitat (Whitener 2002). Sacramento splittail primarily occur in slow-moving reaches of the main rivers and the Delta (Moyle 2002; Moyle *et al.*, 1995). Peak spawning occurs from March through May in sloughs and other shallow, slow-moving water habitats (Moyle 2002; Wang 1986). Spawning by splittail may occur in reaches of the Sacramento, Cosumnes, and American rivers potentially affected by the Proposed Action. These habitats also are utilized seasonally by adult and juvenile splittail as foraging areas.

Reasons for decline in the Sacramento splittail population may include, but are not limited to, water diversions, reduced Delta outflow, channelization and reduction in flood plain inundation, entrainment in diversions, adverse water quality, and loss of shallow water breeding habitats (Moyle *et al.*, 1995; USFWS 1996).

2.4B Delta Smelt

Delta smelt (*Hypomesus transpacificus*) are listed as a threatened species under both the California and federal Endangered Species Acts (58 FR 12854). Delta smelt primarily inhabit the Sacramento River downstream of the confluence with the lower American River, and the Bay-Delta estuary (USFWS 1996). The Sacramento River downstream of Sacramento has been designated by USFWS as part of critical habitat for delta smelt (59 FR 65256). The lower American and Cosumnes rivers are not within the area designated as critical habitat for Delta smelt (59 FR 65256). Delta smelt typically have a 1-year lifecycle with adults spawning during the late winter and early spring (USFWS 1996; Moyle 2002; Wang 1986). Eggs are adhesive on hard substrate (Moyle 2002; USFWS 1996). After hatching, planktonic larvae drift downstream with river currents into the Bay-Delta estuary, which provides juvenile rearing habitat (Wang 1986; USFWS 1996).

2.5B Essential Fish Habitat (EFH) for Pacific Salmon

This document analyzes potential effects to EFH as required by the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). It is also consistent with guidelines detailed in Amendment 14 to the Pacific Coast Salmon Plan, Appendix A (Pacific Fisheries Management Council 1999). EFH only applies to the habitat of commercial fish species (i.e., all Chinook salmon habitat, but not steelhead habitat) and includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity (NMFS 1998). EFH includes all anadromous streams (including some intermittent streams) up to impassable barriers (Pacific Fisheries Management Council 1999). In the Central Valley, it also includes accessible waters of the Delta, Sacramento River, and tributaries up to impassable barriers. In the American River basin, EFH includes the lower American River up to Nimbus Dam. Keswick Dam represents the first impassable barrier on the Sacramento River, within the study area. The evaluation presented in this document satisfies EFH consultation requirements. Thus, a separate EFH document is not needed.

For the purposes of this BRA, Pacific salmon includes spring-run, winter-run and fall/late-fall run Chinook salmon. Although fall/late-fall run Chinook salmon is not a federally listed species, as a Pacific salmon, its habitat is included under the MSFCMA protections for EFH. EFH for Chinook salmon includes all streams, lakes, ponds, wetlands, tributaries, and other water bodies currently viable and most of the habitat historically accessible to Chinook salmon. Within the proposed action area, the Sacramento River provides habitat for spring-run and winter-run Chinook salmon; and the lower American River and Cosumnes River provide habitat for fall/late-fall run Chinook salmon (See Section 2.1B).

3.0B Direct and Indirect Effects of the Proposed Action on Protected Fish Species, Critical Habitat, and Essential Fish Habitat for Pacific Salmon

3.1B Introduction

The proposed action was evaluated to determine potential direct and indirect effects to special-status aquatic species, critical habitat and Essential Fish Habitat (EFH) for Pacific salmon that may result from construction or operation of the CPP facilities.

3.1.1B Methodology

The assessment of potential construction or operational effects upon special-status fish species in the proposed action area considers the potential occurrence, lifestages and habitat requirements (e.g., instream flow and water temperature) for the individual species addressed by this BRA. The potential for adverse effects is evaluated by a comparison of anticipated project conditions relative to existing or baseline conditions.

Construction-related effects to fishery resources, including water quality, were determined using available information regarding anticipated construction methods for the power plant, natural gas pipeline, and associated facilities. The assessment of potential construction-related effects assumes implementation of standard construction best management practices (BMPs) for the protection of aquatic resources. Section 5.0B presents the general protection and mitigation measures for fishery resources.

Operation-related effects upon fishery and water quality resources were determined based on anticipated operation practices which include the incorporation of identified biological resources protection measures to minimize potential adverse effects (i.e., stormwater detention and discharge facilities.

Hydrologic and water temperature modeling was performed to evaluate the potential effects of the proposed action related t o the operational effect of the increased water diversions from the Folsom South Canal (FSC) on the lower American River, Sacramento River and Delta. Model simulations were developed to represent the baseline (existing) conditions and proposed action conditions. These simulations are based on a 70-year (1921-1991) hydrologic period of record and a 69-year (1922-1990) water temperature period of record. Appendix D, Fisheries and Aquatic Habitat, provides additional detail regarding the modeling simulations and assumptions. The results of these simulations were then compared to determine the potential for proposed action-related changes to instream flows or water temperature as indices for habitat quality and availability in the lower American

River, Sacramento River and Delta. Appendix D presents detailed results for each of the effect topics and simulation comparisons for aquatic species.

3.1.2B Baseline Condition

The ESA Baseline Condition includes "the past and present impacts of all federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process" [50 CFR Section 402.02].

For the Cosumnes River, Badger Creek, and Laguna Creek, information on the natural resources and habitat conditions for fish and wildlife, in addition to information on land use, hydrology, soils, sediment, geology, water quality, and cultural resources of the Cosumnes River has been compiled by the Natural Resources Conservation Service (NRCS 2002) in cooperation with the Sloughhouse Resource Conservation District and the Cosumnes River Task Force. Additional information on Chinook salmon spawning, rearing, and juvenile emigration from the Cosumnes River has been reported by Snider and Reavis (2000), for surveys conducted during 1998-1999. Whitener (2002) provides additional information on fishery and aquatic habitat in the area. Information from these and other sources provides the baseline conditions used to evaluate potential project effects on fishery resources and EFH within the Cosumnes River watershed.

Modeling assumptions incorporate the terms and conditions of Biological Opinions (BOs) prepared by resource agencies for past and ongoing federal actions. The existing condition simulation does not include the use of any water associated with federal actions that have not yet completed ESA Section 7 consultation. The terms and conditions of the following Biological Opinions are incorporated into the hydrologic modeling assumptions related to State Water Project (SWP) and Central Valley Project (CVP) operations for the existing condition, which therefore represents the ESA baseline for the evaluation of the proposed action upon the lower American River, Sacramento River, and the Delta:

- Biologic Opinion for Delta Smelt – Los Vaqueros (USFWS);
- Biologic Opinion for Delta Smelt – Operations and Criteria Plan (OCAP) (USFWS);
- Biologic Opinion for Winter-run Chinook Salmon – per the Bay-Delta Accord (NMFS);
- Conference / Biologic Opinion for Sacramento Splittail – Long-term OCAP (USFWS); and
- Biologic Opinion for Steelhead (NMFS).

Additional information used to establish baseline conditions, particularly with respect to life history requirements and habitat conditions for protected species, critical habitat, and EFH within the lower American River, Sacramento River, and Delta (briefly summarized in Section 2.0B), has been developed from CDFG (1993), Mills and Ward (1996), Moyle (2002), Moyle *et al.* (1995), NMFS (1993), Reynolds *et al.* (1990), SWRI (2001), USFWS (1996), Wang (1986), Yoshiyama *et al.* (1998), and other reference documents. Information available from these sources, in combination with BOs and hydrologic modeling, provide the basis for evaluating potential project-related effects on fishery resources and their habitat.

3.1.3B Effects of the Proposed Action

Effects to the aquatic species under discussion can be short-term (one or two reproductive seasons) or long-term (affecting several generations), direct (immediate effects of the proposed action on a species or its habitat), or indirect (effects that result from the proposed action and are later in time, but are still reasonably certain to occur).

Potential effects to aquatic species, critical habitat, or EFH for Pacific Salmon that may result due to construction or operation of the CPP include the following:

- Temporary construction-related effects to water quality and aquatic resources in the Cosumnes River, Badger Creek, and Laguna creeks;
- Water quality effects to the Cosumnes River, Badger Creek, and Laguna Creek due to plant stormwater discharges;
- Introduction of blockage or impediments to migration in the Cosumnes River and/or Badger or Laguna creeks resulting from construction of the CPP;
- Reduced streamflow in the lower American River resulting from cooling water deliveries diverted through the FSC;
- Increased water temperatures in the lower American River as a result of reduced streamflow and/or reduced storage in Folsom and Nimbus Reservoirs;
- Reduced streamflow in the Sacramento River resulting from cooling water deliveries diverted through the FSC;
- Increased water temperatures in the Sacramento River as a result of reduced streamflow; and
- Changes in the location of X2[1] in the Delta resulting from reductions in streamflow in the lower American and Sacramento rivers.

3.2B Construction-Related Effects

Construction of the CPP project site would require that 30 acres be leveled and elevated. A stormwater detention basin and discharge outfall structure would be constructed within the 30 acres of the CPP project site to accommodate the project's stormwater runoff. During project construction, the project would also have a temporary 20 acre laydown area, just south of the project site. The construction of the CPP gas pipeline would require crossing under the Cosumnes River, Badger Creek, and Laguna Creek, via the Horizontal Directional Drill (HDD) construction method.

Construction of the natural gas pipeline and the power plant have the potential to contribute pollutants affecting the water quality or aquatic resources of the Cosumnes River, Badger Creek, and Laguna Creek. Specific aquatic resources protection measures have been incorporated into the project construction plans to minimize or avoid these effects, as

[1] X2 is the geographic location (measured in kilometers from the Golden Gate) of the 2 parts per thousand (ppt) salinity isohaline. X2 is used as an indicator of estuarine habitat conditions for fish and macroinvertebrates. The location of X2 varies in response to the magnitude of freshwater inflow and outflow within the Bay-Delta estuary.

described below. Construction of the CPP facilities would not have any direct or indirect effects upon the Sacramento River where spring-run and winter-run Chinook salmon are known to occur within the project area or upon critical habitat for winter-run Chinook salmon (Sacramento River). Additionally, construction of the CPP facilities would not have any direct or indirect effects upon lower American River or Delta fisheries resources, including EFH. This is because there are no construction related activities associated with the Sacramento River, American River, or the Delta.

3.2.1B Water Quality

3.2.1.1B Sedimentation

The proposed action *may affect, but is not likely to adversely affect* EFH within the Cosumnes River watershed for Pacific salmon, steelhead, or splittail or their habitat due to increased sedimentation associated with the construction of the natural gas pipeline and the powerplant. To minimize the potential affects, construction of the natural gas pipeline crossings under the water channels of Cosumnes River, Badger Creek, and Laguna Creek would occur when the streambeds are dry (August through October, see Section 5.0B). The pipeline would also be installed utilizing the HDD construction method. Under this method, the pipeline would be installed more than 30 feet below the channel bottoms, without affecting the channel surfaces. Constructing the pipeline when the streambeds are dry and the use of the HDD construction method would minimize the potential for adverse effects to water quality that could affect listed species and/or EFH.

The potential risk associated with the use of the HDD construction method is if a "frac-out" occurs. A frac-out is the release of the bentonite slurry drilling lubricant from the drilling hole to the surface through a fissure or crack in the soils. Bentonite is a non-toxic clay material and commonly used in farming practices as a soil enhancement. However, benthic invertebrates, aquatic plants, and fish and their eggs can be smothered by the fine particles if bentonite is discharged to waterways that support these aquatic species. HDD construction method would take place only during the summer months when salmonid species are not present either in the waterways or the CPP construction site. Low flow and high summer time temperatures would prevent salmonid populations from the construction areas. A potential effect associated with a frac-out would be limited only to the Sacramento splittail. If a frac-out were to take place in splittail habitat, potential effects to water quality and Sacramento splittail could occur.

An extensive body of scientific information exists regarding the relationship between exposure of fish and macroinvertebrates to suspended sediments (both concentration and duration of exposure) and resulting biological responses including both sublethal (e.g., changes in physiology, behavioral avoidance, reduced feeding rates, etc.) and lethal mortality. Results of exposure tests have been reported by both individual investigators (e.g., McFarland and Peddicord 1980; O'Connor 1991; and many others) which have also been compiled and synthesized by Newcombe and Jensen (1996) and Wilber and Clarke (2001). Results of these investigations have shown that the tolerance of various fish and macroinvertebrates to suspended sediments vary substantially among species. Species which inhabit estuarine environments, such as the Sacramento-San Joaquin Delta, which are characterized by relatively high ambient suspended sediment concentrations (e.g., greater than 100 mg/L), show a substantially greater tolerance to suspended sediment

concentrations when compared to species which typically inhabit environments characterized by low ambient suspended sediment concentrations (e.g., open ocean pelagic species).

Although scientific data are not available on the tolerance of splittail to suspended sediment concentrations, it is expected that their tolerance would be similar to that of other species inhabiting the Bay-Delta estuary such as striped bass. Data compiled by Wilber and Clarke (2001) for estuarine fish species generally shows a mortality threshold (10 percent acute mortality) for the majority of species at suspended sediment concentrations of approximately 2000 mg/L for a one-day exposure duration or approximately 900 mg/L for a two-day exposure duration. Data for juvenile striped bass showed no affect for an eleven-day exposure at 600 mg/L. However, there was a sublethal hematocrit (red blood cell) count (increased following a five-day exposure to a suspended sediment concentration of 1240 mg/L).

The actual exposure concentration and duration of exposure that would occur as a result of a potential frac-out is unknown and not documented since frac-outs are a very uncommon occurrences. Avoidance and minimization actions, such as those outlined in the preliminary Contingency Plan for Frac-Out (Appendix C), would serve to reduce the potential risk of adverse effects to splittail within the Cosumnes River watershed. HDD during the summer months would eliminate the potential risk of adverse effects associated with exposure to suspended sediments in the event that a frac-out should occur. As a result, the CPP proposed action *may affect, but is not likely to adversely affect* Sacramento splittail.

3.2.1.2B Stormwater Runoff

Stormwater runoff regulations require that construction activities typical to the proposed action incorporate silt fences and other means to minimize or eliminate runoff from all construction areas. Stormwater during construction of the CPP project site will be discharged according to a NPDES permit, which will be obtained prior to construction. CPP is also obtaining authorization under Section 1601 of the Fish and Game Code for construction-related crossings of 37 streams, ditches, swales and other potential wetland features in the CPP action area. Horizontal directional drill (HDD) techniques, incorporating silt fences, wattles or other appropriate BMPs would be utilized when constructing nearby or under all waterways, canals and ditches located in the action area. For additional information on construction conservation measures, refer to Preliminary Draft Stormwater Pollution Prevention Plan, dated May 6, 2002; Drainage Plan, dated January 24, 2003; and Appendix C, Preliminary Contingency Plan for HDD. Final Plans will be submitted to NMFS and USFWS for review prior to construction.

In the project construction laydown area just south to the CPP construction site where construction equipment and materials will be stored, all storm water will be contained and checked for oil. Following an appraisal by a qualified specialist that no oil sheen is present the water is oil free, the water will then be released to the nearby swale and eventually into the creek.

By incorporating the measures mentioned above, there will be no effect upon water quality due to construction-related stormwater runoff. By preventing potential for water quality degradation in the project action area, there would be no direct effects to steelhead, splittail

and their habitat areas known or assumed to occur in the Cosumnes River, Badger Creek, and Laguna Creeks. Additionally, implementation of these protection measures would avoid direct effects upon EFH for Pacific salmon (fall/late-fall run Chinook salmon) within the Cosumnes River and associated waterways.

3.2.1.3B Impediments or Barriers

The pipeline crossings under the Cosumnes River, Badger Creek, and Laguna Creek would be installed using the HDD construction method. Because the pipeline crossings would be more than 30 feet below the channel bottoms, no barrier or impediment would occur during or after construction of the pipeline that would obstruct channel flow, affect adult Pacific salmon upstream migration, or affect juvenile Pacific salmon downstream migration in the Cosumnes River, Badger Creek, or Laguna Creek. Therefore, there would be no adverse effect on EFH for Pacific salmon, or upon steelhead or splittail or their habitat.

3.3B Operational Effects

Operational effects associated with the CPP project consist of stormwater runoff from the project site and the diversion of Folsom South Canal water for project cooling purposes. There would be no operational effects associated with the gas pipeline because it would not create or introduce any new facility or structure that might block or impede flow or fish passage (i.e., steelhead or Chinook salmon adult upstream migration or juvenile downstream migration; adult or juvenile splittail movement) in the Cosumnes River, Badger Creek or Laguna Creek. As described previously, the natural gas pipeline crossings of these waterbodies would be installed under the water channels using the HDD construction technique. Since all crossings would be located well below the streambed, the gas pipeline would not result in the obstruction of channel flow or impairment of fish passage/movement. Therefore, there would be no direct or indirect passage effect upon Chinook salmon, steelhead or splittail in the project area.

In addition, there would be no operational effects associated with the project's wastewater discharge. The wastewater would be disposed of through the use of zero liquid discharge (ZLD) technology and would not be discharged to any water bodies. (Please refer to Section 1 and Supplement C to the Cosumnes Power Plant Application for Certification, dated July 18, 2002.)

3.3.1B Water Quality

3.3.1.1B Stormwater

As part of the CPP project, a stormwater detention basin and discharge outfall structure would be built to accommodate the project's stormwater runoff. The outfall from the basin would be designed to incorporate measures to reduce contaminants, consistent with stormwater requirements, and with a flow dissipater structure equivalent to reduce velocity and potential scouring from the outfall. These elements would minimize the potential for introduction of water quality constituents of concern into the local watershed.

During operation of the CPP, all storm water would be detained in the detention basin, where it would be checked by a qualified specialist for an oily sheen. If clean, it would be

released to Clay Creek (a tributary to Hadselville Creek and Laguna Creek). If oil is present mitigation measures would be utilized and absorbents would remove the oil form the water, then it would be released to Clay Creek.

Stormwater runoff from the CPP may affect listed aquatic species, their habitats, and EFH for Pacific salmon (fall/late-run Chinook salmon with the Cosumnes River and Laguna Creek However, with implementation of the conservation measures listed above, there would be no adverse effect on EFH for Pacific salmon, upon steelhead or splittail or their habitat.

3.3.2B Diversion of Folsom South Canal Water

3.3.2.1B Instream Flow

Operation of the CPP may affect spring-run and winter-run Chinook salmon in the Sacramento River and lower American River near the confluence with the Sacramento River; winter-run Chinook salmon critical habitat within the Sacramento River; EFH for Pacific salmon in the Sacramento River or lower American River; steelhead or its habitat in the Sacramento River or lower American River; splittail or its habitat in the Sacramento River, lower American River, Cosumnes River, or Delta; or delta smelt or its habitat in the Sacramento River or Delta. Potential effects could result from the increased diversion of water from FSC as the source of cooling water for the CPP.

The utilization of an additional 7.3 cfs of water from the FSC could potentially reduce the water available for release from Lake Natoma that would support Pacific salmon in the lower American River and downstream in the Sacramento River. The American River has an average annual unregulated runoff of 2.7 million acre-feet. Average annual runoff has varied from 900,000 acre-feet to 5,000,000 acre-feet (ACOE et al. 2001). The estimated 5,320-acre feet required annually by the CPP equates to 440 AF/month or 14.7 AF/day or 7.3 cubic feet per second (cfs).

Hydrologic modeling results (Appendix D, Fish Resources and Aquatic Habitat) showed no detectable difference (undetectable incremental change) in instream flows in the lower American River or Sacramento River when comparing the proposed action to baseline conditions. In the absence of a detectable effect of the proposed action on these habitat indicators, it was concluded that the proposed action *may affect, but would not likely adversely affect:*

- Adult winter-run or spring-run Chinook salmon migration in the Sacramento River;
- Potential foraging habitat for juvenile winter-run and spring-run Chinook salmon in the lower reaches of the lower American River above its confluence with the Sacramento River;
- Critical habitat for adult and juvenile winter-run Chinook salmon in the Sacramento River;
- EFH provided by the Sacramento River for spring-run and winter-run Chinook salmon;
- EFH provided by the Sacramento River or lower American River for Pacific salmon (fall/late-fall run Chinook salmon);

- Steelhead or its habitat in the Sacramento River or lower American River;
- Splittail or its habitat in the Sacramento River or lower American River; or
- Delta smelt or its critical habitat in the Sacramento River / Delta.

3.3.2.2B Water Temperature

Results of the hydrologic simulation model were used, in combination with the lower American River water temperature simulation model, to evaluate the potential effect of the operation of the CPP on seasonal water temperatures affecting EFH for Pacific salmon, steelhead and splittail and their habitat. Results of the modeling did not detect differences in seasonal water temperature conditions in the lower American River related to the proposed action when compared to baseline conditions (Appendix D, Fish Resources and Aquatic Habitat). These assessments considered individual fish species' requirements for spawning, egg incubation, juvenile rearing and emigration (Appendix D, Fish Resources and Aquatic Habitat). Upon review of the modeling results, it was concluded that the proposed action *may affect, but would not likely adversely affect* EFH for Pacific salmon, steelhead or splittail and their habitat in the lower American River.

3.3.2.3B Changes in the Location of X2 in the Delta

Hydrologic simulation modeling was used to analyze the potential effects of the proposed action on the location of X2 (saline / freshwater interface) in the Delta. Results of these analyses did not detect differences in the location of X2 as a result of proposed action when compared to baseline conditions (Appendix D, Fish Resources and Aquatic Habitat). Based on these results, it was concluded that the proposed action *may affect, but would not likely adversely affect* EFH for Pacific salmon, steelhead or its habitat, splittail or its habitat, or delta smelt or its critical habitat in the estuarine portion of the Delta.

3.4B Summary of Proposed Action Effects

Based on implementation of standard construction BMPs, incorporation of specific design features to avoid effects to aquatic resources, and the results of hydrologic simulation modeling (Appendix D), it was concluded that construction and operation of the proposed action *may affect, but would not likely adversely affect* Pacific salmon, steelhead, splittail or delta smelt in the Cosumnes River, Badger Creek, and Laguna Creek, the lower American River, Sacramento River, or Delta.

Installation of the natural gas pipeline during the dry season and using HDD construction technique would minimize potential effects to water quality. In addition, the gas pipeline would not result in either a blockage or impediment to Pacific salmon or steelhead adult immigration or juvenile emigration, or splittail movement in the Cosumnes River, Badger Creek, or Laguna Creek. Stormwater drainage would be in accordance with BMPs, and a stormwater drainage system would be designed to avoid erosion and scour associated with stormwater discharge. Construction BMPs and other avoidance measures would be used, in combination with HDD and would not result in adverse effects to Pacific salmon, steelhead, or splittail.

The CPP will be designed with ZLD from cooling system operations, and hence would not have any adverse water quality effect to EFH for Pacific salmon, steelhead or its habitat, or splittail or its habitat in Clay Creek. Results of the simulation modeling indicate that operation of the CPP facilities would not adversely affect EFH for Pacific salmon, steelhead or its habitat, or splittail or its habitat as the proposed action would not have a direct adverse effect on American River flows, Sacramento River flows, or the location of X2 in the Delta. Additionally, the proposed action would not adversely affect EFH for Pacific salmon, steelhead or its habitat as operation of the CPP facilities would not result in significant direct adverse affects to lower American River water temperatures.

Analyses of these features indicate that the proposed action *may affect, but would not likely adversely affect* Pacific salmon (and their EFH), steelhead or their habitat, or splittail or their habitat in the action area including the lower American River, Sacramento River, Delta, Cosumnes River, Badger and Laguna Creeks, or other tributaries within the project area.

This page left blank

4.0B Cumulative Effects to Protected Fish Species, Critical Habitat, and Essential Fish Habitat for Pacific Salmon

This section provides a discussion of potentially cumulative effects that may occur in the action area with focused consideration of the Proposed Action's contribution to these effects (incremental effect analysis). This discussion includes an evaluation of CPP's fisheries resources effects, which when considered in conjunction with effects attributable to other projects (either in the vicinity or with similar characteristics), could have the potential to result in collectively adverse effects to the environment that are of greater significance than the individual effects of the proposed action. A discussion of growth-inducing effects follows the cumulative effects analysis.

For purposes of this BRA, cumulative effects include the "effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act" [50 CFR §402.02].

4.1B Projects Considered as part of Cumulative Effects

4.1.1B Land-Based Activities

Non-federal projects identified in the vicinity of the proposed action include:

- An application for biosolids storage on 3 parcels on the north side of Twin Cities Road (06/11/97), adjacent to and east of Clay Station Road. Mr. Gary Silva stores and applies biosolids to cattle pastures in this area.

Non-federal projects identified in the vicinity of the proposed pipeline action include:

- An application to create two lots on the Buzdas property (9/25/00);
- An application to create a residential accessory dwelling (8/30/00);
- An application to create a residential accessory dwelling (Leonard no date);
- An application for Lakepoint Apartments –pending (no date);
- An application to rezone Park to "O" (1/27/99);
- An application from JDS Laguna Sub. Extension of Time (9/21/01);
- An application for RV and Boat storage use permit (12/31/97); and
- An application for Harris ranch #1 – now City of Elk Grove recorded 4/4/2000.

4.1.2B Water Diversion Actions

Currently proposed or future anticipated diversion projects along with various environmental initiatives use the water supplies in the American and Sacramento River basins. These include, but are not necessarily limited to, the past, present, and reasonably

foreseeable actions that are identified below. These actions and projects could result in cumulative environmental effects within the action area, including the American River Basin.

Past Actions

Significant actions have occurred over the years that, collectively, have shaped the physical, natural, regulatory, and socioeconomic environment of the Central Valley, including the action area for the CPP. On a broad scale, such past actions have included agricultural production developments, urban expansion, flood control efforts along major rivers, and increased use and management of water resources within the Central Valley for multi-purpose beneficial uses. Specific actions can be categorized into two groups associated with (1) physical changes or alterations within the Central Valley, and (2) regulatory or administrative changes to the Central Valley Project (CVP) and other projects.

The most notable physical changes include the development of the CVP and State Water Project (SWP). Dams and other water supply and flood control structure have indelibly changed the natural hydrology of many rivers within the Central Valley. Along the major tributaries to both the Sacramento and San Joaquin rivers, the construction of dams has blocked migration routes for certain anadromous fish (e.g., Chinook salmon and steelhead). From a regulatory or administrative perspective, several key guiding initiatives have influenced the manner in which the integrated CVP/SWP is operated and managed.

Past actions include the following:

- U.S. Bureau of Reclamation (Reclamation) - Auburn Dam Construction
- Placer County Water Agency (PCWA) - Middle Fork Project Development
- Reclamation - Central Valley Project Improvement Act (CVPIA)
- Reclamation and Department of Water Resources (DWR) - CVP/SWP Operations and Coordinated Operations Agreement (COA)
- State Water Resources Control Board (SWRCB)/Regional Water Quality Control Board (RWQCB)- Water Quality Control Plan (WQCP) for the Sacramento-San Joaquin River Basins
- SWRCB – San Francisco Bay-Sacramento-San Joaquin Delta Estuary Pollutant Policy Statement
- SWRCB – Bay-Delta Accord
- SWRCB – California Inland Surface Water Plan
- U.S. Fish and Wildlife Service (USFWS) – Biological Opinion for Delta Smelt – Los Vaqueros
- USFWS – Biological Opinion for Delta Smelt – Operations and Criteria Plan (OCAP)
- National Marine Fisheries Service (NMFS) – Biological Opinion for Winter-run Chinook Salmon – per the Bay-Delta Accord

- NMFS – Conference / Biological Opinion for Sacramento Splittail – Long-term OCAPl
- NMFS – Listing of Spring-run Chinook Salmon and Steelhead
- NMFS – Biological Opinion for Steelhead
- City of Roseville – Pumping Plant Expansion, Water Treatment Plant Expansion
- City of Sacramento – Water Treatment Facilities Expansion, Fish Screen Replacement Project
- San Juan Water District (SJWD) – Water Facilities Plan and Water Master Plan
- Sacramento County Water Agency (SCWA) – Application to Appropriate Water from the American and Sacramento Rivers

It is noted that these past actions, for example, meeting the conditions of the biological opinions, may be considered ongoing activities and also could be placed in the list below.

Present or Ongoing Actions

Present actions within the study area that produce effects similar to environmental effects that could occur with implementation of the Proposed Action are listed below.

- CVP Water Service Contracts
- New contracts under Public Law 101-514, Section 206
- SWP Water Customer Contracts
- American River Water Rights Users
- Reclamation / PCWA Seasonal Pump Station – Middle Fork Project Water Entitlements
- PCWA / SJWD – Long-term Groundwater Stabilization Project
- Reclamation – CVPIA Anadromous Fish Restoration Program
- Reclamation – CVPIA Dedicated CVP Yield
- CALFED Bay-Delta Program
- Bay-Delta Water Quality Hearings
- Implementation of Sacramento Area Water Forum Agreement Elements and Programs
- Temperature Control Device at Folsom Dam

Reasonably Foreseeable Actions

Future actions that affect water sources within the action area that could produce environmental effects similar to the Proposed Action include other actions or projects that would facilitate increased diversions from the CVP / SWP system and generally are anticipated to take place over the same timeframe (next 20 to 30 years).

- Renewal of CVP Water Service Contracts (American River Division actions)
- City of Roseville, EID and NWD Warren Act Contracts (American River Division actions)
- Folsom Reservoir Flood Control Operations and Dam Modifications (American River Division actions)
- Lower American River Minimum Flow Pattern (American River Division actions)

- PCWA – Auburn Pump Station
- Georgetown Divide Public Utility District Folsom North Pumping Plant
- Reclamation – CVPIA Supplemental Water Supplies
- Sacramento Regional Wastewater Treatment Plant Expansion
- Trinity River Flow Requirements
- El Dorado Irrigation District Temperature Control Device at Folsom Reservoir
- PCWA / FERC Relicensing of Middle Fork Project Operations
- DWR / FERC Relicensing of SWP / Oroville Operations

These past, present, and reasonably foreseeable actions within the regional study area would have the following types of effects:

- Increased demands to serve environmental purposes;
- Increased demands for municipal and industrial water;
- Increased operational requirements for the CVP (e.g., minimum stream flow releases, reservoir storage requirements); and
- Changes in the CVP or SWP system resulting from changes in water demand, changes in operational requirements, and new or modified CVP or SWP facilities.

These actions and projects have been incorporated into the hydrologic modeling performed for the cumulative impact assessment. Additional details regarding the assumptions are provided in Appendix D, Fish Resources and Aquatic Habitat.

Additional information regarding the actions, projects and programs listed above is available in project-specific documentation, as well as the following reports:

- Water Forum Draft Environmental Impact Report
- Central Valley Project Improvement Act Programmatic Environmental Impact Statement
- Trinity River Flow Evaluation Project Draft Environmental Impact Report / Environmental Impact Statement

4.2B Cumulative Effects Analysis

4.2.1B Land-Based

The CPP project could temporarily disturb aquatic habitat due to the construction of the power plant and gas pipeline. This disturbance, however, would be avoided and / or minimized through the use best management practices. In addition, pipeline construction would occur during the dry season and employ the HDD construction technique, as described in Section 3.0. Additionally, a response plan for HDD construction activities has been incorporated into the proposed action (Refer to Appendix C, preliminary HDD

Contingency Plan). Construction limits, environmental awareness training, biological monitoring, and habitat restoration after construction would avoid and mitigate temporary disturbances (see Section 5.0B).

4.2.2B Water Diversion

This section presents the results of hydrologic and water temperature modeling performed to evaluate the cumulative and Proposed Action incremental effects to fisheries resources. The discussion focuses only on potentially significant cumulative effects. For additional information please refer to Appendix D, Fish Resources and Aquatic Habitat.

Cumulative Effects Analysis Framework and Methodology

The future cumulative condition was modeled using Reclamations PROSIM model of the CVP and SWP, the California Department of Water Resources (DWR) Upper American River Model ("UARM") of the major reservoirs and river reaches above Folsom Reservoir, Reclamation's American and Sacramento rivers water temperature models, and Reclamation's American and Sacramento rivers early-lifestage Chinook salmon mortality models. For additional information on the above models, please refer to Appendix D (Fish Resources and Aquatic Habitat).

Model Simulations

Model simulations were developed to represent existing and future hydrologic conditions with and without implementation of the Proposed Action. The simulations were then compared to identify the potential changes in the CVP/SWP hydrologic conditions (i.e., instream flow, reservoir elevations, end-of-month storage, and water temperature) that could influence environmental resources. The evaluation of environmental impacts was performed by considering the modeling results from the comparison in light of the impact indicators and significance criteria developed for each resource topic.

Three simulations scenarios are used to perform the cumulative analysis:

Existing – The existing or baseline condition simulation represents the SMUD diversion at Folsom South Canal under existing practices. The recent historical maximum annual diversion amount for SMUD is 15 TAF, consisting of water rights supply only. This baseline condition provides the analysis comparison for the overall cumulative effect evaluation.

Cumulative Condition – The cumulative condition simulation includes all reasonably foreseeable future demands including implementation of the Proposed Action, increasing the SMUD annual Folsom South Canal diversion to 30 TAF, with 15 TAF water rights supply and 15 TAF CVP M&I supply subject to water year delivery restrictions. This simulation includes future build-out demands by all purveyors, subject to delivery restrictions defined through known agreements such as the Water Forum, as well as any reasonably foreseeable system operational changes or environmental obligations. The cumulative condition simulation incorporates all relevant existing Biological Opinions.

Cumulative without the Proposed Action (Incremental) – The cumulative without the Proposed Action simulation incorporates all reasonably foreseeable demands with the exception of the future SMUD CPP demand. Under this model simulation, the maximum annual diversion

amount for SMUD at Folsom South Canal is 24.68 TAF, with 15 TAF water rights supply and 9.68 TAF CVP M&I supply subject to water year delivery restrictions.

Impact Assessment Comparisons

The following comparisons were performed to assess the potential cumulative and incremental effects of the Proposed Action.

Cumulative vs. Existing - Identifies the cumulative impacts of all reasonably foreseeable actions related to the Action Area. A permanent power plant facility with an annual diversion amount of 5,320 AF under future conditions was compared to permanent power plant facility with an annual diversion amount of 5,320 AF under existing conditions.

Cumulative vs. Cumulative without the Project. Identifies, in a future context, the potential impacts and benefits of installing the proposed power plant facility. A permanent SMUD power plant facility with an annual diversion amount of 5,320 AF subject to dry year restrictions from Folsom South Canal was compared to the existing condition with no SMUD power plant diversion.

By using 5,320 AF / year for cooling, the CPP project would incrementally contribute to a regional increase in water demands from the baseline condition. However, historically this water was a portion of the water that was used during the operation of the Rancho Seco Nuclear Generation Station (1973 to 1989). Currently the Rancho Seco Nuclear Generating Station uses approximately 15,000 AF / year to support ongoing decommissioning activities. This equates to approximately 20 cfs. The operation of the CPP would utilize approximately 440 AF / month (14.7 AF / day, 7.3 cfs). This amount is unmeasurable in the hydrologic simulation modeling performed as part of this assessment. The total water used at the Rancho Seco site for decommissioning and the operation of the CPP will be approximately 27.3 cfs and was unmeasurable in the hydrologic simulation modeling performed as part of this assessment.

The 70-year and 69-year periods of record for the hydrologic and temperature modeling, respectively, (Appendix D, Fish Resources and Aquatic Habitat) were used to analyze potential cumulative effects of the Proposed Action on fish resources and aquatic habitat. Analyses were performed to compare estimated flows and water temperature within the lower American and Sacramento rivers, and X2 location each month over the 1921-1991 (hydrologic) and 1922-1990 (water temperature) modeling periods. For each analysis, a monthly comparison was made of the cumulative condition, which consists of all reasonably foreseeable projects including the Proposed Action until the year 2020, to the existing condition. Embedded in this analysis is the comparison between the Cumulative Condition and the Cumulative without the Project Condition. The Cumulative Condition without the Project simulates the Proposed Action's incremental contribution to the cumulative condition. In other words, it illustrates the contribution that the Proposed Action's diversion of a yearly average of 7.35 cfs (monthly average ranging from 6.5 cfs to 8.9 cfs) would have on the cumulative condition. Changes in the long-term (69-year and 70-year) average were then evaluated as part of the analysis.

4.2.3B Flow-Related Effects

4.2.3.1B Impacts To Fall-Run Chinook Salmon and Steelhead in the Lower American River

Modeling results show that flows at Watt Avenue are reduced during the October through February adult fall-run Chinook salmon spawning and incubation period under the cumulative condition relative to the existing condition. Long-term average flow at Watt Avenue would decrease 14.3 percent during October, 12.3 percent during November, and 8.5 percent during December. During the remaining months of the adult fall-run Chinook salmon incubation period, long-term average flow at Watt Avenue would decrease 2.4 percent during January, and 3.1 percent during February under the cumulative condition relative to the existing condition.

During the March through June juvenile fall-run Chinook salmon and steelhead rearing period, long-term average flow at Watt Avenue would decrease 4.2 percent during March and 6.3 percent during May under the cumulative condition relative to the existing condition. During the remaining months of the juvenile fall-run Chinook salmon and steelhead rearing period, long-term average flow decreases at Watt Avenue would range from 1.6 to 2.6 percent under the cumulative condition relative to the existing condition.

During the over-summer juvenile steelhead rearing period (July through September), long-term average flow at Watt Avenue would decrease 7.9 percent during July, 10.9 percent during August, and 16.4 percent during September under the cumulative condition relative to the existing condition.

Reductions in flow under the cumulative condition relative to the existing condition could adversely affect adult fall-run Chinook salmon spawning habitat availability, juvenile fall-run Chinook salmon and steelhead rearing habitat availability, and over-summer juvenile steelhead rearing habitat availability in the lower American River.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. Modeling results indicate that the incremental contribution of the Proposed Action to cumulative flow reductions during the adult fall-run Chinook salmon spawning and incubation period would be negligible. During the adult fall-run Chinook salmon spawning and incubation period, the incremental contribution of the Proposed Action comprises 0.3 percent or less of the cumulative long-term average monthly mean flow reductions at Watt Avenue.

During the March through June juvenile fall-run Chinook salmon and steelhead rearing period, the incremental contribution of the Proposed Action to the cumulative condition would consist of a reduction in the long-term average flow at Watt Avenue of 0.3 percent during April, and an increase in the long-term average flow at Watt Avenue of 0.1 percent during May. During the remaining months (March and June) of the juvenile fall-run Chinook salmon and steelhead rearing period, the incremental contribution of the Proposed Action to cumulative long-term average monthly flow reductions at Watt Avenue would consist of a 0.2 percent decrease.

During the over-summer juvenile steelhead rearing period (July through September), the incremental contribution of the Proposed Action to the cumulative condition would consist

of a reduction in the long-term average flow at Watt Avenue of 0.4 percent during July, 0.1 percent during August, and 0.2 percent during September.

Based on these findings, the incremental contribution of the Proposed Action to the cumulative condition would not adversely affect adult fall-run Chinook salmon spawning and incubation, juvenile fall-run Chinook salmon and steelhead rearing, or over-summer juvenile steelhead rearing.

4.2.3.2B Impacts to Splittail in the Lower American River

Modeling results show that flows at Watt Avenue are reduced during the February through May adult splittail spawning period under the cumulative condition relative to the existing condition. Long-term average flow at Watt Avenue would decrease 4.2 percent during March and 6.3 percent during May. During the remaining months (February and April) of the adult splittail spawning period, long-term average monthly flow at Watt Avenue would decrease 3.1 percent during February and 1.6 percent during April under the cumulative condition relative to the existing condition. As a result, the amount of inundated riparian habitat between RM 8 and RM 9 on the lower American River would be reduced for each month of the February through May adult splittail spawning period, particularly during April (11 percent) and May (8.3 percent) under the cumulative condition relative to the existing condition. Reductions in flow under the cumulative condition relative to the existing condition could adversely affect adult splittail spawning habitat availability in the lower American River.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. Modeling results indicate that the incremental contribution of the Proposed Action to the cumulative condition would result in no reduction in the average long-term usable inundated riparian habitat for any month of the February through May adult splittail spawning period.

Based on these results, the incremental contribution of the Proposed Action to the cumulative condition would not adversely affect adult splittial spawning habitat availability in the lower American River.

4.2.4B Water Temperature-Related Effects

4.2.4.1B Impacts to Fall-Run Chinook Salmon and Steelhead in the Lower American River

Modeling results show that water temperatures at Watt Avenue are higher during the March through June juvenile fall-run Chinook salmon and steelhead rearing period under the cumulative condition relative to the existing condition. Long-term average water temperature at Watt Avenue would increase 0.3°F in May, and 0.1°F in June under the cumulative condition relative to the existing condition. During the remaining months (March and April) of the juvenile fall-run Chinook salmon and steelhead rearing period, long-term average water temperature at Watt Avenue would not differ under the cumulative condition relative to the existing condition.

During the July through September over-summer juvenile steelhead rearing period, long-term average water temperature at Watt Avenue would increase 0.2°F in July and 0.1°F in

August under the cumulative condition relative to the existing condition. In September, long-term average water temperature would decrease 0.2°F under the cumulative condition relative to the existing condition.

Increases in water temperature during July and August under the cumulative condition relative to the existing condition could adversely affect juvenile fall-run Chinook salmon and steelhead rearing and over-summer juvenile steelhead rearing in the lower American River.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. The modeling results show that the Proposed Action would not incrementally contribute to long-term average monthly water temperature increases at Watt Avenue during May or June.

During the July through September over-summer juvenile steelhead rearing period, the incremental contribution of the Proposed Action to the cumulative condition would result in no difference in long-term average monthly mean water temperatures at Watt Avenue during August. Also, the incremental contribution of the Proposed Action to the cumulative condition would consist of an increase in long-term average monthly mean water temperatures at Watt Avenue of 0.1°F during July, and a decrease in long-term average monthly mean water temperatures at Watt Avenue of 0.1°F during September.

Based on these results, the incremental contribution of the Proposed Action to the cumulative condition may affect, but would not adversely affect juvenile fall-run Chinook salmon rearing, or over-summer juvenile steelhead rearing.

4.2.4.2B Impacts to Upper Sacramento River Fisheries

Modeling results show that under the cumulative condition, there are several additional months when water temperatures exceed 56°F or 60°F at Keswick Dam or Bend Bridge relative to the existing condition. There would be 22 more occurrences where the 56°F index would be exceeded, and eight more occurrences where the 60°F index would be exceeded at Keswick Dam relative to the existing condition. At Bend Bridge, there would be 31 more occurrences where the 56°F index would be exceeded and seven more occurrences where the 60°F index would be exceeded relative to the existing condition. Therefore, the cumulative condition would result in significant additional exceedances of the water temperature criteria identified in the NMFS Biological Opinion for winter-run Chinook salmon.

In addition, the cumulative condition relative to the existing condition would result in decreases in long-term early-lifestage survival of winter-run, fall-run, spring-run and late fall-run Chinook salmon. Winter-run Chinook salmon long-term average early-lifestage survival would be 93.4 percent under the cumulative condition compared to 96 percent under the existing condition. For fall-run Chinook salmon, long-term average early-lifestage survival would be 86.2 percent under the cumulative condition compare to 89.6 percent under the existing condition. Spring-run Chinook salmon long-term average early-lifestage survival would be 81.7 percent under the cumulative condition compared to 87.5 percent under the existing condition. The long-term average early-lifestage survival for late fall-run

Chinook salmon would be 98.7 percent under the cumulative condition compare to 99.1 percent under the existing condition.

Based on these conditions, water temperature related effects under the cumulative condition relative to the existing condition could adversely affect fisheries resources in the upper Sacramento River.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. Modeling results indicate that the incremental contribution of the Proposed Action to the cumulative condition would result in only one additional month (October) throughout the entire simulation where the water temperature would exceed 56°F below Keswick Dam, although this occurrence represented an increase of only 0.1°F (from 56.0 to 56.1°F).

Modeling results also show that the incremental contribution of the Proposed Action to cumulative long-term average early-lifestage survival of winter-run, fall-run, spring-run and late fall-run Chinook salmon would be negligible. The incremental contribution of the Proposed Action to the cumulative condition would result in no difference in the long-term average early-lifestage survival of winter-run or late fall-run Chinook salmon. The incremental contribution of the Proposed Action to the cumulative condition would consist of a reduction in the long-term average early-lifestage survival of 0.1 and 0.2 percent for fall-run and spring-run Chinook salmon, respectively.

Based on these results, temperature-related effects associated with the incremental contribution of the Proposed Action to the cumulative condition would not adversely affect fish species in the upper Sacramento River.

4.2.4.3B Impacts to Lower Sacramento River Fisheries

Modeling results indicate that water temperatures at Freeport in the lower Sacramento River are higher under the cumulative condition relative to the existing condition. The number of years that water temperatures at this location would exceed 56°F, 60°F and 70°F would be greater (i.e., 2 occurrences more often for the 56°F index, 11 occurrences more often for the 60°F index, and 9 occurrences more often for the 70°F index) than the existing condition during the period of March through November. In addition, 18 percent of the time in the months of March through November, the monthly mean water temperature at Freeport would increase more than 0.3°F under the cumulative condition relative to the existing condition.

Increases in water temperature under the cumulative condition relative to the existing condition could adversely affect fish species in the lower Sacramento River.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. Modeling results indicate that the incremental contribution of the Proposed Action to the cumulative condition would result in a slight increase in the number of years that water temperatures at Freeport would exceed 60°F and 70°F (i.e., one occurrence more often for both the 60°F index and the 70°F index). Nonetheless, the

incremental contribution of the Proposed Action to the cumulative condition would result in essentially equivalent monthly mean water temperatures at Freeport in the lower Sacramento River for all of the 828 months included in the analysis.

Based on these findings, the incremental contribution of the Proposed Action to the cumulative condition would not adversely affect fish species in the lower Sacramento River.

4.2.5B Delta Fishery Impacts

4.2.5.1B Impacts to Delta Fish Populations

Modeling results show that Delta outflow is reduced during the February through June period considered important for providing appropriate spawning and rearing conditions and downstream transport flows for various fish species in the Delta. Delta outflow would decrease by 10 percent or more, 11 percent of the time for the February through June period under the cumulative condition relative to the existing condition. In addition, during the February through June period, the upstream shift in the position of X2 under the cumulative condition relative to the existing condition would exceed one km 11 percent of the time.

Decreases in Delta outflow and upstream shifts in the position of X2 under the cumulative condition relative to the existing condition could adversely affect Delta fish populations.

Incremental Contribution to the Cumulative Condition

Modeling was conducted to evaluate the incremental contribution of the Proposed Action to significant cumulative effects. Modeling results indicate that the incremental contribution of the Proposed Action to the cumulative condition would result in only one individual month (i.e., May) throughout the entire 70-year period of record when Delta outflow is reduced by as much as two percent for the February through June period. In addition, the incremental contribution of the Proposed Action to the cumulative condition would not result in a shift in the long-term average position of X2 for any given month.

Based on these results, the incremental contribution of the Proposed Action to the cumulative condition would not adversely affect Delta fish populations.

4.2.6B Conclusion

Based upon results of these analyses, it was concluded that the incremental contribution of CPP operations to cumulative flow, water temperature and Delta X2 location effects may affect, but would not be likely to adversely affect, protected fish species and their habitat, or EFH, within the lower American River, Sacramento River, or Delta (Appendix D, Fish Resources and Aquatic Habitat).

4.3B Growth-Inducing Effects

Urban growth is the general trend for the Sacramento County region of the Central Valley, and with continued residential development there has been a general increase in urban (M&I) water demands from the CVP/SWP. Water supply demands are particularly offset by reduced agricultural water use (i.e., through conservation programs), which is the dominant land use displaced by residential development. The USBR, the CVP contractors, the SWRCB and other agencies are in the process of implementing methods to supplement and share

regional water resources. Most notable in the Sacramento area is the Water Forum, which is a diverse group of forty-four members including business, agricultural, environmental, citizen groups, water managers and local agencies. In addition, the Sacramento Area Flood Control Agency (SAFCA) is the state agency primarily responsible for flood protection, and sponsors a number of studies and developments that affect the management and transport of lower American River water (e.g., SAFCA Folsom Dam Modification Report New Outlets Plan).

The CPP is needed to serve the growing electrical demand in the Sacramento region, as well as to improve reliability and voltage support for all of Northern California. SMUD has an obligation to serve all electric power demands in its territory and therefore, must secure additional supplies to serve current and anticipated electrical needs. Thus, construction and operation of CPP does not encourage or induce growth.

5.0B General Protection and Conservation Measures of the CPP Project – Fishery Resources

Many of the potential effects to protected fishery resources and their habitat would be avoided through implementation of general construction management practices. The following measures would be implemented for all proposed action impact areas. These measures would help to avoid and minimize effects to protected fish species, critical habitat, and EFH for Pacific salmon. The CPP project would:

- Prepare a Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP) that details how the protection and mitigation measures will be implemented. The BRMIMP is a document required by the California Energy Commission (CEC) that also describes the responsibilities of the Compliance Manager, who oversees all compliance measures required for the project, the Designated Biologist who oversees compliance with biological mitigation measures, and the Biological Monitor who oversees construction activities on the ground. The Designated Biologist also submits daily logs and monthly compliance reports to the CEC. Any necessary monitoring reports are submitted to the CEC and relevant agencies.
- Provide worker environmental awareness training for all construction personnel. Training would include identification of sensitive biological resources that may occur in construction areas and measures required to minimize project impacts during construction and operation.
- Avoid and minimize impacts to sensitive habitats and species during construction by designating exclusion zones with temporary fencing, flagging, and/or signs that restrict construction activity or access.
- Provide mitigation construction monitoring by qualified biologists during construction activities near sensitive habitats and resources. Prohibit ground disturbance until the Biological Monitor has monitored or surveyed the area for sensitive species and determined the appropriate timing to proceed.
- Minimize extent of habitat disturbance. Require that construction activities be limited to existing roads, access points, and construction zones developed in coordination with qualified biologists as specified in final approved construction plans and documents. Prohibit ground disturbance until cleared by the Biological Monitor (see number 4 above). Where possible along linear pipeline alignments, use the alignment itself as the access route. Prohibit access to construction zones from off-road routes. Prohibit off-road traffic outside designated project areas.

- Prohibit refueling or storage of hazardous materials 100 feet from "waters of the U.S." or waters of the state. For portable equipment that uses fuels or lubricants, use Visqueen or other containment material under the equipment to capture leaks or spills.
- Construct and install the gas pipeline using HDD techniques at stream crossings on the Cosumnes River, Badger and Laguna creeks. Installation of the gas pipeline below the water channels would avoid obstruction of channel flow or impairment of Chinook salmon, steelhead, or splittail passage / movement for the life of the proposed action. In addition, construction and installation of the pipeline would occur during summer months to further minimize potential effects in the Cosumnes River watershed on steelhead, EFH for Pacific salmon, and splittail. Construction periods for the pipeline installation are identified in Table 10.

TABLE 10
Proposed Work Windows for Special-Status Fishes in the CPP Project Area.

Species name	Location	Active Period	Proposed Biological Construction Window
Chinook salmon and steelhead	Cosumnes River, American River and tributaries	November to June	August through October (dry season)
Sacramento splittail	Cosumnes River, American River and tributaries	December to July	August through October (dry season)

Reference: California Department of Fish and Game 1601 Streambed Alteration Agreement (Ref R2-2002-246).

5.1B Protection of Fish and Aquatic Species in Waterways

The Cosumnes River and tributaries support Chinook salmon, steelhead, and Sacramento splittail (Section 2.0B). Protection measures were developed for the CPP project to prevent sediments and construction debris from entering waterways through a site-specific erosion control and restoration plan (Preliminary Draft Stormwater Pollution Prevention Plan, dated May 6, 2002.). Silt fencing and / or other sediment controls will be used at each construction location, including the stormwater outfall. Stormwater during construction and operation at the CPP site will be discharged according to the NPDES permit. The discharge will be monitored according to the requirements of the permit.

The use of HDD for constructing the gas pipeline under the Cosumnes River, Badger and Laguna creeks, and Cosumnes Preserve will minimize impacts to the fish and aquatic habitat. Potential effects could occur if inadvertent returns of drilling mud (frac-out) enter the waterway through a fissure or crack in the soils. The drilling mud (normally bentonite) is a non-toxic clay material often used as an impervious layer in wetland construction and by farmers as a soil enhancement. When drilling mud enters a waterway, it can smother benthic invertebrates, aquatic plants, fish eggs, and young fish. A contingency plan has been developed for the CPP HDD activities and is presented in Appendix C, Contingency Plan for Horizontal Directional Drilling. The plan outlines how an inadvertent return of drilling mud will be minimized, contained, and cleaned up. Prior to construction, the plan will present emergency contact numbers and a spill response team to contact in case of excessive spills. Key points include:

- A Biological Monitor will be on-site or on-call during the HDD and will assist SMUD in monitoring for frac-outs during the drilling operation. The Biological Monitor will consult with CDFG, NMFS, and USFWS and assist in coordinating the containment and clean up of spilled drilling mud.
- HDD equipment and materials will be located at least 150 feet from the outer edge of the Cosumnes River and Badger and Laguna creeks riparian corridors.
- Construction under the waterways would occur during the dry season (August through October) when salmon and steelhead are not expected to be in the river and creeks (because of low flow levels) in the vicinity of construction activity.

Other measures associated with the design and operation of the CPP project include the following:

- Design and operation of a stormwater detention basin and discharge outfall structure to Clay Creek. The outfall from the basin would be designed to incorporate measures to reduce contaminants, consistent with stormwater requirements, and with a flow dissipater structure equivalent to reduce velocity and potential scouring from the outfall. These elements would minimize the potential for introduction of water quality constituents of concern into the local watershed.
- Design and operation of a Zero-liquid Discharge (ZLD) system that would process all of the wastewater produced by the plant, returning a relatively high quality distillate stream for reuse in the plant and producing a solids waste stream suitable for disposal in a landfill. Incorporation of the ZLD system prevents introduction of waste products into the local watershed, thereby avoiding the potential for related water quality and aquatic resources effects.

This page left blank

6.0B Conclusion and Determination of Project Effects on Protected Fish Species, Critical Habitat, and Essential Fish Habitat for Pacific Salmon

Results of this assessment support a conclusion that construction and operation of the proposed CPP ***may affect, but would not likely adversely affect***:

- Protected fish species including winter-run Chinook salmon, spring-run Chinook salmon, steelhead, Sacramento splittail, and delta smelt within the action area;
- Critical habitat in the Sacramento River for winter-run Chinook salmon;
- Critical habitat in the Sacramento River and Delta for delta smelt; and
- EFH for Pacific salmon in the lower American River, Sacramento River, Cosumnes River and tributaries, and Delta.

These findings are based, in part, upon results of a 70-year hydrologic simulation modeling of the proposed action compared to baseline conditions (e.g., including operations in compliance with existing BOs and other State and federal regulations).

The erosion control and contingency planning to protect water quality during project construction, in combination with standard BMPs and other measures designed to avoid and minimize scour and erosion associated with stormwater discharges from the site will minimize / prevent degradation of water quality and related potential effects upon aquatic resources. The findings also are based on consideration of proposed construction techniques for the gas pipeline and the use of HDD construction techniques to avoid obstructions to fish migration in the Cosumnes River and tributaries. The assessment also recognizes the ZLD approach / design for cooling water system operations that would avoid water quality effects resulting from CPP operations. Lastly, results of the hydrologic modeling indicated no detectable changes in lower American River instream flows or water temperatures; Sacramento River instream flows; or the location of X2 in the Delta as a result of the proposed action. The results of these analyses are consistent and support a finding that the proposed action ***may affect, but is not likely to adversely affect*** protected fish species, critical habitat, or EFH for Pacific salmon.

This page left blank

7.0B References

The following references either are specifically cited in the text or generally were used to support the evaluation of fish resources and aquatic habitat effects.

Beak Consultants, Incorporated. 1993. Lower American River Operations and Fisheries Plan. California Department of Fish and Game and Hanson Environmental, Incorporated. September and October 1993.

Bovee, K.D. 1978. Instream Flow Information Paper 12, FWS/OBS-78/07. Probability-of-use Criteria for the Family Salmonidae. United States Fish and Wildlife Service.

Brown and Caldwell, Archibald & Wallberg Consultants, Marvin Jung & Associates, and McGuire Environmental Consultants, Inc. 1995. Study of Drinking Water Quality in Delta Tributaries. Prepared for the California Urban Water Agencies, May 1995.

Brown, L.R., P.B. Moyle, and C.D. Vanicek. 1992. American River Studies: Intensive Fish Surveys, March- June 1991. Department of Wildlife and Fisheries Biology, University of California, Davis, and Department of Biology, California State University, Sacramento. April 1992.

Castleberry, D.T., J.J. Cech, Jr., M.K. Saiki, and B.A. Martin. 1991. Growth, Condition, and Physiological Performance of Juvenile Salmonids from the Lower American River: February through June, 1991. USFWS, National Fisheries Contaminant Research Center, Dixon, CA.

CCOMWP. 1999. Final Environmental Impact Report for the Water Forum Proposal. City of Sacramento, County of Sacramento. Prepared by EDAW and Surface Water Resources, Inc. October 1999.

CDFG. 1980. California Trout, Salmon, and Warmwater Fish Production and Costs, 1978-1979. Inland Fisheries Branch. Inland Fisheries Administrative Report 80-1.

CDFG. 1986. Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California. Stream evaluation Report No. 86-1.

CDFG. 1987. Associations Between Environmental Factors and the Abundance and Distribution of Resident Fisheries in the Sacramento-San Joaquin Delta. CDFG Exhibit No. 24. State Water Resources Control Board 1987 water quality/water rights proceeding for the San Francisco Bay/Sacramento-San Joaquin Delta, Sacramento, CA.

CDFG. 1991. Steelhead Restoration Plan for the American River.

CDFG. 1992. Chinook Salmon and Steelhead Trout Redd Survey Lower American River, 1991- 1992, Final Report.

CDFG. 1993a. Factors Controlling the Abundance of Aquatic Resources in the Sacramento-San Joaquin Estuary.

CDFG. 1993b. Restoring Central Valley Streams: A Plan for Action.

CDFG. 1994. Critical Evaluation of the Emigration Survey: Lower American River, 1993. Final Report.

CDFG. 1995. Chinook Salmon Redd Survey: Lower American River, Fall, 1993.

DWR. 1994a. BA: Effects of the Central Valley Project and State Water Project on Delta Smelt and Sacramento Splittail. Prepared for the U.S. Fish and Wildlife Service by the California Department of Water Resources and the U.S. Bureau of Reclamation. August 1994.

Ganssle, D. 1966. Fishes and Decapods of San Pablo and Suisun Bay. Pages 64-94 in D.W. Kelley, editor, Ecological studies of the Sacramento-San Joaquin Estuary. Part 1. California Department of Fish and Game Bulletin 133.

Hallock, R.J. and F.W. Fisher. 1985. Status of the Winter-run Chinook Salmon (Oncorhynchus tshawytscha) in the Sacramento River. Prepared for the California Department of Fish and Game.

Herbold, B., D. Jassby, and P.B. Moyle. 1992. Status and trends report on the aquatic resources in the San Francisco Estuary. San Francisco Estuary Project Public Report. Prepared under Cooperative Agreement #CE009519-01-1 with the U.S. Environmental Protection Agency.

Jones and Stokes and SWRI. 2000. Program Environmental Impact Report on Flood control Improvements Along the Mainstem of the American River. Prepared for Sacramento Area Flood Control Agency, April 2000.

Moyle, P.B. 1976. Inland Fishes of California. University of California Press. Berkeley, CA. 1976.

Moyle, P.B., R.M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake. 1995. Fish species of concern in California, second edition. Report prepared for the California Department of Fish and Game, Rancho Cordova, CA.

National Marine Fisheries Service (NMFS). 1993. Biological Opinion for Winter-Run Chinook Salmon. February 12, 1993.

Raleigh, R.F., W.J. Miller, and P.C. Nelson. 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Chinook Salmon. USFWS Biological Report 82 (10.1222). 64 pp.

Reclamation and Sacramento County Water Agency. 1997. Draft Environmental Impact Statement and Environmental Impact Report for the P.L.101-514 CVP Water Contracts.

Reclamation. 1991a. Planning Report/Final Environmental Statement. Shasta Outflow Temperature Control.

Reclamation. 1991b. Appendices to Shasta Outflow Temperature Control Planning Report/Environmental Statement. Part I - Fisheries.

Reclamation. 1992. BA for U.S. Bureau of Reclamation. 1992 Central Valley Project Operations. Mid-Pacific Region. Sacramento, CA.

Reclamation. 1996. Preliminary Concept Plan, Restoration and Management of the Auburn Dam Site.

Reclamation. 1997. Central Valley Project Improvement Act Draft Programmatic Environmental Impact Statement. September 1997.

Reclamation. 2001. American River Basin Cumulative Report. August 2001.

Reclamation. 1991b. Appendices to Shasta outflow temperature control planning report / environmental statement. Part I - Fisheries.

Regional Water Quality Control Board, Central Valley Region. 1994. The Water Quality Control Plan (Basin Plan) for the California Water Quality Control Board, Central Valley Region, Sacramento River and San Joaquin River Basins. Third edition.

Reiser, D.W. and T.C. Bjornn. 1979. Habitat requirements of anadromous salmonids. In Influence of forest and rangeland management on anadromous fish habitat in the western Unites States and Canada. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service, Gen. Tech. Rep. PNW-96. Portland, OR. 54 pp.

Reynolds, F.L., R.L. Roberts, and J. Schuler. 1990. Central Valley Salmon and Steelhead Restoration and Enhancement Plan. Prepared for the California Department of Fish and Game.

Rich, A.A. 1987. Establishing Temperatures Which Optimize Growth and Survival of the Anadromous Fishery Resources of the Lower American River. Prep. For McDonough, Holland, and Allen, Sacramento, CA. 25 pp.

Sacramento City-County Office of Metropolitan Water Planning (CCOMWP). 2000. The Water Forum Agreement. City of Sacramento, County of Sacramento. Prepared by EDAW and Surface Water Resources, Inc. January 2000.

Sacramento County Water Agency and U.S. Bureau of Reclamation. 1997. Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Draft Environmental Impact Statement / Environmental Impact Report. July 1997.

Sacramento County Water Agency, San Juan Water District, City of Folsom, and U.S. Bureau of Reclamation. 1995. Initial Alternatives Screening for Water Supply Contracts Under Public Law 101-514 Section 206 Within Sacramento County. Prepared by Beak Consultants, Inc. March 1, 1995.

Sacramento County. 1985. American River Parkway Plan. Planning and Community Development Department (December).

Sacramento County. 2000. Resolution Authorizing the Execution of an Agreement with the City of Sacramento for use of Sacramento River Water Treatment Plant Facilities to Wheel Surface Water (Resolution No. 2000-0386). April 4, 2000.

Sacramento Metropolitan Water Authority and U.S. Bureau of Reclamation. 1996. American River Water Resources Investigation. Planning Report and Draft Environmental Impact Report / Environmental Impact Statement. January 1996.

Sacramento, City of. 1993. Sacramento River Parkway Plan. City of Sacramento Neighborhood Services Department. Department of Planning and Development. October 1993.

Sacramento, City of. 1995. Admin Draft Environmental Impact Report for Water Supply Expansion.

SAFCA and U.S. Bureau of Reclamation. 1994. Interim Reoperation of Folsom Dam and Reservoir Final Environmental Impact Report/Environmental Assessment. Prepared by SAFCA, David R. Schuster, Water Resources Management, Beak Consultants Incorporated. December 1994.

SAFCA. 2001. Draft Environmental Assessment. Long-Term Reoperation of Folsom Dam and Reservoir. September 2001.

San Francisco Estuary Project. 1992. State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.

San Francisco Estuary Project. 1993. Comprehensive Conservation and Management Plan. June 1993.

Sands, A., S.D. Sanders, R.F. Holland, and E.C. Brady. 1985. Exhibits in Support of Testimony on Instream Flow Requirements for the Riparian Corridor of the American River, California.

Sands, A., S.D. Sanders, R.F. Holland, V.I. Dains, and E.C. Beedy. 1985. American River Parkway Riparian Vegetation and Wildlife Testimony. Presented to Staff of the State Water Resources Control Board on behalf of Sacramento County, California. June 5, 1985.

Scott, B. 1995. Cultural Resources portion of Administrative Draft Report, American & Sacramento Rivers Project Task 4: Folsom Dam and Reservoir Permanent Reoperation. Jones & Stokes Associates, Inc., Sacramento. Prepared for the U.S. Army Corps of Engineers, Sacramento District. Not yet on file at NCIC.

Snider, B., R.G. Titus, and B.A. Payne. 1997. Lower American River Emigration Survey: November 1994-September 1995. Final Report. California Department of Fish and Game, Environmental Sciences Division, Stream Evaluation Program. September, 1997.

Snider, W.M. and D. McEwan. 1993. Final Report, Fish community survey, lower American River, February-July 1992. CDFG Environmental Services Division.

Snider, W.M. and E. Gerstung. 1986. Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California. California Department of Fish and Game, Stream Evaluation Report No. 86-1.

Snider, W.M. and N. Keenan. 1994. Final Report, Fish community survey, lower American River, January-June 1993. CDFG Environmental Services Division.

Snider, W.M. and R. Titus. 1994. Fish community survey, lower American River, January-July 1994. CDFG Environmental Services Division.

Snider, W.M. and R. Titus. 1996. Fish Community Survey: Lower American River, January through June, 1995. CDFG Environmental Services Division.

State Water Resources Control Board (SWRCB). 1994. Technical Report, Lower American River Court Reference.

Stevens, D. 1989. When do winter-run chinook salmon smolts migrate through the Sacramento-San Joaquin Delta? Unpublished Memorandum. Prepared for California Department of Fish and Game, Bay-Delta Project. Stockton, CA.

Thompson, J. 1957. The Settlement Geography of the Sacramento-San Joaquin Delta, California. Unpublished Ph.D. dissertation, Stanford University Department of Geography.

U.S. Army Corps of Engineers. 1987. Folsom Dam and Lake, American River, California, Water Control Manual.

U.S. Army Corps of Engineers. 1992. Folsom Dam and Reservoir Reoperation, California. Operation Plan and Environmental Impact Statement. Draft Report. Sacramento, California.

U.S. Army Corps of Engineers. 1998. American River, CA, Rain Flood Flow Frequency Analysis. Sacramento District. February 3, 1998.

U.S. Bureau of Reclamation (Reclamation). 1970. Contract Between the United States of America and Sacramento Municipal Utilities District Providing for Water Service (Contract No. 14-200-5198a). November 20, 1970.

U.S. Fish and Wildlife Service (USFWS). 1967. Special Scientific Report Fisheries No. 550. Biology and Management of the American Shad and Status of the Fisheries, Atlantic Coast of the U.S.

United States Environmental Protection Agency (EPA). 1993. San Francisco Estuary Project Technical Reports.

University of California, Division of Agriculture and Natural Resources (DANR). 1996. Yellow Starthistle Biology and Control (Publication 21541). Oakland: University of California Communication Services. 1996.

USFWS. 1988. Species profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates. U.S. Fish Wildl. Serv. Biol. Rep. 82(11.82).

USFWS. 1991. American River Watershed Investigation, Detailed Report on Fish and Wildlife Resources. Fish and Wildlife Coordination Act Report. Ecological Services, Sacramento Field Office. 42 pp. Sacramento, CA.

USFWS. 1995. Draft Anadromous Fish Restoration Plan, A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California. Prepared for the Secretary of Interior under authority of the CVPIA. With assistance from the Anadromous Fish Restoration Core Group.

USFWS. 1996. American River Water Resources Investigation, Draft Fish and Wildlife Coordination Act Report: A Detailed Report on Fish and Wildlife Resources. Ecological Services, Sacramento Field Office. 106pp.

USFWS. 1999. Trinity River Mainstem Fishery Restoration Draft EIS/EIR. Sacramento Fish and Wildlife Office. July 9, 1999.

Wang, J.C.S. 1986. Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A Guide to the Early Life Histories. Interagency Ecological Study Program for the Sacramento-San Joaquin estuary. Tech. Report #9.

8.0 List of Contacts/Contributors/Preparers

8.1 Contacts

Dan Gifford / California Department of Fish and Game
Ken Fuller / U.S. Fish and Wildlife Service
John Baker / National Marine Fisheries Service
Glen Wiley / U.S. Geological Survey
Mike Finan / U.S. Army Corps of Engineers
Jaymee Marty / The Nature Conservancy / Cosumnes River Preserve
Keith Whitener / The Nature Conservancy / Cosumnes River Preserve
Brian Deason / Bureau of Reclamation / Folsom South Canal

8.2 Contributors

Russell Huddleston / CH2M HILL
Ellyn Davis / Davis Environmental Consulting
Pat Frost / SMUD
Ron Scott / SMUD
Paul Olmstead / SMUD
Ken Fuller / USFWS
Craig Aubrey / USFWS
Dan Gifford / CDFG
John Baker / NMFS
Jaymee Marty / Cosumnes Preserve
Kenneth Whitney / Cosumnes Preserve

8.3 Preparers

EJ Koford / CH2M HILL
Debra Crowe / CH2M HILL
Chuck Hansen / Hansen Environemntal Incorporated
Buzz Link / Surface Water Resources Incorporated
Susan Strachan / Strachan Consulting Inc.

8.4 Reviewed By:

John Carrier / CH2M HILL
Kevin Hudson / IEC
Ron Scott / SMUD
Jane Luckhardt / Downey, Brand, Seymor and Royer

This page left blank

TABLE 1.
Special Status Species Potentially Occurring in the Proposed Cosumnes Power Plant Project Area, Their Status, and Determination of Potential Project Affect.

Species Name	Status*	Habitat†	Not likely to Affect	May Affect	Comments
PLANTS AND HABITATS					
Slender orcutt grass *Orcuttia tenuis*	FT	VP	X		Species is known from pools east of Rancho Seco site
Sacramento orcutt grass *Orcuttia viscida*	FE	VP	X		Species known from vernal pools near Rancho Seco
Fleshy (=succulent) owl's clover *Castilleja campestris* ssp*. succulenta*	FT	VP	X		Not known from Sacramento County
Boggs Lake hedge-hyssop *Gratiola heterosepala*	CE, 1B	VP	X		Not known from project site.
Valley sagittaria (Sanford's arrowhead) *Sagittaria sanfordii*	SC	AW, VP		X	Not known from project site, could occur in wetlands along pipeline.
Legenere *Legenere limosa*	SC, 1B	VP		X	Species is known from Badger Creek and Laguna Creek
Delta tule pea *Lathyrus jepsonii* var*. jepsonii*	SC	CM		X	Species is known from Badger Creek and Cosumnes River
Mason's lilaeopsis *Lilaeopsis masonii*	SC	CM, CR		X	Species may occur in Cosumnes and Badger confluence area.
INVERTEBRATES					
Antioch Dunes anthicid beetle *Anthicus antiohensis*	SC	Sandy soils	X		No suitable habitat
Sacramento anthicid beetle *Anthicus sacramento*	SC	Sandy soils	X		No suitable habitat
Vernal pool tadpole shrimp *Lepidurus packardi*	FE	SW		X	In vernal pool north of CPP site and in seasonal ponding areas along gas pipeline
Vernal pool fairy shrimp *Branchinecta lynchi*	FT	SW		X	In vernal pool north of CPP site and in seasonal ponding areas along gas pipeline
California linderiella *Linderiella occidentalis*	SC	VP		X	In vernal pool north of CPP site and in seasonal ponding areas along gas pipeline

TABLE 1.
Special Status Species Potentially Occurring in the Proposed Cosumnes Power Plant Project Area, Their Status, and Determination of Potential Project Affect.

Species Name	Status*	Habitat†	Not likely to Affect	May Affect	Comments
Midvalley fairy shrimp *Branchinecta mesovallensis*	SC	VP		X	Could occur along with other vernal pool species, no surveys conducted for this species.
Conservancy fairy shrimp *Branchinecta conservatio*	FE	SW	X		Distribution is outside project area
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	elderberry shrubs		X	Scattered shrubs along gas pipeline alignment near Elk Grove Blvd.
FISH					
Winter-run chinook salmon *Oncorhynchus tshawytscha*	FE, SE	migration, CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Spring-run chinook salmon *Oncorhynchus tshawytscha*	FT	migration, CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Fall/late fall -run chinook salmon *Oncorhynchus tshawytscha*	C	migration, CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Delta smelt *Hypomesus transpacificus*	FT, ST	Downstream of CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Central Valley steelhead *Oncorhynchus mykiss*	FT	migration, CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Sacramento splittail *Pogonichthys macrolepidotus*	FT	CR	X		May occur seasonally in Cosumnes River. Construction will avoid water.
Green sturgeon *Acipenser medirostris*	SC	CR	X		Species is not known from project area.
River lamprey *Lampetra ayresi*	SC	CR	X		Construction will avoid Cosumnes River.
Pacific lamprey *Lampetra tridentata*	SC	CR	X		Construction will avoid Cosumnes River.
Kern brook lamprey *Lampetra hubbsi*	SC	CR?	X		Construction will avoid Cosumnes River.

TABLE 1.
Special Status Species Potentially Occurring in the Proposed Cosumnes Power Plant Project Area, Their Status, and Determination of Potential Project Affect.

Species Name	Status*	Habitat†	Not likely to Affect	May Affect	Comments
Longfin smelt *Spirinchus thaleichthys*	SC	CR	X		Construction will avoid Cosumnes River.
REPTILES AND AMPHIBIANS					
California tiger salamander *Ambystoma californiense*	C	AG, VP		X	Known records in 1.25 miles of CPP site, but not detected in surveys of gas line or project site
Western spadefoot toad *Scaphiopus hammondii*	SC/CSC	VP		X	
California red-legged frog *Rana aurora draytonii*	FT	W, pond	X		Not known from project area.
Foothill yellow-legged frog *Rana boylii*	SC	none	X		Not known from project area.
Giant garter snake *Thamnophis gigas*	FT, ST	AW, sloughs and creeks, CRP		X	Known to occur in sloughs ands ditches near Badger Creek and Cosumnes River along gas pipeline.
California horned lizard *Phrynosoma coronatum frontale*	SC	Sandy soil	X		Not known from this project area.
Western pond turtle *Clemmys marmorata*	SC	W, AW, CRP		X	Occurs in Clay Creek, Rancho Seco Reservoir, Cosumnes and tributaries.
BIRDS					
American bittern *Botaurus lentiginosus*	SC	Nesting, CRP, AW	X		Proposed action will avoid nest habitat in Cosumnes Preserve and potential for nesting near waterways
White-faced ibis *Plegadis chihi*	SC	Winter forage CRP, AW, flooded crop, pastures	X		May occur in Cosumnes seasonally.
White-tailed kite *Elanus leucurus*	SC, FP	Nesting, CRP, RI, AC, AG	X		Proposed action will avoid nests.
Bald eagle *Haliaeetus leucocephalus*	FT, SE	winter forage, CRP, AC, AG	X		May occur as winter migrant in region. Nearest historical record of nest 5 miles from project.
Swainson's hawk *Buteo swainsoni*	ST	Nesting, CRP, RI, AC, AG		X	At least 5 historical and current nests known to occur along pipeline .

TABLE 1.
Special Status Species Potentially Occurring in the Proposed Cosumnes Power Plant Project Area, Their Status, and Determination of Potential Project Affect.

Species Name	Status*	Habitat†	Not likely to Affect	May Affect	Comments
Ferruginous hawk *Buteo regalis*	SC	winter forage, AG	X		May occur in region during winter migration.
Greater sandhill crane *Crus canadensis tabida*	ST, FP	winter forage, CRP, AC, AG		X	Cosumnes Preserve is major wintering area.
Mountain plover *Charadrius montanus*	PT	winter forage, CRP ,AG	X		May forage in agricultural habitats as winter migrant.
Burrowing owl *Athene cunicularia hypugea*	SC/CSC	AG, CRP		X	Potential foraging habitat on project site and potential nesting habitat along gas pipeline. One pair observed during surveys at Sims Road.
Little willow flycatcher *Empidonax traillii brewsteri*	SC/SE	Willow riparian	X		May occur rarely in Cosumnes River Preserve.
Bank swallow *Riparia riparia*	ST	Steep banks along Sacramento River	X		No suitable habitat
Grasshopper sparrow *Ammodramus savannarum*	SC	AG, CRP	X		Suspected to nest occasionally in Cosumnes Preserve
Tricolored blackbird *Agelaius tricolor*	SC	CRP, AC, AG	X		Known to nest in Cosumnes Preserve
MAMMALS					
Small-footed myotis bat *Myotis ciliolabrum*	SC	R,CRP	X		Project would avoid all riparian habitat and remove no old buildings.
Long-eared myotis bat *Myotis evotis*	SC	R,CRP	X		Project would avoid all riparian habitat and remove no old buildings.
Fringed myotis bat *Myotis thysanodes*	SC	R, CRP	X		Project would avoid all riparian habitat and remove no old buildings.
Long-legged myotis bat *Myotis volans*	SC	R, CRP	X		Project would avoid all riparian habitat and remove no old buildings.
Yuma myotis bat *Myotis yumanensis*	SC	CRP, R	X		Project would avoid all riparian habitat and remove no old buildings.
Pacific western big-eared bat *Corynorhinust townsendii townsendii*	SC	R, CRP	X		Project would avoid all riparian habitat and remove no old buildings.

TABLE 1.
Special Status Species Potentially Occurring in the Proposed Cosumnes Power Plant Project Area, Their Status, and Determination of Potential Project Affect.

Species Name	Status*	Habitat†	Not likely to Affect	May Affect	Comments
Pale Townsend's big-eared bat *Plecotus townsendii pallescens*	CSC, SC	R, CRP	X		Project would avoid all riparian habitat and remove no old buildings.
Greater western mastiff-bat *Eumops perotis californicus*	SC		X		Project would avoid all riparian habitat and remove no old buildings.
San Joaquin pocket mouse *Perognathus inornatus*	SC	AG	X		Project would avoid all riparian habitat and remove no old buildings.
Riparian (San Joaquin Valley) woodrat *Neotoma fuscipes riparia*	FE	R	X		Not known to occur in project region.
Riparian brush rabbit *Sylvilagus bachmani riparius*	FE	R	X		Not known to occur in project region.
Ring-tailed cat *Bassariscus astutus*	FP	CRP, R	X		Project will avoid all riparian habitat.

* Federal, state, and CNPS listed species.
- FE: Federally Endangered
- FT: Federally Threatened
- SC: Federal Species of Concern
- PE: Federal Proposed Endangered
- PT: Federal Proposed Threatened
- SE: California Endangered
- ST: California Threatened
- CSC: California Species of Special Concern
- FP: California Fully-Protected species
- 1B: CNPS rare or endangered in California and elsewhere
- 2: CNPS rare or endangered in California, more common elsewhere

+ Abbreviations for habitat areas.
- CRP: Cosumnes River Preserve
- FM: freshwater marsh
- CR: Cosumnes River and tributaries
- AG: Annual grassland
- AW: Agricultural water conveyance canal
- AC: Agricultural crop
- R: Riparian
- VP: Vernal pool and seasonal wetlands on CPP project site and gas pipeline alignment

Note: The USFWS and CNDDB searches included the following 71/2 minute USGS topographic quadrangles: Clay, Goose Creek, Elk Grove, Florin, Bruceville, and Galt.

This page left blank

Figures

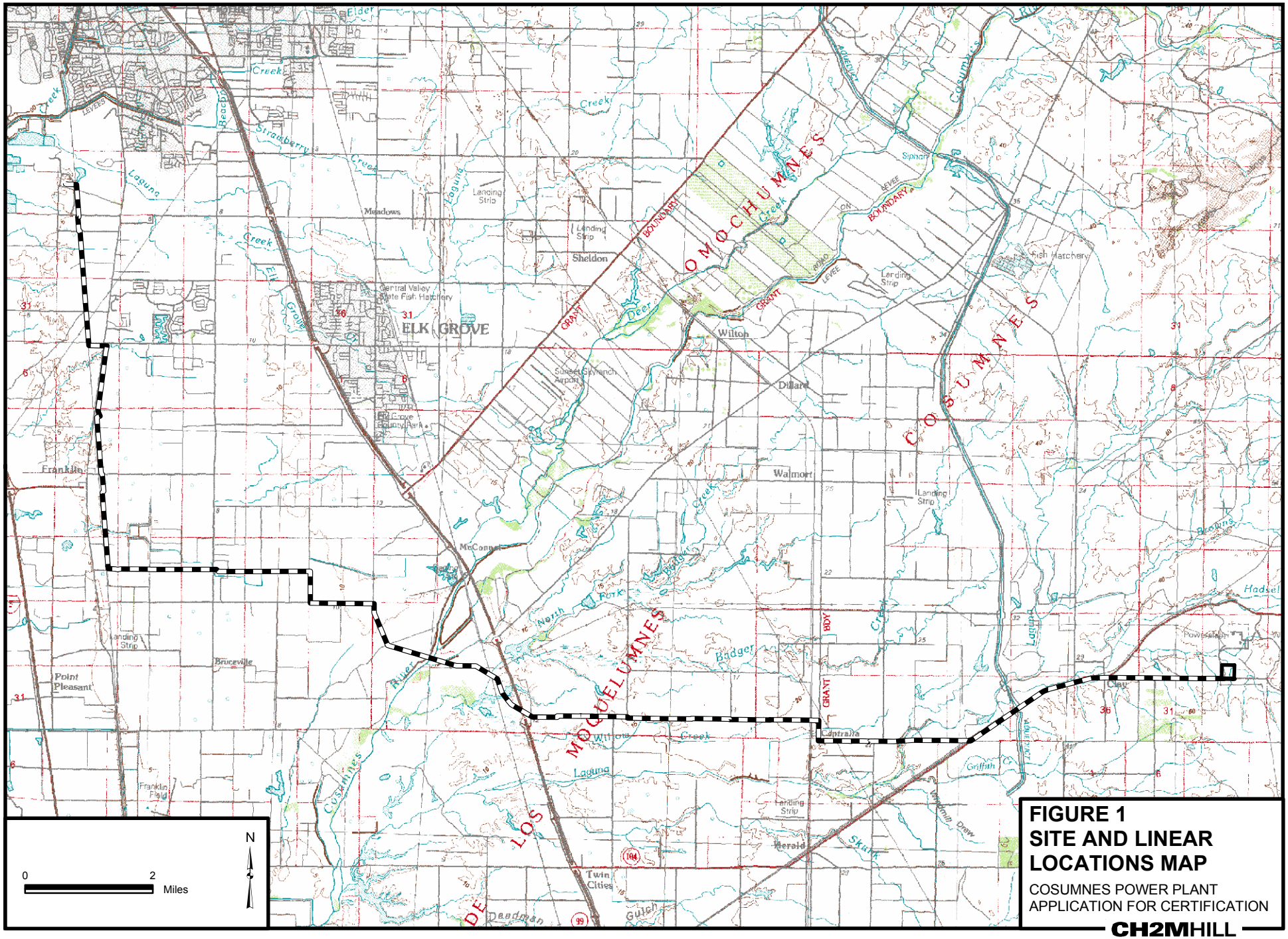


FIGURE 1
SITE AND LINEAR LOCATIONS MAP

COSUMNES POWER PLANT
APPLICATION FOR CERTIFICATION

CH2MHILL

File Path: \\Thor\Cart1\rddgis\Rancho_seco\new_projection_csp83_z2_ft\cpp_sitemap.mxd, Date: December 18, 2002,

LEGEND

- PROPOSED TRANSMISSION POLE
- WETLANDS DELINEATED*
- STREAMS
- DETENTION POND
- CONSTRUCTION ZONE
- ACCESS ROAD
- WATER LINE

*NOTE: Wetlands delineated by:
Davis Environmental Consulting 2000,
Jones and Stokes 1993,
CH2M HILL 2002

N

0 400 Feet

SCALE IS APPROXIMATE

FIGURE 2
DELINEATED WETLANDS AT CPP
COSUMNES POWER PLANT

CH2MHILL

CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_wetland_delineation.apr 2:55 p.m. 01-17-2003

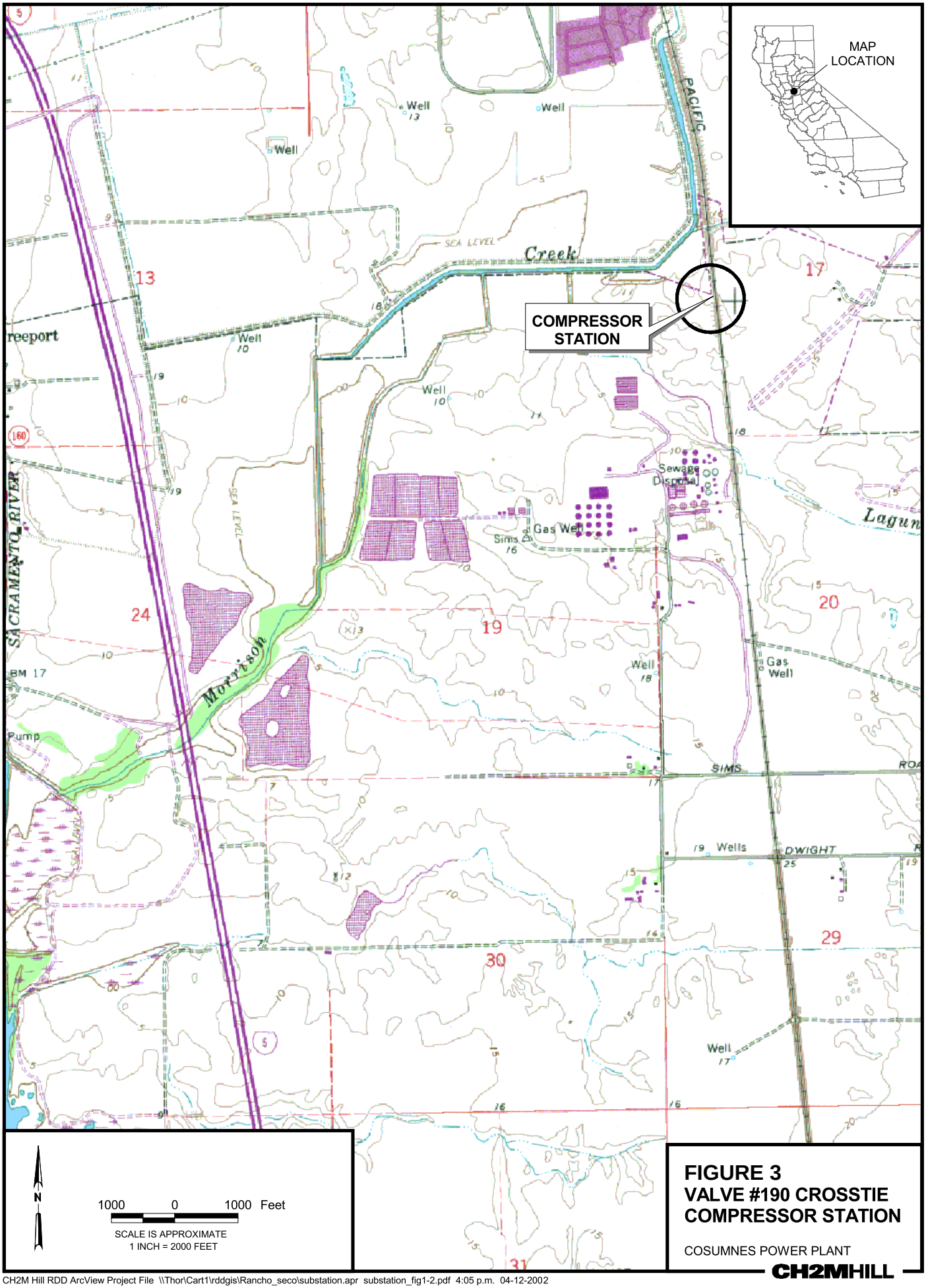


FIGURE 3
VALVE #190 CROSSTIE
COMPRESSOR STATION

COSUMNES POWER PLANT

CH2MHILL

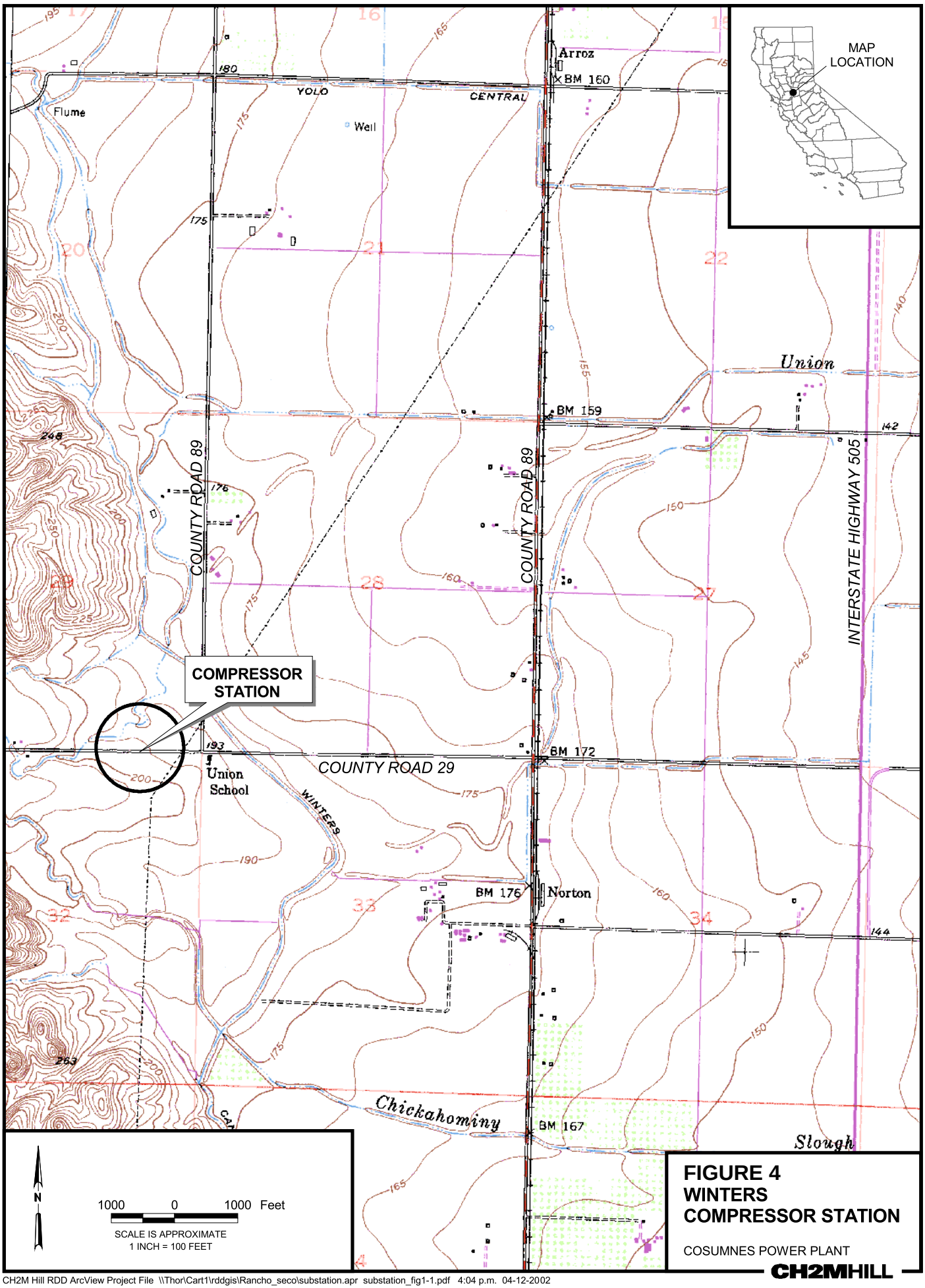


FIGURE 4
WINTERS
COMPRESSOR STATION

COSUMNES POWER PLANT

CH2MHILL

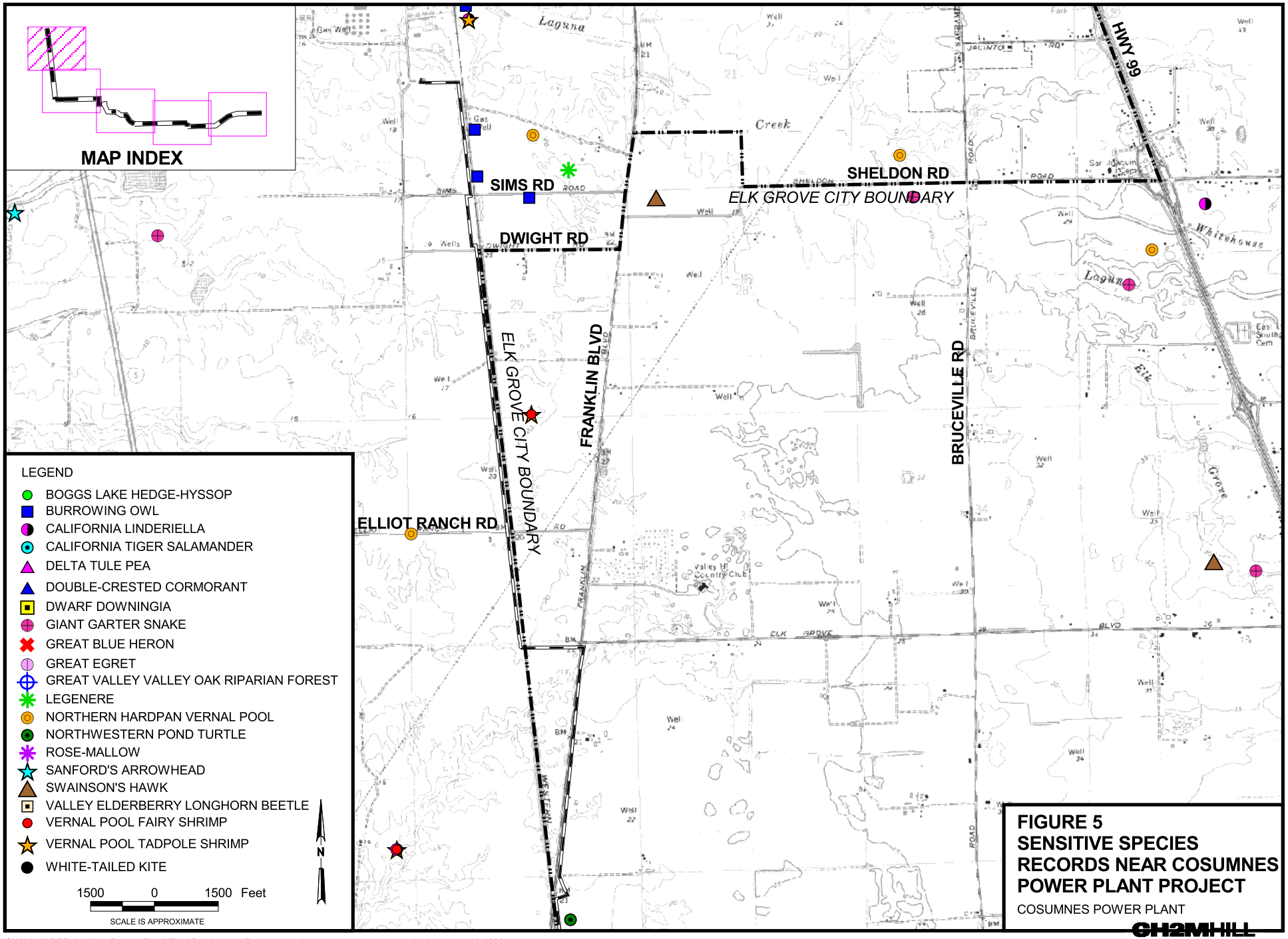
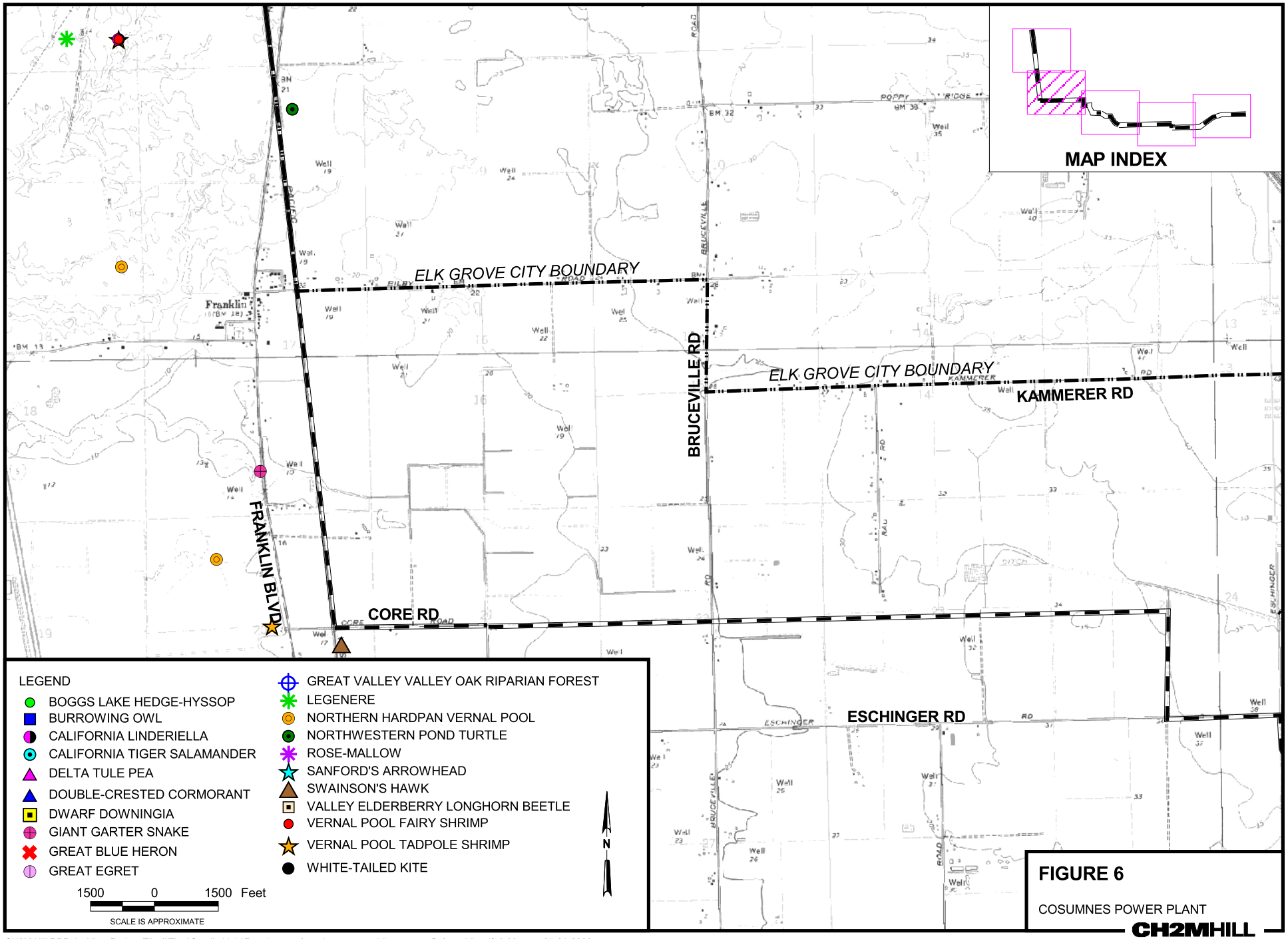


FIGURE 5
SENSITIVE SPECIES RECORDS NEAR COSUMNES POWER PLANT PROJECT

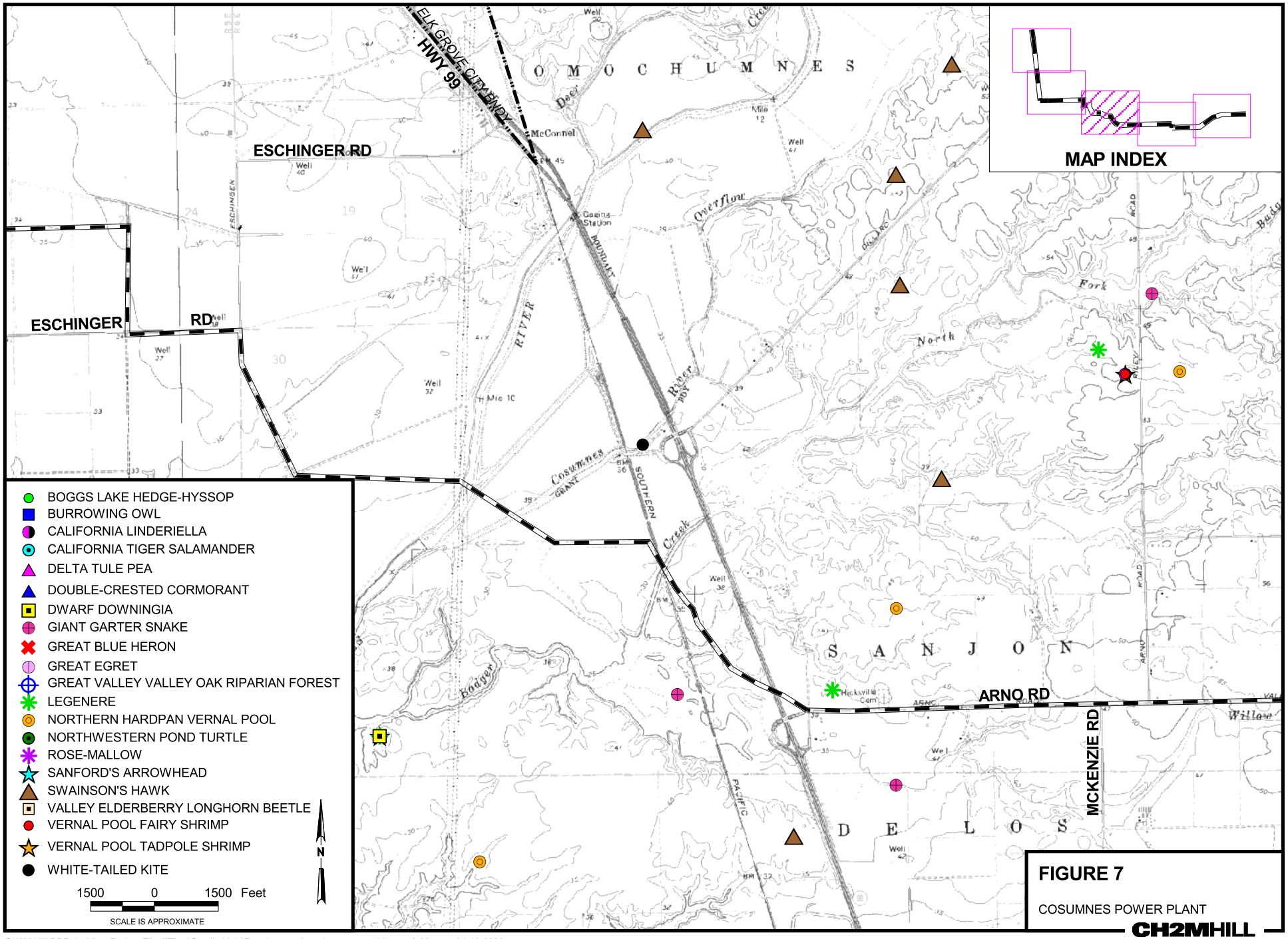
COSUMNES POWER PLANT

CH2MHILL

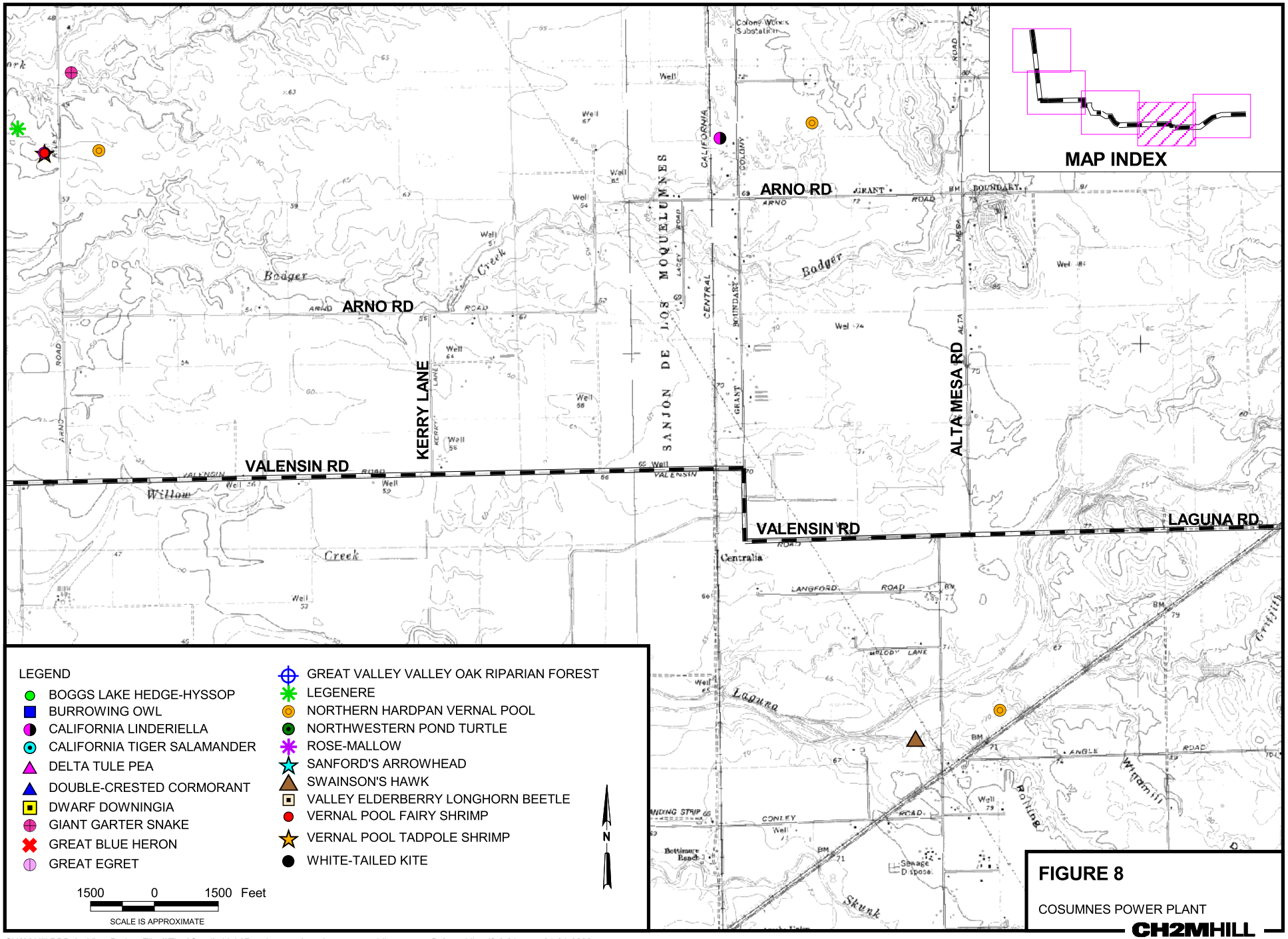
CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_cnddb.apr 2:06 p.m. 01-16-2003



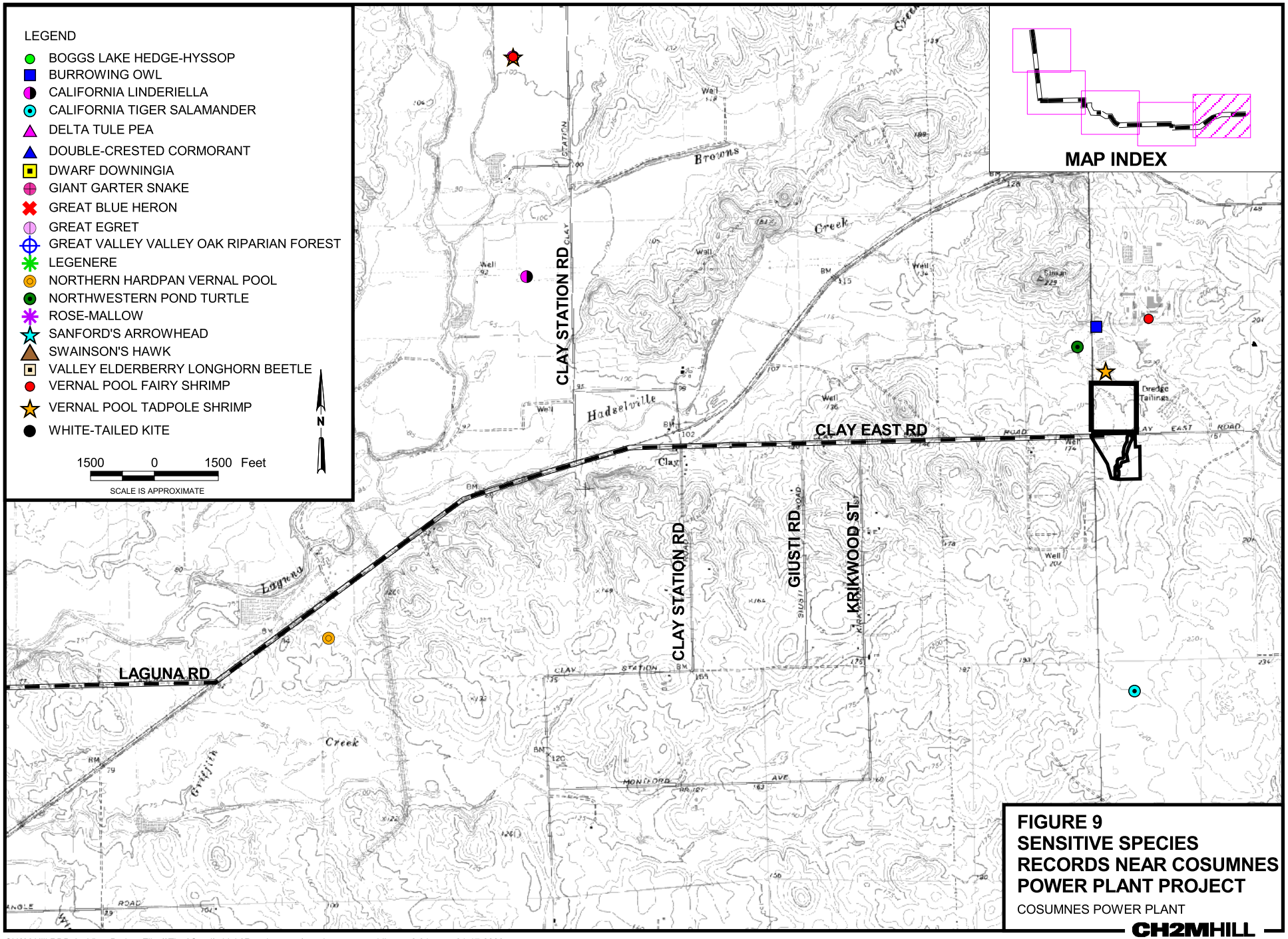
CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_cnddb.apr cpp_fig6_cnddb.pdf 8:22 a.m. 05-21-2002



CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_cnddb.apr 2:08 p.m. 01-16-2003



CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_cnddb.apr cpp_fig8_cnddb.pdf 8:21 a.m. 05-21-2002



CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\Rancho_seco\rancho_seco_cnddb.apr 2:31 p.m. 01-17-2003

APPENDIX A

Species List Provided by USFWS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W2605
Sacramento, California 95825

IN REPLY REFER TO:
1-1-02-SP-0949

February 20, 2002

E.J. Koford and Debra Crowe
CH2M HILL
2485 Natomas Park Drive
Sacramento, California 95833

Subject: Species List for Cosumnes Power Plant

Dear E.J. and Debra:

We are sending the enclosed list in response to your , request for information about endangered and threatened species (Enclosure A). The list covers the following U.S. Geological Survey 7 1/2 minute quads:

495C	CLAY
495D	GOOSE CREEK
496A	ELK GROVE
496B	FLORIN
496C	BRUCEVILLE
496D	GALT

Please read Important Information About Your Species List (enclosed). It explains how we made the list and describes your responsibilities under the Endangered Species Act. Contact Ken Fuller at (916) 414-6645, if you have any questions about the attached list or your responsibilities under the Endangered Species Act.

For the fastest response to species list requests, address them to the attention of Harry Mossman at this address. You may fax requests to him at (916) 414-6712 or 414-6713.

Sincerely,

Harry Mossman

for Jan C. Knight, Chief
Endangered Species Division

Enclosures

Endangered and Threatened Species that May Occur in
or be Affected by Projects in the Selected Quads Listed Below
Reference File No. 1-1-02-TA-0501
Cosumnes Power Plant
February 20, 2002

QUAD: 495C CLAY

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

fleshy (=succulent) owl's-clover, *Castilleja campestris ssp. succulenta* (T)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS

Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

grasshopper sparrow, *Ammodramus savannarum* (SC)

short-eared owl, *Asio flammeus* (SC)

western burrowing owl, *Athene cunicularia hypugaea* (SC)

oak titmouse, *Baeolophus inornatus* (SLC)

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

Swainson's hawk, *Buteo Swainsoni* (CA)

ferruginous hawk, *Buteo regalis* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Vaux's swift, *Chaetura vauxi* (SC)

black tern, *Chlidonias niger* (SC)

white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

greater sandhill crane, *Grus canadensis tabida* (CA)

loggerhead shrike, *Lanius ludovicianus* (SC)

Lewis' woodpecker, *Melanerpes lewis* (SC)

long-billed curlew, *Numenius americanus* (SC)

Nuttall's woodpecker, *Picoides nuttallii* (SLC)

white-faced ibis, *Plegadis chihi* (SC)

bank swallow, *Riparia riparia* (CA)

rufous hummingbird, *Selasphorus rufus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

QUAD: 495D GOOSE CREEK

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

fleshy (=succulent) owl's-clover, *Castilleja campestris ssp. succulenta* (T)

Sacramento Orcutt grass, *Orcuttia viscida* (E)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

grasshopper sparrow, *Ammodramus savannarum* (SC)

short-eared owl, *Asio flammeus* (SC)

western burrowing owl, *Athene cunicularia hypugaea* (SC)

oak titmouse, *Baeolophus inornatus* (SLC)

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

Swainson's hawk, *Buteo Swainsoni* (CA)

ferruginous hawk, *Buteo regalis* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Vaux's swift, *Chaetura vauxi* (SC)

black tern, *Chlidonias niger* (SC)

white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

greater sandhill crane, *Grus canadensis tabida* (CA)

loggerhead shrike, *Lanius ludovicianus* (SC)

Lewis' woodpecker, *Melanerpes lewis* (SC)

long-billed curlew, *Numenius americanus* (SC)

Nuttall's woodpecker, *Picoides nuttallii* (SLC)

white-faced ibis, *Plegadis chihi* (SC)

bank swallow, *Riparia riparia* (CA)

rufous hummingbird, *Selasphorus rufus* (SC)

Brewer's sparrow, *Spizella breweri* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

Kern brook lamprey, *Lampetra hubbsi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

Boggs Lake hedge-hyssop, *Gratiola heterosepala* (CA)

QUAD: 496A ELK GROVE

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, delta smelt, *Hypomesus transpacificus* (T)

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

slender Orcutt grass, *Orcuttia tenuis* (T)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS

Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

grasshopper sparrow, *Ammodramus savannarum* (SC)

short-eared owl, *Asio flammeus* (SC)

western burrowing owl, *Athene cunicularia hypugaea* (SC)

oak titmouse, *Baeolophus inornatus* (SLC)

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

Swainson's hawk, *Buteo Swainsoni* (CA)

ferruginous hawk, *Buteo regalis* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Vaux's swift, *Chaetura vauxi* (SC)

black tern, *Chlidonias niger* (SC)

white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
little willow flycatcher, *Empidonax traillii brewsteri* (CA)
American peregrine falcon, *Falco peregrinus anatum* (D)
greater sandhill crane, *Grus canadensis tabida* (CA)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
Nuttall's woodpecker, *Picoides nuttallii* (SLC)
white-faced ibis, *Plegadis chihi* (SC)
bank swallow, *Riparia riparia* (CA)
rufous hummingbird, *Selasphorus rufus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
southwestern pond turtle, *Clemmys marmorata pallida* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
Sacramento anthicic beetle, *Anthicus sacramento* (SC)
Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

Boggs Lake hedge-hyssop, *Gratiola heterosepala* (CA)
legenere, *Legenere limosa* (SC)
valley sagittaria (=Sanford's arrowhead), *Sagittaria sanfordii* (SC)

QUAD: 496B FLORIN

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *
riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, delta smelt, *Hypomesus transpacificus* (T)

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS

Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)
grasshopper sparrow, *Ammodramus savannarum* (SC)
short-eared owl, *Asio flammeus* (SC)
western burrowing owl, *Athene cunicularia hypugaea* (SC)
oak titmouse, *Baeolophus inornatus* (SLC)
Aleutian Canada goose, *Branta canadensis leucopareia* (D)
Swainson's hawk, *Buteo Swainsoni* (CA)
ferruginous hawk, *Buteo regalis* (SC)
Lawrence's goldfinch, *Carduelis lawrencei* (SC)
Vaux's swift, *Chaetura vauxi* (SC)
black tern, *Chlidonias niger* (SC)
white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
little willow flycatcher, *Empidonax traillii brewsteri* (CA)
American peregrine falcon, *Falco peregrinus anatum* (D)
greater sandhill crane, *Grus canadensis tabida* (CA)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
Nuttall's woodpecker, *Picoides nuttallii* (SLC)
white-faced ibis, *Plegadis chihi* (SC)
bank swallow, *Riparia riparia* (CA)
rufous hummingbird, *Selasphorus rufus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Kern brook lamprey, *Lampetra hubbsi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
Sacramento anthicid beetle, *Anthicus sacramento* (SC)

Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

legenere, *Legenere limosa* (SC)

valley sagittaria (=Sanford's arrowhead), *Sagittaria sanfordii* (SC)

QUAD: 496C BRUCEVILLE

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, delta smelt, *Hypomesus transpacificus* (T)

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS
Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)

grasshopper sparrow, *Ammodramus savannarum* (SC)

short-eared owl, *Asio flammeus* (SC)

western burrowing owl, *Athene cunicularia hypugaea* (SC)

oak titmouse, *Baeolophus inornatus* (SLC)

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

Swainson's hawk, *Buteo Swainsoni* (CA)

ferruginous hawk, *Buteo regalis* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Vaux's swift, *Chaetura vauxi* (SC)

black tern, *Chlidonias niger* (SC)

white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

greater sandhill crane, *Grus canadensis tabida* (CA)

loggerhead shrike, *Lanius ludovicianus* (SC)

Lewis' woodpecker, *Melanerpes lewis* (SC)

long-billed curlew, *Numenius americanus* (SC)

Nuttall's woodpecker, *Picoides nuttallii* (SLC)

white-faced ibis, *Plegadis chihi* (SC)

bank swallow, *Riparia riparia* (CA)

rufous hummingbird, *Selasphorus rufus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)
western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

river lamprey, *Lampetra ayresi* (SC)

Kern brook lamprey, *Lampetra hubbsi* (SC)

Pacific lamprey, *Lampetra tridentata* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)

Sacramento anthicid beetle, *Anthicus sacramento* (SC)

Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)

California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

delta tule-pea, *Lathyrus jepsonii var. jepsonii* (SC)

Mason's lilaeopsis, *Lilaeopsis masonii* (SC)

QUAD: 496D GALT

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

riparian brush rabbit, *Sylvilagus bachmani riparius* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Critical habitat, delta smelt, *Hypomesus transpacificus* (T)

delta smelt, *Hypomesus transpacificus* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)
valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)
vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

fleshy (=succulent) owl's-clover, *Castilleja campestris ssp. succulenta* (T)

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS
Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)
small-footed myotis bat, *Myotis ciliolabrum* (SC)
long-legged myotis bat, *Myotis volans* (SC)
Yuma myotis bat, *Myotis yumanensis* (SC)
San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Birds

tricolored blackbird, *Agelaius tricolor* (SC)
grasshopper sparrow, *Ammodramus savannarum* (SC)
short-eared owl, *Asio flammeus* (SC)
western burrowing owl, *Athene cunicularia hypugaea* (SC)
oak titmouse, *Baeolophus inornatus* (SLC)
Aleutian Canada goose, *Branta canadensis leucopareia* (D)
Swainson's hawk, *Buteo Swainsoni* (CA)
ferruginous hawk, *Buteo regalis* (SC)
Lawrence's goldfinch, *Carduelis lawrencei* (SC)
Vaux's swift, *Chaetura vauxi* (SC)
black tern, *Chlidonias niger* (SC)
white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)
greater sandhill crane, *Grus canadensis tabida* (CA)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
Nuttall's woodpecker, *Picoides nuttallii* (SLC)
white-faced ibis, *Plegadis chihi* (SC)
bank swallow, *Riparia riparia* (CA)
rufous hummingbird, *Selasphorus rufus* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)
western spadefoot toad, *Spea hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Kern brook lamprey, *Lampetra hubbsi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
Sacramento anthicic beetle, *Anthicus sacramento* (SC)
Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)

Plants

Boggs Lake hedge-hyssop, *Gratiola heterosepala* (CA)
legenere, *Legenere limosa* (SC)
valley sagittaria (=Sanford's arrowhead), *Sagittaria sanfordii* (SC)

Endangered and Threatened Species that May Occur in or be Affected by
Projects in the Area of the Following California Counties
Reference File No. 1-1-02-TA-0501
February 20, 2002

SACRAMENTO COUNTY

Listed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

Central Valley spring-run chinook salmon, *Oncorhynchus tshawytscha* (T) NMFS

Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

Critical Habitat, Central Valley spring-run chinook, *Oncorhynchus tshawytscha* (T) NMFS

Critical habitat, Central Valley steelhead, *Oncorhynchus mykiss* (T) NMFS

Critical habitat, delta smelt, *Hypomesus transpacificus* (T)

Critical habitat, winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

delta smelt, *Hypomesus transpacificus* (T)

winter-run chinook salmon, *Oncorhynchus tshawytscha* (E) NMFS

Invertebrates

Conservancy fairy shrimp, *Branchinecta conservatio* (E)

Critical habitat, valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

delta green ground beetle, *Elaphrus viridis* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

vernal pool tadpole shrimp, *Lepidurus packardi* (E)

Plants

Antioch Dunes evening-primrose, *Oenothera deltoides ssp. howellii* (E)

Sacramento Orcutt grass, *Orcuttia viscida* (E)

slender Orcutt grass, *Orcuttia tenuis* (T)

soft bird's-beak, *Cordylanthus mollis ssp. mollis* (E) *

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Birds

Western yellow-billed cuckoo, *Coccyzus americanus occidentalis* (C)

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Fish

Central Valley fall/late fall-run chinook salmon, *Oncorhynchus tshawytscha* (C) NMFS

Critical habitat, Central Valley fall/late fall-run chinook, *Oncorhynchus tshawytscha* (C) NMFS

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

San Francisco dusky-footed woodrat, *Neotoma fuscipes annectens* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

long-legged myotis bat, *Myotis volans* (SC)

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

Birds

Aleutian Canada goose, *Branta canadensis leucopareia* (D)

American bittern, *Botaurus lentiginosus* (SC)

American peregrine falcon, *Falco peregrinus anatum* (D)

Brewer's sparrow, *Spizella breweri* (SC)

California thrasher, *Toxostoma redivivum* (SC)

Lawrence's goldfinch, *Carduelis lawrencei* (SC)

Lewis' woodpecker, *Melanerpes lewis* (SC)

Nuttall's woodpecker, *Picoides nuttallii* (SLC)

Snowy Egret, *Egretta thula* (MB)

Swainson's hawk, *Buteo Swainsoni* (CA)

bank swallow, *Riparia riparia* (CA)

black rail, *Laterallus jamaicensis coturniculus* (CA)

black tern, *Chlidonias niger* (SC)
common loon, *Gavia immer* (SC)
ferruginous hawk, *Buteo regalis* (SC)
grasshopper sparrow, *Ammodramus savannarum* (SC)
greater sandhill crane, *Grus canadensis tabida* (CA)
little willow flycatcher, *Empidonax traillii brewsteri* (CA)
loggerhead shrike, *Lanius ludovicianus* (SC)
long-billed curlew, *Numenius americanus* (SC)
oak titmouse, *Baeolophus inornatus* (SLC)
rufous hummingbird, *Selasphorus rufus* (SC)
short-eared owl, *Asio flammeus* (SC)
tricolored blackbird, *Agelaius tricolor* (SC)
western burrowing owl, *Athene cunicularia hypugaea* (SC)
white-faced ibis, *Plegadis chihi* (SC)
white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)

Reptiles

California horned lizard, *Phrynosoma coronatum frontale* (SC)
northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
silvery legless lizard, *Anniella pulchra pulchra* (SC)
southwestern pond turtle, *Clemmys marmorata pallida* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)
western spadefoot toad, *Spea hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
green sturgeon, *Acipenser medirostris* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)
river lamprey, *Lampetra ayresi* (SC)

Invertebrates

Antioch Dunes anthicid beetle, *Anthicus antiochensis* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)
Midvalley fairy shrimp, *Branchinecta mesovallensis* (SC)
Sacramento anthicid beetle, *Anthicus sacramento* (SC)
San Joaquin dune beetle, *Coelus gracilis* (SC)
curved-foot hygrotus diving beetle, *Hygrotus curvipes* (SC)

Plants

Ahart's (dwarf) rush, *Juncus leiospermus var. ahartii* (SC)
Amador (Bisbee Peak) rush-rose, *Helianthemum suffrutescens* (SLC)
Boggs Lake hedge-hyssop, *Gratiola heterosepala* (CA)
Mason's lilaeopsis, *Lilaeopsis masonii* (SC)
Northern California black walnut, *Juglans californica var. hindsii* (SC) *
Red Bluff (dwarf) rush, *Juncus leiospermus var. leiospermus* (SC)
San Joaquin spearscale (=saltbush), *Atriplex joaquiniana* (SC)
Suisun Marsh aster, *Aster lentus* (SC)
Tuolumne coyote-thistle (=button-celery), *Eryngium pinnatisectum* (SC)
delta tule-pea, *Lathyrus jepsonii var. jepsonii* (SC)
legenere, *Legenere limosa* (SC)
pincushion navarretia, *Naverretia myersii spp. myersii* (SC)
stinkbells, *Fritillaria agrestis* (SLC)
valley sagittaria (=Sanford's arrowhead), *Sagittaria sanfordii* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	Other species of concern to the Service.
(SLC)	*Species of Local Concern*	Species of local or regional concern or conservation significance.
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
NMFS	NMFS species	Under jurisdiction of the National Marine Fisheries Service. Contact them directly.
*	*Extirpated*	Possibly extirpated from the area.
**	*Extinct*	Possibly extinct
	Critical Habitat	Area essential to the conservation of a species.

APPENDIX B

Vernal Pool Invertebrate Habitat Assessment for the Cosumnes Power Plant and Associated Linear Features

Vernal Pool Invertebrate Habitat Assessment for the Cosumnes Power Plant and Associated Linear Features

PREPARED FOR: EJ Koford / SAC

PREPARED BY: Russell Huddleston /SAC

DATE: February 10, 2003

Introduction

The Sacramento Municipal Utility District (the District) proposes to develop a natural gas-fired generating facility south of the Rancho Seco Nuclear Plant in Sacramento County, 25 miles southeast of the city of Sacramento. The proposed Cosumnes Power Plant (CPP) will be located on a 30-acre parcel that is part of 2,480 acres owned by the District. Additional features associated with the proposed project include;

- a 0.2 mile water supply pipeline from the existing Rancho Seco pump station to the CPP;
- a 0.3 mile transmission line, including two monopole tower structures, from the CPP to the Rancho Seco 230 kV switchyard;
- a 0.62 mile access road from the eastern end of Clay East Road to the east entrance of the Rancho Seco facility,
- a 26-mile natural gas supply pipeline constructed from Carson Cogen Facility, approximately 20 miles northwest of the CPP site;
- and a 20-acre laydown area immediately south of the proposed CPP site.

The purpose of this memorandum is to evaluate potential impacts to habitat within the project areas for special status vernal pool crustaceans including the vernal pool fairy shrimp (*Branchinecta lynchii*), the vernal pool tadpole shrimp (*Lepidurus packardi*), and the California fairy shrimp (*Linderiella occidentalis*).

Vernal Pool Fairy Shrimp (***Branchinecta lynchii***)

The vernal pool fairy shrimp is a federally-listed threatened aquatic crustacean in the Branchinectidae family. The vernal pool fairy shrimp has a pale, elongate body ranging from 0.5 to 1.0 inch in length. This species occurs in a variety of seasonally wet habitats including small swales and pools in grasslands, railroad and roadside drainages, and other seasonally ponded areas. This species may be found in short lived and unpredictable pools as small as 6 feet across or in large vernal lakes covering nearly a quarter of an acre. Water quality and substrate can be highly variable, but this species is most often found in pools with muddy or grassy bottoms, low total dissolved solids and moderate to low turbidity. In California this species occurs in the Central Valley from Shasta County south to Tulare

County, and along the coast from Solano County south to San Benito County, with disjunct populations found in San Luis Obispo, Santa Barbara and Riverside Counties. Typically this species is found at elevations between 30 and 1000 feet (Ericksen and Belk, 1999).

The California Natural Diversity Database (CNDDB) identified several occurrences of vernal pool fairy shrimp near the proposed natural gas pipeline including areas between Dwight Road and the town of Franklin California, north of Arno Road, and along Clay Station Road. Vernal pool fairy shrimp have also been reported in the vicinity of the proposed CPP site immediately south of the Rancho Seco Power Plant. Maps of the CNDDB special status species occurrences have are included in Attachment A.

Vernal Pool Tadpole Shrimp (***Lepidurus packardi***)

The vernal pool tadpole shrimp is a federally-listed endangered aquatic crustacean in the Triopsidae family. This species has a distinctive shield-like carapus, and two long cerci at the end of the tail. A flat paddle-shaped anal plate distinguishes this species from the related genus *Triops*. Tadpole shrimp occur in a variety of natural and man-made seasonal wetlands including swales, vernal pools, drainage ditches and stock ponds. While they can occur in a variety of water quality conditions, prolonged periods of inundation (at least seven weeks) are required for survival (Gallagher 1996). The vernal pool tadpole shrimp is endemic to California where it is found from Shasta County south to Merced County and from one disjunct population in Alameda County.

The CNDDB reports several occurrences of vernal pool tadpole shrimp along the natural gas pipeline alignment including areas east of the Sacramento Regional Water Treatment Facility south to Core Road, north of Arno Road and west of Clay Station Road. Maps of these locations are provided in Attachment A. Vernal pool tadpole shrimp were also tentatively identified near Elk Grove Boulevard during the wetland delineation for the natural gas pipeline. These observations were based on visual observation only and no specimens were collected to confirm the identification. Copies of the CNDDB data sheets and mapped locations for these occurrences are included in Attachment B.

California Fairy Shrimp (***Linderiella occidentalis***)

The California fairy shrimp is an aquatic crustacean in the Linderiellidae Family and is a federal species of concern. This species has a pale, elongate body approximately 0.4 inches long, and red compound eyes. This species is the most common fairy shrimp in California's Central Valley and occurs in a wide range of habitats from very small pools to large vernal lakes. They are tolerant of a wide range of water quality conditions including warm temperatures and low dissolved oxygen, but are generally not found in highly alkaline pools or in areas with high amounts of dissolved solids (Ericksen and Belk, 1999). California fairy shrimp range from Shasta County south to Fresno County at elevation typically between 30 and 600 feet.

California fairy shrimp have been reported in the CNDDB in the vicinity of the natural gas pipeline alignment near the Sacramento Regional Waste Water Treatment Plant, by the intersection of Sheldon Road and Highway 99, north of Valensin Road, and west of Clay

Station Road (Attachment A). California fairy shrimp were observed at one location along the western Pacific Rail Road tracks, west of Franklin Boulevard during the wetland delineation for the natural gas pipeline alignment (Attachment B).

Methods

Suitable habitat for special-status vernal pool crustaceans was evaluated based on information collected by Russell Huddleston, CH2M Hill Biologist and vernal pool specialist, during the wetland delineation for the proposed natural gas pipeline alignment and laydown area. Information was also obtained from wetland delineations and biological surveys done for the District's property south of the Rancho Seco Nuclear Facility (Davis 2000, Davis 1999, Jones and Stokes 1993, Jones and Stokes 1984). Aerial photography and field reconnaissance surveys were used to identify areas of potential habitat that were not included in the wetland delineations.

Suitable Habitat

Special-status vernal pool crustaceans may be found in a wide variety of habitats including both natural and man-made seasonal wetlands. Because these species require prolonged seasonal inundation, hydrology was considered a primary factor in determining habitat suitability. Under optimal conditions (minimum daytime temperatures of 20°C) vernal pool fairy shrimp may reach reproductive maturity in after 18 days, however, six to seven weeks of continuous inundation is typically required for both vernal pool fairy shrimp and vernal pool tadpole shrimp(Ericksen and Belk 1999, Gallagher 1996). Factors used to evaluate hydrology included the presence of standing water during early spring surveys, topographic features (i.e. clearly defined basins with distinct upland vegetation transition zones), alga mats and the presence of hydrophytic vegetation.

Ponded areas that were characterized by low-growing herbaceous species as well as areas with open or barren substrates were considered suitable habitat. Areas with dense growth of emergent vegetation such as cattails and bulrushes were not considered to provide suitable habitat for listed crustaceans as these areas were considered to be flooded throughout the majority of the year and or inundated during the summer months. Swales and weakly expressed topographic depressions characterized by upland vegetation were not considered potential habitat as these areas were not considered to retain water for a long enough duration to support listed vernal pool crustaceans. Riverine and fluvial systems were not considered to provide suitable habitat due to potential high flows and the likelihood of predatory fish species.

Additional data regarding general physical and biological characteristics of several of the features observed along the natural gas pipeline alignment were collected during the wetland delineation. These data sheets and the definitions used for each criteria are included in Attachment C. Selected photographs are included in attachment D. No aquatic sampling was done as part of these surveys, but visual observations of aquatic invertebrates were noted.

Acreage's of potential habitat along the natural gas pipeline alignment and for the laydown area were determined form the GIS data base created for the CH2M HILL wetland delineation. Wetland areas were delineated and mapped in the field using RTK GPS. All

wetland areas on the District's Property were determined from digitized polygons into the GIS wetland database from previous wetland delineations, conducted by Davis Environmental and Jones and Stokes Associates, and field verified on November 15, 2002 by Justin Cutler of the Army Corps of Engineers.

Direct and Indirect Impacts

Any seasonal wetland that may provided suitable habitat for listed crustaceans was considered to be directly affected if any part of the wetland was included within the construction area of the proposed power plant, transmission line towers, detention pond, water and gas supply pipelines or within the boundary of the laydown area. In several locations the construction work area was either confined or redesigned to avoid direct impacts to seasonal wetlands.

Indirect impacts were considered for any seasonal wetland that was either partly or completely within 250 feet of the construction area of the proposed power plant and associated linear features, or the boundary of the proposed laydown area. An exception was made for seasonal wetland which were within 250 feet of the natural gas pipeline construction area, but were separated by a hydrologic barrier such as railroad tracks, paved roadways, fluvial; features such as seasonal streams or seasonal wetlands located up gradient of the construction area.

Potential Impacts

Any placement of fill material or drainage of seasonal wetlands that results in a loss of wetland function and value was considered to be an impact. Any seasonal wetland providing habitat for vernal pool crustaceans was considered to be directly affected if the wetland (in part or in whole) was located in the construction area of the proposed power plant, transmission towers, detention pond, laydown area, new access road, water supply pipeline or natural gas supply pipeline.

Impacts to seasonal wetlands associated with construction activities for the water and natural gas pipeline were evaluated based on the type of wetland, past disturbance and likelihood of impacts to wetland hydrology. Excavation of a 7-foot trench through any naturally occurring seasonal wetland was considered to be an impact. Excavation to such depths will result in a disruption to the restrictive hardpan that will likely result in altered hydrology. For the purposes of this evaluation impacts resulting from temporary pipeline construction activities to man-made wetlands such as railroad and roadside drainages, drainage ditches and roadway ponding areas were not considered permanent. Based on the presence of existing utilities in many of these areas (i.e. PG&E gas lines, and fiber optic lines) it is unlikely that trenching will result in significant alterations to the hydrology in these types of seasonal wetlands.

Results

A total 97 seasonal wetlands and other aquatic features were considered potential habitat for special status aquatic crustaceans (Tables 1 and 2). Seasonal wetlands that were not considered suitable habitat included drainages along the natural gas pipeline alignment that were characterized by dense growth of cattails, weakly expressed seasonal swales

characterized by upland plant species and a flooded irrigated pastures. Suitable habitat area included natural vernal pools, swales, seasonal streams, degraded seasonal wetlands, railroad and roadside drainages, drainage ditches and roadway ponded areas. These general habitat types are discussed below.

Vernal Pools and Swales

For the purpose of this report vernal pools and swales are defined specifically as either naturally occurring depressions in grassland areas that are characterized by mound and intermound microtopography, or constructed vernal pool mitigation areas. Natural vernal pool habitats in the project area have been classified as Northern Hardpan Vernal Pools (CDFG 2000). These areas are characterized by seasonal inundation resulting from a perched water table above a silica-cemented hardpan. Northern hardpan vernal pools occur primarily on old alluvial terraces where seasonal ponding occurs in a mosaic of small basins and swales within an upland area. Non-native annual grasses characterized the uplands while the pools and swales are typically covered by native annual forbs including popcorn flower (*Plagiobothrys stipitatus*), Fremont's goldfields (*Lasthenia fremontii*), and coyote thistle (*Eryngium vaseyi*). Non-native grasses such as perennial ryegrass (*Lolium perenne*) and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum)* may also be present in some areas. Natural vernal pools and swales were observed along the natural gas pipeline on the Nature Conservancy's Cosumnes River Preserve, in a grassland area east of Laguna Creek, and at the western end of Clay East Road. Vernal pools were also present on the District's property south of the Rancho Seco Nuclear Facility. The natural gas pipeline was relocated to avoid impacts to the Stone Lakes vernal pool mitigation site on the south side of Elk Grove Boulevard.

A total of 0.957 acres of vernal pool and swale habitat will be directly affected by the proposed project , of which 0.642 acres occur in designated critical habitat (Table 3). An additional 4.189 acres of vernal pools and swales may be indirectly affected by the proposed project, of which 0.530 acres occur within critical habitat (Table 3).

Seasonal Streams

Seasonal streams are ephemeral, low order streams that typically flow in weakly or moderately defined channels during the wet season. Four seasonal streams were observed on the Districts property south of Ranch Seco. The proposed new access road from the east end of Clay East Road to the east entrance of the Rancho Seco Facility would cross these seasonal streams. A fire break has been graded along the fence line in this area resulting in the impoundment of the stream flows and creation of slack-water areas. These slack water pools were considered suitable habitat for vernal pool species. The vegetation in these areas was characterized by hydrophytic species such as coyote thistle and perennial ryegrass.

A total of 0.033 acres of slack water ponding areas associated with these seasonal streams would be directly and permanently affected by the construction of the new access road (Table 3). These features are all located within designated critical habitat.

Degraded Seasonal Wetlands

Davis Environmental Consulting (2000) identified four areas immediately south of the Ranch Seco Power Plant as degraded seasonal wetlands. Based on analysis of historic aerial

photos these wetlands were created sometime either during or after the construction of the nuclear facility. These wetland areas were described by Davis (2000) as being closed basin systems dominated by hydrophytic vegetation and saturated within the upper 12 inches at the time of the survey. Dominant plant species in this area included curly dock (*Rumex crispus*), spike rush (*Eleocharis macrostachya*) and perennial ryegrass (Davis 2000).

A total of 1.805 acres of degraded seasonal wetlands occur within 250 feet of the proposed water supply pipeline and electrical transmission line route (Table 3). These features are all located within designated critical habitat, but no direct impacts to these areas are expected as a result of the proposed project.

Seasonal Wetlands

Seasonal wetlands include features such as railroad and roadside pools that are functionally similar to natural vernal pools in terms of seasonal hydrology. These seasonal wetlands occur in man-made, often narrow, linear depressions between fill slopes associated with railroads and roadway embankments. Seasonal ponding is associated with shallow topographic depressions that may be isolated or part of an excavated drainage area. The vegetation in these pools is variable, some areas may include typical vernal pool species such as popcorn flower and goldfields, while others are dominated by nonnative annual grasses such as Mediterranean barley and perennial ryegrass. Other areas are denuded of vegetation and characterized by open muddy substrates. This type of wetland was common along the natural gas pipeline alignment from the Carson Co-gen facility south to Core Road, and along Twin Cities Road from Laguna Road to Clay East Road.

A total of 1.242 acres of seasonal wetlands will be direct affected by the proposed project, of which 0.747 acres are within critical habitat. An additional 0.748 acres will be indirectly affected, including 0.013 acres within critical habitat (Table 3).

Drainage Ditches

Drainage ditches are constructed water conveyance channels that were seasonally flooded largely as a result of precipitation, runoff and agricultural irrigation. These areas were generally characterized by ponded water at the outflow and/or inflow of culverts along roadways and railroad tracks. Aquatic invertebrates as well as bullfrogs and/or tadpoles were common in several of these areas. Vegetation in most of these areas was sparse or characterized by ruderal species such as curly dock and perennial ryegrass. These areas were considered to provide low quality habitat based on the potential for occasional heavy flows and the presence of predaceous species such as bullfrogs.

A total of 0.076 acres of drainages ditches will be directly affected, all of which occur within critical habitat.

Ponded Features

Several ponded areas were observed along the natural gas pipeline alignment. These features were most commonly observed in a dirt access road along Twin Cities Road between Laguna Road and Clay East Road. Tractors and other farm vehicles were observed driving through these areas during the wet season and these pools were generally denuded of vegetation and highly turbid. While the overall habitat quality of these areas was

considered poor, water appeared to be present for prolonged periods and aquatic life including Cladocerans, Copepods, and Arthropods were observed in many of these pools.

A total of 0.659 acres of ponded features will be directly affected by construction of the natural gas pipeline, of which 0.498 occur within designated critical habitat. An additional 0.135 acres will be indirectly affected, including 0.054 acres within critical habitat.

Summary

A total of 2.967 acres of potential habitat for special status vernal pool crustaceans, including vernal pools, swales, slack water pools, railroad and roadside pools, drainages and roadway ponded areas will be directly affected by the proposed project. Permanent impacts include total of 1.287 acres of vernal pools, swales and slack water areas. A total of 1.996 acres of habitat directly affected by the project is located within designated critical habitat areas.

A total of 6.877 acres of seasonal wetlands, not separated by hydrological barriers, are within 250 feet of the proposed construction work areas. A total of 2.402 acres of wetland habitat potentially indirectly affected by the project occurs within designated critical habitat.

TABLE 1.
Potential Fairy Shrimp Habitat Directly affected by the Cosumnes Power Plant Project. Features in bold type are located within Critical Habitat Areas.

Location/ID	Project Feature	Type	Size (acres)	Data Source
SW10	**Detention Pond**	**Seasonal Wetland**	**0.173**	DEC, 2000
SW12	**Plant Site**	**Seasonal Wetland**	**0.035**	DEC, 2000
SW13	**Plant Site**	**Seasonal Wetland**	**0.045**	DEC, 2002
VP9	**Plant Site**	**Vernal Pool**	**0.033**	DEC, 2002
HVP3	**Water Supply Pipeline**	**Vernal Pool**	**0.011**	DEC, 2000
HVP4	**Water Supply Pipeline**	**Vernal Pool**	**0.016**	DEC, 2000
SW11	**Water Supply Pipeline**	**Seasonal Wetland**	**0.382**	DEC, 2000
DR1	**Access Road**	**Seasonal Stream / Pool**	**0.013**	CH2M HILL 2002
DR2	**Access Road**	**Seasonal Stream / Pool**	**0.005**	CH2M HILL 2002
DR3	**Access Road**	**Seasonal Stream / Pool**	**0.015**	CH2M HILL 2002
DR5	**Access Road**	**Vernal Pool**	**0.005**	CH2M HILL 2002
DR7	**Access Road**	**Swale**	**0.007**	CH2M HILL 2002
VP2	**Laydown Area**	**Vernal Pool**	**0.023**	CH2M HILL 2002
VP3	**Laydown Area**	**Vernal Pool**	**0.006**	CH2M HILL 2002
VP12	**Laydown Area**	**Vernal Pool**	**0.005**	CH2M HILL 2002
VP13	**Laydown Area**	**Vernal Pool**	**0.006**	CH2M HILL 2002
VP14	**Laydown Area**	**Vernal Pool**	**0.004**	CH2M HILL 2002
SW2	**Laydown Area**	**Swale**	**0.213**	CH2M HILL 2002
SW3	**Laydown Area**	**Swale**	**0.313**	CH2M HILL 2002
007-SW (W4)	Natural Gas Line	Seasonal Wetland	0.066	CH2M HILL 2002
008-SW (A4)	Natural Gas Line	Seasonal Wetland	0.232	CH2M HILL 2002
009-SW (A5)	Natural Gas Line	Seasonal Wetland	0.043	CH2M HILL 2002
010-SW (A6)	Natural Gas Line	Seasonal Wetland	0.154	CH2M HILL 2002
086-VP (W24)	Natural Gas Line	Vernal Pool	0.029	CH2M HILL 2002
089-SS (W25)	Natural Gas Line	Swale	0.064	CH2M HILL 2002
090-SS (W26)	Natural Gas Line	Swale	0.222	CH2M HILL 2002
131-PF	Natural Gas Line	Ponded Feature	0.061	CH2M HILL 2002
135-DD (A21)	**Natural Gas Line**	**Drainage Ditch**	**0.007**	CH2M HILL 2002
136-PF	**Natural Gas Line**	**Ponded Feature**	**0.005**	CH2M HILL 2002
137-PF (A23)	**Natural Gas Line**	**Ponded Feature**	**0.009**	CH2M HILL 2002
138-PF (A25)	**Natural Gas Line**	**Ponded Feature**	**0.023**	CH2M HILL 2002
139-PF	**Natural Gas Line**	**Ponded Feature**	**0.026**	CH2M HILL 2002

TABLE 1.
Potential Fairy Shrimp Habitat Directly affected by the Cosumnes Power Plant Project. Features in bold type are located within Critical Habitat Areas.

Location/ID	Project Feature	Type	Size (acres)	Data Source
140-PF	**Natural Gas Line**	**Ponded Feature**	**0.057**	CH2M HILL 2002
141-PF	**Natural Gas Line**	**Ponded Feature**	**0.021**	CH2M HILL 2002
142-PF (A30)	**Natural Gas Line**	**Ponded Feature**	**0.010**	CH2M HILL 2002
143-PF (A31)	**Natural Gas Line**	**Ponded Feature**	**0.050**	CH2M HILL 2002
144-PF (A32)	**Natural Gas Line**	**Ponded Feature**	**0.099**	CH2M HILL 2002
145-PF	**Natural Gas Line**	**Ponded Feature**	**0.008**	CH2M HILL 2002
146-PF	**Natural Gas Line**	**Ponded Feature**	**0.005**	CH2M HILL 2002
147-SW (A33)	**Natural Gas Line**	**Seasonal Wetland**	**0.112**	CH2M HILL 2002
148-PF (A36)	**Natural Gas Line**	**Ponded Feature**	**0.024**	CH2M HILL 2002
149-DD (A35)	**Natural Gas Line**	**Drainage Ditch**	**0.013**	CH2M HILL 2002
150-PF	**Natural Gas Line**	**Ponded Feature**	**0.110**	CH2M HILL 2002
151-PF (A38)	**Natural Gas Line**	**Ponded Feature**	**0.018**	CH2M HILL 2002
152-PF (A39)	**Natural Gas Line**	**Ponded Feature**	**0.033**	CH2M HILL 2002
153-DD (A42)	**Natural Gas Line**	**Drainage Ditch**	**0.056**	CH2M HILL 2002
157-PF (A48)	Natural Gas Line	Ponded Feature	0.036	CH2M HILL 2002
158-PF	Natural Gas Line	Ponded Feature	0.007	CH2M HILL 2002
160-PF	Natural Gas Line	Ponded Feature	0.014	CH2M HILL 2002
161-PF	Natural Gas Line	Ponded Feature	0.011	CH2M HILL 2002
162-PF (A52)	Natural Gas Line	Ponded Feature	0.032	CH2M HILL 2002
Total for all potential habitat within construction area				

Notes:
Davis Environmental Consulting Wetland Delineation, 2000. Acreages verified by the Army Corps of Engineers on Nov, 15, 2002.

Davis Environmental Consulting Wetland Delineation, 1999. Acreages verified by the Army Corps of Engineers on Nov, 15, 2002.

Jones and Stokes Associates Wetland Delineation, 1993. Acreages were not verified by the Army Corps in 2002.

CH2M HILL, Wetland Delineation currently under reviewed by the Army Corps of Engineers, field verification of access road and laydown area conducted on Nov. 15, 2002.

TABLE 2.
Potential Fairy Shrimp Habitat Within the 250- foot Indirect Impact Area of for Cosumnes Power Plant Project. Features in Bold Type are located within Critical Habitat Areas.

Location/ID	Project Feature	Type	Size (acres)	Data Source
DSW 1	**Water Supply Pipeline**	**Degraded Seasonal Wetland**	**1.195**	DEC, 2000
DSW 2	**Water Supply Pipeline**	**Degraded Seasonal Wetland**	**0.345**	DEC, 2000
DSW 3	**Water Supply Pipeline**	**Degraded Seasonal Wetland**	**0.265**	DEC, 2000
SW9	**Transmission Line**	**Vernal Pool**	**0.104**	DEC, 2000
VP-1	**Access Road**	**Vernal Pool**	**0.019**	DEC, 1999
VP-3	**Access Road**	**Vernal Pool**	**0.027**	DEC, 1999
VP 746	**Access Road**	**Vernal Pool**	**0.02**	JSA, 1993
VP 738	**Access Road**	**Vernal Pool**	**0.01**	JSA, 1993
VP 739	**Access Road**	**Vernal Pool**	**0.01**	JSA, 1993
VP1	**Laydown Area**	**Vernal Pool**	**0.152**	CH2M HILL 2002
VP4	**Laydown Area**	**Vernal Pool**	**0.049**	CH2M HILL 2002
VP5	**Laydown Area**	**Vernal Pool**	**0.044**	CH2M HILL 2002
VP6	**Laydown Area**	**Vernal Pool**	**0.005**	CH2M HILL 2002
VP7	**Laydown Area**	**Vernal Pool**	**0.012**	CH2M HILL 2002
VP9	**Laydown Area**	**Vernal Pool**	**0.030**	CH2M HILL 2002
VP10	**Laydown Area**	**Vernal Pool**	**0.018**	CH2M HILL 2002
VP11	**Laydown Area**	**Vernal Pool**	**0.001**	CH2M HILL 2002
001-SW (W1)	Natural Gas Line	Seasonal Wetland	0.069	CH2M HILL 2002
002-SW (W2)	Natural Gas Line	Seasonal Wetland	0.113	CH2M HILL 2002
004-SW (A1A)	Natural Gas Line	Seasonal Wetland	0.076	CH2M HILL 2002
005-SW (A2)	Natural Gas Line	Seasonal Wetland	0.022	CH2M HILL 2002
011-SW	Natural Gas Line	Seasonal Wetland	0.029	CH2M HILL 2002
011A –CW (A6A)	Natural Gas Line	Created Vernal Pool	1.253	CH2M HILL 2002
025-SW	Natural Gas Line	Seasonal wetland	0.070	CH2M HILL 2002
O26-SW	Natural Gas Line	Seasonal wetland	0.048	CH2M HILL 2002
028-SW (A87)	Natural Gas Line	Seasonal Wetland	0.184	CH2M HILL 2002
032-PF (A16P)	Natural Gas Line	Ponded Feature	0.062	CH2M HILL 2002
074-SW (W13)	Natural Gas Line	Seasonal Wetland	0.092	CH2M HILL 2002
W14 (D)	Natural Gas Line	Vernal Pool	0.149	CH2M HILL 2002
P1	Natural Gas Line	Vernal Pool	0.019	CH2M HILL 2002
P2	Natural Gas Line	Vernal Pool	0.146	CH2M HILL 2002

TABLE 2.
Potential Fairy Shrimp Habitat Within the 250- foot Indirect Impact Area of for Cosumnes Power Plant Project. Features in Bold Type are located within Critical Habitat Areas.

Location/ID	Project Feature	Type	Size (acres)	Data Source
077-VP (104/105)	Natural Gas Line	Vernal Pool	0.166	CH2M HILL 2002
080-VP (VP1)	Natural Gas Line	Vernal Pool	0.556	CH2M HILL 2002
081-VP (W16)	Natural Gas Line	Vernal Pool	0.490	CH2M HILL 2002
082-VP (W17)	Natural Gas Line	Vernal Pool	0.049	CH2M HILL 2002
085-SS (W23)	Natural Gas Line	Swale	0.053	CH2M HILL 2002
089A-SS	Natural Gas Line	Swale	0.669	CH2M HILL 2002
089B-SS	Natural Gas Line	Swale	0.109	CH2M HILL 2002
127-SW (W9)	**Natural Gas Line**	**Seasonal Wetland**	**0.007**	CH2M HILL 2002
128-SW (P7)	**Natural Gas Line**	**Seasonal Wetland**	**0.006**	CH2M HILL 2002
126-SS	**Natural Gas Line**	**Swale**	**0.004**	CH2M HILL 2002
131-PF	Natural Gas Line	Ponded Feature	0.019	CH2M HILL 2002
152-PF (A39)	**Natural Gas Line**	**Ponded Feature**	**0.033**	CH2M HILL 2002
156-PF	**Natural Gas Line**	**Ponded Feature**	**0.021**	CH2M HILL 2002
162-SW (A52)	Natural Gas Line	Seasonal Wetland	0.032	CH2M HILL 2002
VP-8 (P11)	**Natural Gas Line**	**Vernal Pool**	**0.025**	CH2M HILL 2002
Total for all potential habitat areas within 250 feet buffer area			**6.258**	

Notes:
Davis Environmental Consulting Wetland Delineation, 2000. Acreages verified by the Army Corps of Engineers on Nov, 15, 2002.

Davis Environmental Consulting Wetland Delineation, 1999. Acreages verified by the Army Corps of Engineers on Nov, 15, 2002.

Jones and Stokes Associates Wetland Delineation, 1993. Acreages were not verified by the Army Corps in 2002.

CH2M HILL, Wetland Delineation currently under reviewed by the Army Corps of Engineers, field verification of access road and laydown area conducted on Nov. 15, 2002.

TABLE 3.
Acreage of Potential Fairy Shrimp Habitat Types Directly and Indirectly affected by the Cosumnes Power Plant Project. And Summary of Areas Within Critical Habitat Units.

Habitat Type	Direct (Acres)	Direct within Critical Habitat (Acres)	Indirect (Acres)	Indirect within Critical Habitat (Acres)
Vernal Pool	0.138	0.109	2.101	0.526
Created Vernal Pool	0	0	1.253	0
Swale	0.819	0.533	0.835	0.004
Seasonal Stream / Pool	0.033	0.033	0	0
Degraded Seasonal Wetland	0	0	1.805	1.805
Seasonal Wetlands	1.242	0.747	0.748	0.013
Drainage Ditches	0.076	0.076	0	0
Ponded Features	0.659	0.498	0.135	0.054
Total for all habitat types	**2.967**	**1.996**	**6.877**	**2.402**

References

California Department of Fish and Game (CDFG), 2000. List of Terrestrial Natural Communities. State of California Department of Fish and Game Wildlife and Habitat Analysis Branch, Sacramento, California.

Davis, E. 2000. *Wetland Delineation Report for the South Sacramento Power Plant at Rancho Seco, Sacramento California.* Associates, Inc Davis Environmental Consulting, Davis, California.

Davis, E. 1999. *Wetland Delineation Report for the Rancho Seco Photovoltaic Expansion Area, Sacramento County, California.* Prepared for Sacramento Municipal Utility District by Davis Environmental Consulting, Davis, California.

Ericksen, C. and D. Belk. 1999. *Fairy Shrimps of California's Puddles, Pools, and Playas.* Mad River Press, Inc. Eureka, California.

Gallagher S. P. 1996. *Seasonal occurrence and habitat characteristics of some vernal pool branchiopoda in northern California, USA*. Journal of Crustacean Biology 16(2): 323-329.

Jones and Stokes. 1993. *Preliminary Delineation of Waters of the United States, Including Wetlands, for the Ranch Seco Park Master Plan.* Prepared for Project Dimensions, by Jones and Stokes Associates, Inc. Sacramento, California.

Jones and Stokes. 1984. *Terrestrial Ecology Report: Solar Voltaic Electric Generation Facility at Rancho Seco.* Prepared for Sacramento Municipal Utility District by Jones and Stokes Associates, Inc. Sacramento, California.

Terms and Definitions

Physical Features

Definitions of wetland types are based on definitions provided in Bates and Jackson (1980) and Ferren et al. (1996).

Wetland Type:

Stream – Any body of running water that moves under gravity to progressively lower levels in a relatively narrow, but clearly defined channel.

Pond – A body of standing fresh water that occupies a small surface depression, that is smaller than a lake, but larger than a pool.

Pool – A small depression containing water at least seasonally or intermittently.

Swale – A slight open depression which lacks a defined channel, but funnels overland or subsurface flow into a drainageway.

Ditch – A long, narrow excavation (channel or trench) used for conveying water for drainage or irrigation.

Hydrologic Class:

All hydrologic classes are based on the definitions employed by the U.S. Fish and Wildlife Service's National Wetland Inventory (Cowardin et al., 1979). Determination of hydrologic class in the field was based on such things as water depth, vegetation, hydrologic connectivity to other aquatic features and other indicators that suggested the duration of inundation of a particular feature.

Permanently Flooded – Water covers the land surface throughout the year in all years.

Semipermanently Flooded - Surface water persists throughout the growing season in most years.

Seasonally Flooded - Surface water is present for extended periods, especially early in the growing season, but is absent by the end of the season in most years.

Temporarily Flooded – Surface water is present for brief periods, especially early in the growing season, but the water table usually lies well below the soil surface most of the year.

Saturated – Substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

Habitat Features

The presence of habitat features relevant to special status species for each aquatic feature was noted in the field.

Emergent Vegetation - Generally tall, erect herbaceous plants that are temporarily or permanently flooded at the base, but do not tolerate prolonged inundation of the entire plant (e.g. cattail and bulrush).

Hydrophytic Vegetation – Plant species adapted to growth in water or substrate that is periodically saturated to the point where soil oxygen is deficient. While emergent plants are hydrophytes, this category was intended to included smaller annual and perennial species that are indicative of inundation, but do not provide the same habitat functions as tall emergent vegetation such as cattails and bulrushes.

Mammal Burrows – Ground squirrel burrows or other small burrows or holes excavated in the soil that may provide refugia to reptiles, amphibians, or burrowing owls.

Other Refugia – This includes such things as rocks, woody debris, man-made structures (e.g. pipes), rotten logs, or other features that may be used for cover by amphibians or reptiles.

Basking Sites – Floating or partially submerged debris such as logs or dense vegetation mats, rocks; and grassy or sandy banks with minimal shade. Generally basking sites are in open areas, but close to water, emergent vegetation or other refugia to allow for rapid escape from predators.

Small Fish and Amphibians – Prey items for reptiles and amphibians should be noted if observed or heard. In addition amphibians such as bullfrogs are predatory on fairy shrimp and tadpole shrimp.

Aquatic Invertebrates – No aquatic sampling was conducted during the surveys, but to the extent possible the water column was visually inspected for the presence of aquatic invertebrates such as insects, snails, copepods, water fleas and fairy shrimp. Presence of aquatic invertebrates provides food for amphibians as well as Tadpole shrimp and may also an indication of prolonged inundation and overall water quality.

Algae – Algae provides a food source for fairy shrimp, amphibian larva and are also an indication of prolonged inundation.

Nest Trees – Note the presence of large trees, or trees with nests observed in the areas adjacent or around the aquatic feature. Such areas may provide suitable habitat for Swainson's Hawks.

Other Wetlands in the Immediate Vicinity – Other wetlands in the area that may be hydrologically connected may provide information on the source or type of hydrology of a given feature. Absence of natural wetlands in surrounding low areas may indicated that water is ponded as a result of human activity. Also presence or absence of adjacent wetlands helps determine if the feature is isolated or part of a large complex of features. A brief descriptive note describing the other wetland(s) in the area.

Environmental Features

Adjacent Vegetation – Note the vegetation in the immediate surroundings of the feature. This includes the upland slopes and areas in the immediate vicinity of the feature.

Adjacent Land Use - This refers to the landscape in which the feature is located. Only note those land uses that are in adjacent to the feature. For example if the feature is completely surrounded by rangeland, but there is a residential area 1000 feet away, ,only note the

pasture. If on the other hand the feature is located between an urban area and railroad tracks, both should be noted.

Human Impacts – Note any human impacts that may influence the features hydrology, soils or vegetation. Presence of underground utilities is included because this may indicate past soil disturbance as a result of trench excavation. Land leveling includes any form of grading (e.g. graded roads). Fill material may be determined by differences in elevation to the surrounding area and/or evidence of soil mixing.

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # W1 Photo # 3 Location: (125') 125 -250'
001-SW Direction: N

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 140' X 25'
Pond	Semipermanently Flooded	Water Depth (inches) 8
(Pool)	(Seasonally Flooded)	Notes: RAILROAD DITCH ON SACRAMENTO REGIONAL WATER TREATMENT BUFFERLANDS
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: WILLOW TREE ON WEST SIDE OF POOL
- POTENTIAL HYDROLOGIC CONNECTION TO LAGUNA CREEK - FLOOD EVENTS

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs (Trees) Woodland Riparian
└ISOLATED WILLOW

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
BUFFERLANDS Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts (Underground Utilities)
Land Leveling (Fill Material) Disking/Plowing

Notes: RAIL ROAD BEDDING MATERIAL / PG&E PIPELINE IN THIS AREA

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # W2 (002-SW) Photo # 7 Direction: S

Location: (125') 125-250'

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 370'X 18'
Pond	Semipermanently Flooded	Water Depth (inches) 3.5
(Pool)	(Seasonally Flooded)	Notes: RAIL ROAD DITCH - SAC. REGIONAL WATER TREATMENT BUFFERLANDS
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians BULL FROGS	(YES)	NO			

Notes: CONNECTED TO DRAINAGE AT SOUTH END OF POOL

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs (Trees) Woodland Riparian
SMALL CLUMP OF WILLOWS

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
BUFFERLANDS Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) (Underground Utilities)
Land Leveling (Fill Material) Disking/Plowing

Notes: RAIL ROAD FILL MATERIAL / PG&E GAS PIPELINE, WATER PIPELINE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: 3-22-01

Feature # A1A 004-SW Photo # NONE Direction: _____ Location: (125') 125 -250'

Routine Data Sheet(s) (YES) NO Falgged: (YES) NO

Physical Features (Circle)

Potential Jurisdictional WL: YES (NO)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15'x300'
Pond	Semipermanently Flooded	Water Depth (inches) 0-1
(Pool)	Seasonally Flooded	Notes: RAIL ROAD DRAINAGE DITCH
Swale	(Temporarily Flooded)	SMALL AMOUNT OF PONDING ONLY
Ditch	Saturated	AT NORTH END OF FEATURE

Habitat Features

Emergent Vegetation (cattails) VERY SPARSE <5%	(YES)	NO	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: TWO 40" CMPs UNDER RAIL ROAD, IN THIS AREA - NO AQUATIC INVERTS OBSERVED

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: Area characterized by Typha - Thus presumed inundation not suitable for FS.

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # A2 005-PF Photo # 5 Direction: N Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 70' X 15'
Pond	Semipermanently Flooded	Water Depth (inches) 5.5"
(Pool)	(Seasonally Flooded)	Notes: HIGHLY DESAUPCRATE POOL AREA ALONG RAIL ROAD / DWIGHT ROAD
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: DEBRIS WITHIN AND AROUND POOL, SPARSE VEGETATION

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland, (Ruderal), Agricultural, Shrubs, Trees, Woodland, Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture), Field Crops, Vineyards, (Urban/Residential), Rangeland, (Roads), (Railroad), Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages, Culverts, Underground Utilities, Land Leveling, (Fill Material), Disking/Plowing

Notes: LIKELY SOME FILL FROM ROADWAY AND RAILROAD IN THIS AREA

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: E. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # W4 007-SW Photo # 15 Direction: S Location: (125') 125 -250'

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 160' x 20'
Pond	Semipermanently Flooded	Water Depth (inches) 8.5"
(Pool)	(Seasonally Flooded)	Notes: LINEAR POOL ALONG RAILROAD
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
			Nest Trees	YES	NO
Mammal Burrows	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	(YES)	NO			
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: LARGE - EXCAVATED DRAINAGE JUST WEST OF THIS POOL NO OBVIOUS HYDROLOGIC CONNECTION

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards (Urban/Residential)
Rangeland Roads (Railroad) (Industrial)

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) (Underground Utilities)
Land Leveling Fill Material Disking/Plowing

Notes: PG&E GAS PIPELINE, CULVERTS UNDER RR TRACK OBSERVED IN THIS AREA NEAR POOL

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # A-4 Photo # 19
008.SW Direction: S

Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 660' X 20'
Pond	Semipermanently Flooded	Water Depth (inches) 7.5"
(Pool)	(Seasonally Flooded)	Notes: ALONG RAILROAD, LONG, LINEAR POOL FEATURE
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: EXCAVATED DRAINAGE TO THE WEST, POOL JUST NORTH ALSO IN RAIL ROAD DRAINAGE

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards (Urban/Residential)
Rangeland Roads (Railroad) (Industrial)

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts (Underground Utilities)
Land Leveling (Fill Material) Disking/Plowing

Notes: POTENTIAL FILL FROM RR BEDDING, PG&E GAS LINE IN THIS AREA

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # A5 Photo # 24 Location: (125') 125 -250'

009-SW Direction: S

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class
Stream	Permanently Flooded
Pond	Semipermanently Flooded
(Pool)	(Seasonally Flooded)
Swale	Temporarily Flooded
Ditch	Saturated

Approximate Size 150' x 15'

Water Depth (inches) 6.5"

Notes: POOL AREA ALONG RAILROAD ISOLATED BY HOUSING DEVELOPMENTS TO EAST AND WEST.

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes:		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs (Trees) Woodland Riparian
Valley Oaks in this area

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards (Urban/Residential)
Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts (Underground Utilities)
Land Leveling (Fill Material) Disking/Plowing

Notes: RAILROAD FILL / PG&E GAS LINE IN THIS AREA

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 2-1-02

Feature # A6 Photo # 26 Location: (125') 125 -250'
010-SW Direction: S

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15' x 480'
Pond	Semipermanently Flooded	Water Depth (inches) N 3-4"
(Pool)	(Seasonally Flooded)	Notes: LONG, LINEAR FEATURE ALONG RAILROAD, ISOLATED BY URBAN DEVELOPEMENT ON EAST AND WEST SIDES
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes:		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards (Urban/Residential)
Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) (Underground Utilities)
Land Leveling (Fill Material) Disking/Plowing

Notes: POTENTIAL FILL FROM RAILROAD, HOUSING DEVELOPEMENT, PG&E GAS LINE, 24" CULVERT UNDER RR TRACKS NEAR CENTER OF POOL

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-18-02

Feature # A87 Photo # 24
028-DD Direction: S

Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 400' X 25'
Pond	Semipermanently Flooded	Water Depth (inches) N 4-6"
(Pool)	(Seasonally Flooded)	Notes: LONG, LINEAR FEATURE
Swale	Temporarily Flooded	ABUNDANT WOODY DEBRIS IN POOL
(Ditch)	Saturated	- WATER QUALITY APPEARS POOR
		→ PART OF DRAINAGE DITCH

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates ?	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: PART OF DRAINAGE DITCH ALONG RR - NO AQUATIC INVERTEBRATES OBSERVED BY VISUAL INSPECTION		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) Agricultural
(Shrubs) RUBUS (Trees) SALIX Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture (Field Crops) Vineyards Urban/Residential
Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: CONCRETE PIPES PILED AROUND EAST SIDE OF POOL

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A17 Photo # 9
031-DD Direction: N

Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 130'X 30'
Pond	Semipermanently Flooded	Water Depth (inches) NONE
Pool	Seasonally Flooded	Notes: NO PONDED WATER OR SATURATED SOILS OBSERVED DITCH IS IMPOUNDED ON NORTH SIDE BY ACCESS ROAD FILL
Swale	(Temporarily Flooded)	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails) DENSE TYPHA	(YES)	NO	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	YES	(NO)			
Small Fish or Amphibians	YES	(NO)			

Notes: AREA IS CHARACTERIZED BY TYPHA AND SALIX - NO WATER OBSERVED - POTENTIALLY FED BY SUMMER AG RUNOFF.

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) Agricultural
(Shrubs) RUBUS (Trees) SALIX Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture (Field Crops) Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling (Fill Material) Disking/Plowing

Notes: ROADWAY AND RAILROAD FILL POSSIBLE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: F. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A16P Photo # 6-8
C32-PF Direction: N

Location: 125' 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 180' X 16'
Pond	Semipermanently Flooded	Water Depth (inches) 3,5
(Pool)	(Seasonally Flooded)	Notes: LINEAR POOL ALONG RR DRAINAGE AND AGRICULTURAL FIELDS - TRASH AND DEBRIS IN AND ADJACENT TO POOL AREA
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: NO AQUATIC INVERTS OBSERVED IN THIS POOL DURING SURVEY

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) (Agricultural)
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) (Field Crops) Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts (Underground Utilities)
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A14 Photo # 4
035-DD Direction: W

Location: (125) 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 20' X 20'
Pond	(Semipermanently Flooded)	Water Depth (inches) 17
(Pool)	Seasonally Flooded	Notes: PONDED WATER AT CULVERT UNDER RR TRACKS - SURROUNDED BY RUBUS.
Swale	Temporarily Flooded	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	(YES)	NO	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES ?	NO			

Notes: NO FROGS OBSERVED - BUT LIKELY HABITAT FOR BULL FROGS - CONNECTS TO DRAINAGE WEST OF RAIL ROAD TRACKS

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) (Agricultural) (Shrubs) RUBUS Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture (Field Crops) ALFALFA Vineyards Urban/Residential Rangeland (Roads) FARM ACCESS (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) (Underground Utilities) Land Leveling Fill Material Disking/Plowing

Notes: FIBER OPTIC LINE, 36" CULVERT UNDER RR

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-5-02

Feature # P10 Photo # 13 Location: (125') 125 -250'
Included in 045-SW Direction: W

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 100' X 60'
Pond	Semipermanently Flooded	Water Depth (inches) 3"
(Pool)	Seasonally Flooded	Notes: OVERFLOW FROM STOCK WATERING TANK
Swale	(Temporarily Flooded)	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: PONDED WATER AROUND STOCK TANK IN PASTURE AREA

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal (Agricultural)
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material (Disking/Plowing) ?

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 3-11-02

Feature # W13 Photo # NONE Location: (125') 125 -250'
074-SW Direction: _____

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 100'X50'
Pond	Semipermanently Flooded	Water Depth (inches) 5
(Pool)	(Seasonally Flooded)	Notes: SHALLOW TOPOGRAPHIC DEPRESSION, DIRT ROADWAY ALONG SOUTH WEST OF POOL
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: NO AQUATIC ENVERTS OBSERVED AT THIS TIME.

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial
COSUMNES PRESERVE

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: ROADWAY ADJACENT TO POOL

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 3-11-02

Feature # D (W14) Photo # NONE
PART OF 076-DD Direction: SW OF DRAINAGE

Location: 125' (125-250')

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 100' x 80'
Pond	Semipermanently Flooded	Water Depth (inches) 10"
(Pool)	(Seasonally Flooded)	Notes: TOPOGRAPHIC DEPRESSION IN ANNUAL GRASSLAND SWALE COMPLEX
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: NO AQUATIC INVERTS OBSERVED DURING SURVEY. POOL HYDROLOGIC CONNECTION TO SYSTEM OF SWALES

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
Rangeland Roads Railroad Industrial
COSUMNES PRESERVE

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: ROADWAY ALONG WEST EDGE OF POOL

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: _____

Feature # P1 Photo # NONE Direction: — Location: 125' (125 -250')

Routine Data Sheet(s): YES (NO) Falgged: YES (NO)

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 0.02 ACRES
Pond	Semipermanently Flooded	Water Depth (inches) NE
(Pool)	(Seasonally Flooded)	Notes: VERNAL POOL / SWALE ON COSUMNES RIVER PRESERVE
Swale	~~Temporarily Flooded~~	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: VERNAL POOL / SWALE COMPLEX, NO AQUATIC INVERTS OBSERVED, PRESUMED TO BE PRESENT IN THIS AREA

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: _____

Feature # P2 Photo # NONE Location: 125' (125 -250')
Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: YES (NO)

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 0.15 ACRES
Pond	Semipermanently Flooded	Water Depth (inches) NE
(Pool)	(Seasonally Flooded)	Notes: VERNAL POOL ON COSUMNES RIVER PRESERVE
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: VERNAL POOL / SWALE COMPLEX
NO AQUATIC INVERTS OBSERVED, BUT ASSUMED TO BE PRESENT

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: _____

Feature # 104/105 Photo # NONE Location: (125') 125 -250'
077-UP Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: YES (NO)

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 0.16 ACRES
Pond	Semipermanently Flooded	Water Depth (inches) NE
(Pool)	(Seasonally Flooded)	Notes: VERNAL POOL AREA ON COSUMNES RIVER PRESERVE
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	? NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: NO AQUATIC INVERTEBRATES OBSERVED IN THIS AREA, CONSIDERED POTENTIAL HABITAT.

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: _____

Feature # VP1 Photo # DIGITAL Location: (125') 125 -250'
OSO-UP Direction: N

Routine Data Sheet(s): YES (NO) Falgged: YES (NO)

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 0.56 ACRES
Pond	Semipermanently Flooded	Water Depth (inches) NE
(Pool)	(Seasonally Flooded)	Notes: VERNAL POOL ON THE COSUMNES RIVER PRESERVE
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: VERNAL POOL / SWALE COMPLEX, NO AQUATIC INVERTS OBSERVED AT THIS TIME, BUT ASSUMED PRESENT

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: SOUTHERN PART OF THE POOL APPEARS TO HAVE BEEN PARTIALLY LEVELED

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON, S. LONG Date: 3-11-02

Feature # W17 Photo # DIGITAL Location: (125') 125 -250'
082-DP Direction: E

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 325' x 90'
Pond	Semipermanently Flooded	Water Depth (inches) 9"
(Pool)	(Seasonally Flooded)	Notes: LARGE VERNAL POOL ON COSUMNES PRESERVE
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: PART OF POOL/SWALE COMPLEX THAT EXTENDS TO NORTH EAST

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: ON COSUMNES RIVER PRESERVE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 3-12-02

Feature # W23 Photo # DIGITAL Location: (125') 125 -250'
085-UP Direction: _____

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 70 x 35
Pond	Semipermanently Flooded	Water Depth (inches) 2
(Pool)	(Seasonally Flooded)	Notes: SHALLOW DEPRESSION IN ANNUAL GRASSLAND
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: PART OF POOL / SWALE COMPLEX		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: ON COSUMNES PRESERVE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 3-12-02

Feature # W24 Photo # NONE Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 55' x 30'
Pond	Semipermanently Flooded	Water Depth (inches) 2.5
(Pool)	(Seasonally Flooded)	Notes: SHALLOW DEPRESSION IN ANNUAL GRASSLAND
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: PART OF POOL/SWALE COMPLEX		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: ON COSUMNES PRESERVE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 3-12-02

Feature # W25 Photo # NONE Location: (125') 125 -250'
090-55 Direction: _____

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 250' X 15'
Pond	Semipermanently Flooded	Water Depth (inches) 0-1
Pool	(Seasonally Flooded)	Notes: SWALE FEATURE, SHALLOW
(Swale)	Temporarily Flooded	AREAS OF PONDING OBSERVED
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: PART OF SWALE POOL COMPLEX		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: ON COSUMNES RIVER PRESERVE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 3-12-02

Feature # W26 Photo # DIGITAL Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size EXTENSIVE
Pond	Semipermanently Flooded	Water Depth (inches) 2
Pool	(Seasonally Flooded)	Notes: EXTENSIVE SWALE COMPLEX WITH AREAS OF SHALLOW PONDING
(Swale)	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES ?	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: PART OF POOL / SWALE COMPLEX		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes: ON COSUMNES RIVER PRESERVE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-15-02

Feature # W9A Photo # NONE Location: (125') 125 -250'
126-SW Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: YES (NO)

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15'X15'
Pond	Semipermanently Flooded	Water Depth (inches) 0
(Pool)	Seasonally Flooded	Notes: VERY SHALLOW TOPOGRAPHIC
Swale	(Temporarily Flooded)	DEPRESSION IN ANNUAL GRASSLAND
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
			Nest Trees	(YES)	NO
Mammal Burrows	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)			
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: WITHIN FLOODPLAIN OF LAGUNA CREEK, OTHER POOLS AND SWALES IN THIS AREA NO WATER AT TIME OF SURVEY

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs (Trees) VALLEY OAKS (Woodland) Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-15-02

Feature # A81 Photo # 20
~~127-50~~ Direction: N
128-55

Location: (125') 125 -250'

Routine Data Sheet(s): YES NO Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 0.13 ACRES
Pond	Semipermanently Flooded	Water Depth (inches) 0-4
Pool	Seasonally Flooded	Notes: DRAINAGE PATTERN/SWALE
(Swale)	(Temporarily Flooded)	SMALL POOL AT NORTH END
Ditch	Saturated	OF FEATURE

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes:

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-15-02

Feature # W10 (P8) 125-CS Photo # 23 Direction: N

Location: (125') 125 -250'

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
(Stream)	Permanently Flooded	Approximate Size —
Pond	Semipermanently Flooded	Water Depth (inches) 7.5
(Pool)	(Seasonally Flooded)	Notes: APPARENT TRIBUTARY OF LAGUNA CREEK - BED AND BANK PRESENT, NO TO MINIMAL FLOW IN THIS AREA
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: LAGUNA CREEK		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs (Trees) VALLEY OAK (Woodland) VALLEY OAK Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R HUDDLESTON, K HARRISON Date: 2-15-02

Feature # P9 Photo # 21 Location: (125') 125 -250'
127-SW Direction: S

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Potential Jurisdictional WL: (YES) NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 20 x 25'
Pond	Semipermanently Flooded	Water Depth (inches) 3.5
(Pool)	(Seasonally Flooded)	Notes: POOL WITHIN A SWALE FEATURE
(Swale)	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
			Nest Trees	(YES)	NO
Mammal Burrows	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)			
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: SWALE FEATURE - FLOWS WEST INTO TRIBUTARY OF LAGUNA CREEK		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) Roads Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A30 Photo # 13 Location: (125') 125 -250'
Direction: E

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Physical Features (Circle)

Potential Jurisdictional WL: YES (NO)

Wetland Type	Hydrologic Class
Stream	Permanently Flooded
Pond	Semipermanently Flooded
(Pool)	(Seasonally Flooded)
Swale	Temporarily Flooded
Ditch	Saturated

Approximate Size 35' X 15'

Water Depth (inches) 0.5

Notes: ONLY SMALL POCKET OF WATER PRESENT AT TIME OF SURVEY

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: ISOLATED POOL AREA BETWEEN RAIL ROAD AND TWIN CITIES ROAD

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Shrubs (Ruderal) Trees (Agricultural) Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Rangeland (Roads) Field Crops (Vineyards) (Railroad) Urban/Residential Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A31 Photo # 15 Direction: E Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 110' X 22'
Pond	Semipermanently Flooded	Water Depth (inches) 3"
Pool	(Seasonally Flooded)	Notes: PONDED AREA IN DIRT FARM ACCESS ROADWAY
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: 18" CMP UNDER TWIN CITIES ROAD - WOODEN CULVERT UNER RR TRACKS -

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Shrubs (Ruderal) Trees Agricultural Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
Rangeland (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: P. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A 32 Photo # 17 Location: (125') 125 -250'
Direction: E

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15' x 300'
Pond	Semipermanently Flooded	Water Depth (inches) 5.5
(Pool)	(Seasonally Flooded)	Notes: SERIES OF PONDED AREAS
Swale	Temporarily Flooded	IN DIRT FARM ACCESS ROAD
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) TADPOLES	NO			

Notes: POOLS RECIEVE OVERFLOW FROM ADJACENT ROADSIDE DITCHES

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) (Industrial)

Human Impacts: (Circle all that apply)
(Excavated Drainages) Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A33 Photo # 18 Location: (125') 125 -250'
Direction: E

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 34' X 180'
Pond	Semipermanently Flooded	Water Depth (inches) 5.75
(Pool)	(Seasonally Flooded)	Notes: PONDED AREA IN DIRT FARM ACCESS ROAD
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) TADPOLES	NO			

Notes: RECIEVES RUNOFF FROM ROADSIDE DITCH

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A35 Photo # 20 Direction: E Location: (125') 125 -250'

Routine Data Sheet(s): (YES) NO Falgged: (YES) NO

Physical Features (Circle)

Potential Jurisdictional WL: YES (NO)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size _____
Pond	Semipermanently Flooded	Water Depth (inches) 4.5
(Pool)	(Seasonally Flooded)	Notes: GRASSY, SHALLOW DEPRESSION AREAS WITH PONDED WATER INTERMITTENT
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) TADPOLES	NO			

Notes: - HYDROLOGIC CONNECTION TO NATURAL INTERMITTENT DRAINAGE THROUGH PASTURE AREA TO THE SOUTH & NORTH

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: F. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A36 Photo # 21 Direction: E Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 10' x 200'
Pond	Semipermanently Flooded	Water Depth (inches) 9.75
Pool	(Seasonally Flooded)	Notes: 24" CONCRETE BOX CULVERT UNDER TWIN CITIES ROAD
Swale	Temporarily Flooded	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) BULL FROGS	NO			

Notes: ROADSIDE DRAINAGE

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
(Rangeland) (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A38 Photo # 24 Location: (125') 125 -250'
Direction: S

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15' x 60'
Pond	Semipermanently Flooded	Water Depth (inches) 23 -(AT RR CULVERT)
Pool	Seasonally Flooded	Notes: 44" CONCRETE CULVERT UNDER TWIN CITIES ROAD, BOX CULVERT UNDER RAIL ROAD TRACKS
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) BULL FROGS	NO			

Notes: HYDROLOGICALLY CONNECTED TO INTERMITTENT DRAINAGE ON SOUTH SIDE OF ROAD

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs (Trees) Woodland Riparian
EUCALYPTUS

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: P. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A39 Photo # 3 Location: (125') 125 -250'
Direction: E

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 10' x 1401'
Pond	Semipermanently Flooded	Water Depth (inches) 2
(Pool)	(Seasonally Flooded)	Notes:
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
			Nest Trees	YES	(NO)
Mammal Burrows	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)			
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: ROADSIDE DITCH		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A42 Photo # 8 Location: (125') 125 -250'
Direction: N

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15'X20'
Pond	Semipermanently Flooded	Water Depth (inches) 4
Pool	(Seasonally Flooded)	Notes: 24" CMP UNDER TWIN CITIES ROAD, 24" CEMENT CULVERT UNDER RAIL ROAD
(Swale)	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails) NORTH SIDE ONLY	(YES)	NO	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
			Nest Trees	YES	(NO)
Mammal Burrows	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)			
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: DRAINS INTO PONDED AREA ON NORTH SIDE OF RAIL ROAD TRACKS		
Small Fish or Amphibians	(YES)	NO BULL FROGS			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A48 Photo # 3 Direction: W Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class
Stream	Permanently Flooded
Pond	Semipermanently Flooded
(Pool)	(Seasonally Flooded)
Swale	Temporarily Flooded
Ditch	Saturated

Approximate Size 25' x 85'

Water Depth (inches) 2.5

Notes: PONDED WATER IN DIRT FARM ACCESS ROADWAY

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: VERY TURBID WATER - NO AQUATIC INVERTEBRATES OBSERVED BY VISUAL INSPECTION

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
(Rangeland) (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-7-02

Feature # A52 Photo # 12.13 Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 15' x 126'
Pond	Semipermanently Flooded	Water Depth (inches) 8.5
(Pool)	(Seasonally Flooded)	Notes:
Swale	Temporarily Flooded	
Ditch	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes:		
Small Fish or Amphibians	(YES) BULL FROGS	NO			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) (Ruderal) Agricultural
Shrubs (Trees) EUCALYPTUS Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland Roads (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON Date: _____

Feature # P3-P6 Photo # NONE Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): YES NO Falgged: YES NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size _____
Pond	Semipermanently Flooded	Water Depth (inches) _____
(Pool)	(Seasonally Flooded)	Notes: SERIES OF VERNAL POOLS
Swale	Temporarily Flooded	BETWEEN TWIN CITIES AND
Ditch	Saturated	CLAY EAST ROADS

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	YES	(NO)
Mammal Burrows	YES	(NO)	Nest Trees	(YES)	NO
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes:		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages Culverts Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A23 Photo # 32 Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES NO

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 10'x40'
Pond	Semipermanently Flooded	Water Depth (inches) 4"
Pool	(Seasonally Flooded)	Notes: 18" CONCRETE CULVERT UNDER RAIL ROAD
Swale	Temporarily Flooded	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
			Nest Trees	YES	(NO)
Mammal Burrows	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)			
Basking Sites (within or adjacent to wetland)	(YES)	NO	Notes: RUNOFF FROM ROADSIDE DITCH - NO CULVERT UNDER TWIN CITIES ROAD		
Small Fish or Amphibians	YES	(NO)			

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) - RR Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K HARRISON Date: 2-6-02

Feature # A25 Photo # 1 Location: 125' 125 -250'
Direction: S

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

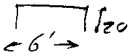
Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class
Stream	Permanently Flooded
Pond	Semipermanently Flooded
Pool	(Seasonally Flooded)
Swale	Temporarily Flooded
(Ditch)	Saturated

Approximate Size 14' x 80'

Water Depth (inches) 4" - 9"

Notes:  120" BOX CULVERT UNDER TWIN CITIES ROAD

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES) BULL FROGS	NO			

Notes: APPEARS TO BE PART OF NATURAL SWALE ON NORTH SIDE OF ROAD, SOUTH SIDE CONVERTED TO VINEYARD

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) Agricultural
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: FARM ACCESS ROAD RUNS THROUGH THIS DRAINAGE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A 19 Photo # 23 Location: (125') 125 -250'
Direction: N

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 3'x 50'
Pond	Semipermanently Flooded	Water Depth (inches) NONE
Pool	Seasonally Flooded	Notes: DRAINAGE DITCH
Swale	(Temporarily Flooded)	18" CMP UNDER TWIN CITIES
(Ditch)	Saturated	ROAD, WOOD BOX CULVERT
		UNDER RAIL ROAD

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	YES	(NO)
			Nest Trees	YES	(NO)
Mammal Burrows	(YES)	NO	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	(YES)	NO			
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: RECIEVES OVERFLOW FROM ADJACENT VINYARDS - NO NATURAL WETLANDS ADJACENT

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland, (Ruderal), (Agricultural), Shrubs, Trees, Woodland, Riparian

Adjacent Land Use: (Circle all that apply)
Pasture, (Field Crops), (Vineyards), Urban/Residential, Rangeland, (Roads), (Railroad), Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages, (Culverts), Underground Utilities, (Land Leveling), Fill Material, Disking/Plowing

Notes: ROAD - FARM ACCESS THROUGH DRAINAGE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A20 Photo # 25 Direction: N Location: (125') 125 -250'

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 3' x 55'
Pond	Semipermanently Flooded	Water Depth (inches) NONE
Pool	Seasonally Flooded	Notes: 18" CMP UNDER TWIN CITIES ROAD, WOOD BOX CULVERT UNDER RAILROAD
Swale	(Temporarily Flooded)	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	YES	(NO)	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	YES	(NO)
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: SOME PONDED WATER OBSERVED IN PASTURES TO THE NORTH, BUT NO APPARENT HYDROLOGIC CONNECTION WITH THIS DITCH

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) (Agricultural)
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops (Vineyards) Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: DIRT FARM ACCESS ROAD RUNS THROUGH THIS DRAINAGE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: E. HUDDLESTON, K. HARRISON Date: 2-6-02

Feature # A21 Photo # 27 Location: (125') 125 -250'
Direction: S

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Potential Jurisdictional WL: YES (NO)

Physical Features (Circle)

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 14' x 25'
Pond	Semipermanently Flooded	Water Depth (inches) 4"
Pool	(Seasonally Flooded)	Notes: 18" CMP UNDER TWIN CITIES ROAD, 18" CONCRETE CULVERT UNDE RR TRACKS
Swale	Temporarily Flooded	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES) SPARSE	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: THIS DRAINAGE APPEARS TO BE HYDROLOGICALLY CONNECTED TO PONDED AREAS IN PASTURE ON NORTH SIDE OF RAILROAD

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland (Ruderal) (Agricultural)
Shrubs (Trees) Woodland Riparian
EUCALYPTUS

Adjacent Land Use: (Circle all that apply)
(Pasture) Field Crops Vineyards Urban/Residential
Rangeland (Roads) (Railroad) Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
(Land Leveling) Fill Material Disking/Plowing

Notes: FARM ACCESS ROAD IN THIS AREA RUNS THROUGH DRAINAGE

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-8-02

Feature # A55 Photo # _____ Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Physical Features (Circle)

Potential Jurisdictional WL: YES NO

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 10'x130'
Pond	Semipermanently Flooded	Water Depth (inches) 16
Pool	(Seasonally Flooded)	Notes: 30" CMP UNDER CLAY EAST ROAD
Swale	Temporarily Flooded	
(Ditch)	Saturated	- ROADSIDE DRAINAGE DITCH

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	(YES)	NO
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES)	NO	Algae	(YES)	NO
Mammal Burrows	YES	(NO)	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	(YES)	NO			

Notes: LARGE POOL/SWALE COMPLEX ON SOUTH SIDE OF ROAD
POSSIBLE BULL FROGS

Environmental Features

Adjacent Vegetation: (Circle all that apply)
(Annual Grassland) Ruderal (Agricultural)
Shrubs Trees Woodland Riparian

Adjacent Land Use: (Circle all that apply)
Pasture Field Crops (Vineyards) Urban/Residential
(Rangeland) (Roads) Railroad Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages (Culverts) Underground Utilities
Land Leveling Fill Material Disking/Plowing

Notes:

Cosumnes Power Plant Natural Gas Pipeline
Aquatic Features Field Data Sheet

Observers: R. HUDDLESTON, K. HARRISON Date: 2-8-02

Feature # AS8 Photo # _____ Location: (125') 125 -250'
Direction: _____

Routine Data Sheet(s): YES (NO) Falgged: (YES) NO

Physical Features (Circle)

Potential Jurisdictional WL: YES NO

Wetland Type	Hydrologic Class	
Stream	Permanently Flooded	Approximate Size 10'x15'
Pond	Semipermanently Flooded	Water Depth (inches) 6.5
Pool	Seasonally Flooded	Notes: 12" CMP UNDER LAGUNA ROAD
Swale	(Temporarily Flooded)	
(Ditch)	Saturated	

Habitat Features

Emergent Vegetation (cattails)	YES	(NO)	Aquatic Invertebrates	YES	(NO)
Hydrophytic Vegetation (popcorn flower, semaphore grass, etc.)	(YES) SPARSE	NO	Algae	(YES)	NO
Mammal Burrows	(YES)	NO	Nest Trees	YES	(NO)
Other Refuge (rocks, debris, wood, etc)	YES	(NO)	Other Wetlands in Immediate Vicinity (i.e. hydrologically connected)	(YES)	NO
Basking Sites (within or adjacent to wetland)	(YES)	NO			
Small Fish or Amphibians	YES	(NO)			

Notes: WEAKLY EXPRESSED SWALE ON SOUTH SIDE OF LAGUNA ROAD

Environmental Features

Adjacent Vegetation: (Circle all that apply)
Annual Grassland, Ruderal, (Agricultural), Shrubs, Trees, Woodland, Riparian

Adjacent Land Use: (Circle all that apply)
Pasture, Field Crops, (Vineyards), Urban/Residential, Rangeland, (Roads), Railroad, Industrial

Human Impacts: (Circle all that apply)
Excavated Drainages, (Culverts), Underground Utilities, Land Leveling, Fill Material, Disking/Plowing

Notes:

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 02 - 01 - 2002
month (mm) date (dd) year (yyyy)

Scientific Name: LEPIDURUS PACKARDI

Common Name: VERNAL POOL TADPOLE SHRIMP

Species Found? ☒ yes ☐ no _____ If not, why?
Total No. Individuals 1 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☐ unk.
Yes, Occ. #
Collection? If yes: NONE
Number Museum / Herbarium

Reporter: RUSSELL HUDDLESTON / CH2M HILL
Address: 2485 NATOMAS PARK DR. #60
SACRAMENTO, CA 95833
Email Address: rhuddle1@ch2m.com
Phone: (916) 286-0239

Plant Information
Phenology: _____ % vegetative _____ % flowering _____ % fruiting

Animal Information
Age Structure: 1 # adults 0 # juveniles 0 # unknown
☒ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location (please also attach or draw map on back) APPROXIMATELY 1000 FEET NORTH OF ELK GROVE BLVD, POOL ON WEST SIDE OF WESTERN PACIFIC RAIL ROAD TRACKS APPROXIMATELY 0.5 MILES WEST OF FRANKLIN BLVD
County: SACRAMENTO Landowner / Mgr.: PVT
Quad Name: FLORIN Elevation: 20'
T 7N R 5E SE 1/4 of SW 1/4 of Section 32 T ____ R ____ ____ 1/4 of ____ 1/4 of Section ____
UTM: Zone: CAL. ZONE 2 (10, 11) Datum: NAD 88 (NAD83, NAD27, WGS84, other)
Source: GPS (GPS, map & type, etc.) Point Accuracy: 0-1 Meters
UTM Coordinates N. 19/2223.118 E. 6717800.682

Habitat Description (plant communities, dominants, associates, substrates/soils, aspects/slope) SHALLOW, LINEAR TOPOGRAPHIC DEPRESSION ADJACENT TO RAIL ROAD TRACKS. APPROX. 5" PONDED WATER PRESENT, HERBACEOUS AND GRASSY SUBSTRATE, COPEPODS AND WATER FLEAS PRESENT
Other rare species?

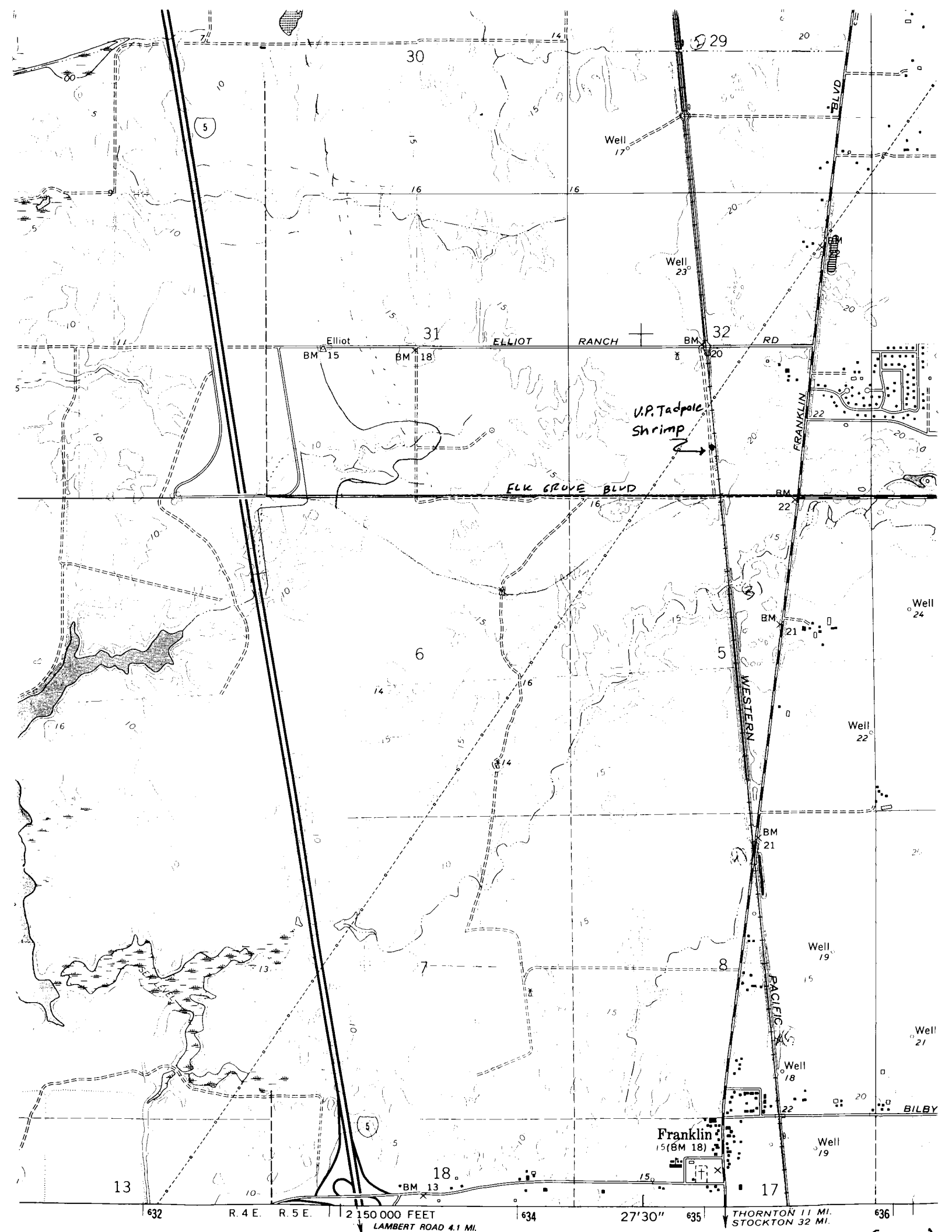
Site Information Overall site quality: ☐ Excellent ☐ Good ☒ Fair ☐ Poor
Current / surrounding land use: POOL WAS WITHIN RAIL ROAD RIGHT OF WAY, RESIDENTIAL AREAS TO EAST AND WEST
Visible disturbances / possible threats:
Comments: VISUAL OBSERVATION ONLY, NO AQUATIC SAMPLING DONE AT THIS LOCATION.

Determination: (check one or more, and fill in blanks)
☐ Keyed (cite reference): VISUAL ID ONLY
☐ Compared with specimen housed at: SPECIES HAS NOT
☐ Compared with photo / drawing in: BEEN CONFIRMED
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more)

	Slide	Print
Plant / animal	☐	☐
Habitat	☐	☒
Diagnostic feature	☐	☐

May we obtain duplicates at our expense? ☒ yes ☐ no


30
29
31
32
6
5
7
8
18
17
13
Well 17
Well 23
Well 24
Well 22
Well 19
Well 21
Well 18
Well 19
Elliot
BM 15
BM 18
BM 20
BM 22
BM 21
BM 21
BM 13
ELLIOT RANCH RD
ELK GROVE BLVD
FRANKLIN BLVD
WESTERN PACIFIC
BILBY
V.P. Tadpole Shrimp
Franklin
(BM 18)
5
R. 4 E.
R. 5 E.
632
634
635
636
2 150 000 FEET
27'30"
LAMBERT ROAD 4.1 MI.
THORNTON 11 MI.
STOCKTON 32 MI.

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 02 - 04 - 2002
month (mm) date (dd) year (yyyy)

Scientific Name: LINDERIELLA OCCIDENTALIS

Common Name: CALIFORNIA FAIRY SHRIMP

Species Found? ☒ yes ☐ no _____ If not, why?
Total No. Individuals 5-10 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☐ unk.
Collection? If yes: Yes, Occ. # NONE _____
Number Museum / Herbarium

Reporter: RUSSELL HUDDLESTON/CH2M HILL
Address: 2485 NATOMAS PARK DR #600
SACRAMENTO, CA, 95833
Email Address: rhuddle1@ch2m.com
Phone: (916) 286-0239

Plant Information
Phenology: _____ % vegetative _____ % flowering _____ % fruiting

Animal Information
Age Structure: 5-10 # adults ∅ # juveniles ∅ # unknown
☒ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

Location (please also attach or draw map on back) APPROXIMATELY 1 MILE SOUTH OF ELK GROVE BLVD, WEST SIDE OF WESTERN PACIFIC RAIL ROAD RIGHT OF WAY.

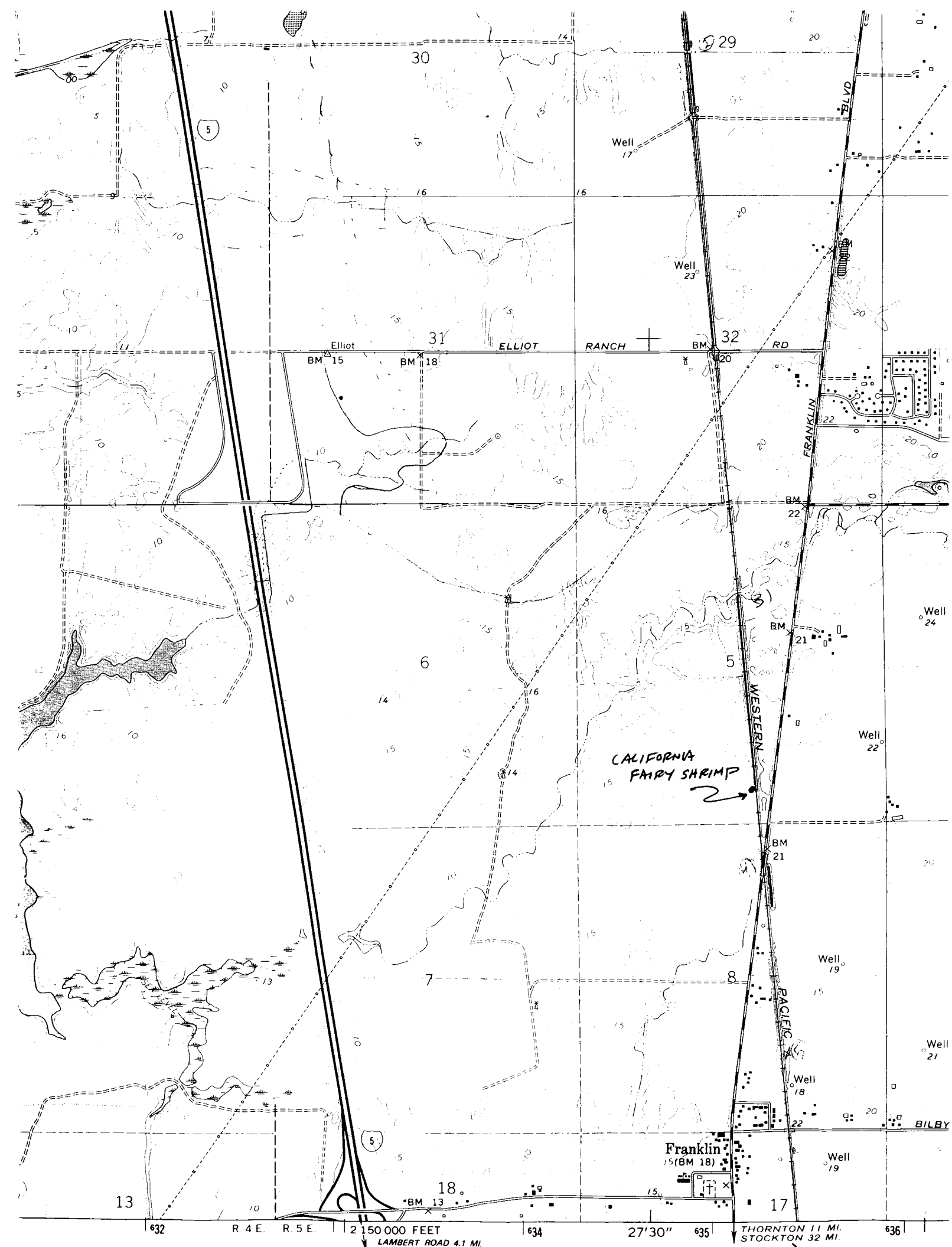
County: SACRAMENTO Landowner / Mgr.: PVT
Quad Name: FLORIN Elevation: 15'
T 6N R 5E NE 1/4 of NW 1/4 of Section 8 T ____ R ____ ____ 1/4 of ____ 1/4 of Section ____
UTM: Zone: CAL. ZONE 2 (10, 11) Datum: NAD 88 (NAD83, NAD27, WGS84, other)
Source: GPS (GPS, map & type, etc.) Point Accuracy: 0-1 Meters
UTM Coordinates N. 1906629.366 E. 671835'. 993

Habitat Description (plant communities, dominants, associates, substrates/soils, aspects/slope) SHALLOW TOPOGRAPHIC DEPRESSION IN RAIL ROAD RIGHT OF WAY. HERBACEOUS AND GRASSY SUBSTRATE.
Other rare species?

Site Information Overall site quality: ☐ Excellent ☐ Good ☒ Fair ☐ Poor
Current / surrounding land use: RAIL ROAD RIGHT OF WAY - STONE LAKES VERNAL POOL MITIGATION SITE TO WEST.
Visible disturbances / possible threats:
Comments: VISUAL OBSERVATION ONLY, NO AQUATIC SAMPLING AT THIS SITE

Determination: (check one or more, and fill in blanks)
☐ Keyed (cite reference): _____
☐ Compared with specimen housed at: _____
☐ Compared with photo / drawing in: _____
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more) Slide Print
Plant / animal ☐ ☐
Habitat ☐ ☒
Diagnostic feature ☐ ☐
May we obtain duplicates at our expense? ☒ yes ☐ no


30
29
31
32
ELLIOT RANCH RD
Elliot
BM 15
BM 18
BM 20
Well 17
Well 23
DAVIS
FRANKLIN
BM 22
Well 24
BM 21
6
5
WESTERN
CALIFORNIA FAIRY SHRIMP
Well 22
BM 21
Well 19
7
8
PACIFIC
Well 21
Well 18
BILBY
Franklin
(BM 18)
Well 19
18
BM 13
13
17
R 4 E.
R 5 E.
2 150 000 FEET
27'30"
THORNTON 11 MI.
STOCKTON 32 MI.
LAMBERT ROAD 4.1 MI.
632
634
635
636

California Native Species Field Survey Form

Mail to:
Natural Diversity Database
California Department of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95814

For Office Use Only
Source Code _____ Quad Code _____
Elm Code _____ Occ. No. _____
EO Index No. _____ Map Index No. _____

Date of Field Work: 02 (month (mm)) - 04 (date (dd)) - 2002 (year (yyyy))

Scientific Name: LEPIDURUS PACKARDI

Common Name: VERNAL POOL TADPOLE SHRIMP

Species Found? ☒ yes ☐ no _____ If not, why?
Total No. Individuals 1 Subsequent Visit? ☐ yes ☐ no
Is this an existing NDDB occurrence? _____ ☐ no ☐ unk. Yes, Occ. #
Collection? If yes: NONE Number _____ Museum / Herbarium

Reporter: RUSSELL HUDDLESTON / CH2M HILL
Address: 2485 NATOMAS PARK DR. #600
SACRAMENTO, CA 95833
Email Address: rhuddle1@ch2m.com
Phone: (916) 286-0239

Plant Information
Phenology: _____ % vegetative _____ % flowering _____ % fruiting

Animal Information
Age Structure: 1 # adults 0 # juveniles 0 # unknown
☒ breeding ☐ wintering ☐ burrow site ☐ rookery ☐ nesting ☐ other

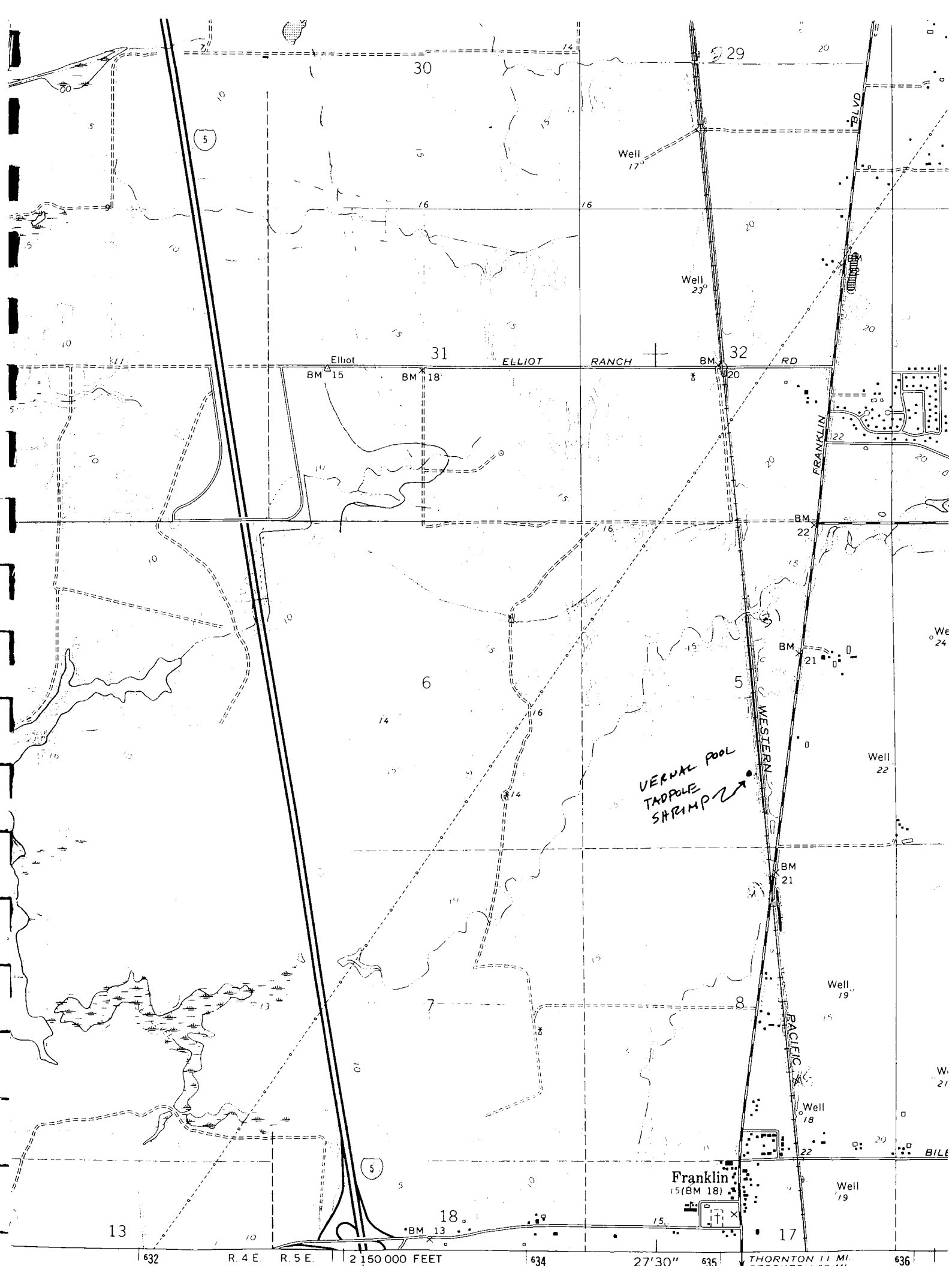
Location (please also attach or draw map on back) POOL A12 - APPROXIMATELY 0.4 MILES NORTH OF THE INTERSECTION OF THE WESTERN PACIFIC RAILROAD AND FRANKLIN BLVD. IN POOL ON WEST SIDE OF RAIL ROAD IN CONSTRUCTED VERNAL POOL
County: SACRAMENTO Landowner / Mgr.: STONE LAKES
Quad Name: FLORIN Elevation: 20'
T 6N R 5E _____ 1/4 of _____ 1/4 of Section 5 T _____ R _____ _____ 1/4 of _____ 1/4 of Section _____
UTM: Zone: CAL. ZONE 2 (10, 11) Datum: NAD 88 (NAD83, NAD27, WGS84, other)
Source: GPS (GPS, map & type, etc.) Point Accuracy: 0-1 Meters
UTM Coordinates N. 1907531.011 E. 6718078.222

Habitat Description (plant communities, dominants, associates, substrates/soils, aspects/slope) LARGE CONSTRUCTED VERNAL POOL IN ANNUAL GRASSLAND. APPROX 2" PONDED WATER GRASSY AND HERBACEOUS SUBSTRATE
Other rare species?

Site Information Overall site quality: ☐ Excellent ☒ Good ☐ Fair ☐ Poor
Current / surrounding land use: STONE LAKES VERNAL POOL MITIGATION SITE, LOW INTENSITY CATTLE GRAZING IN THIS AREA
Visible disturbances / possible threats:
Comments: VISUAL OBSERVATION ONLY - NO AQUATIC SAMPLING DONE AT THIS LOCATION

Determination: (check one or more, and fill in blanks)
☐ Keyed (cite reference): VISUAL OBS. ONLY - ID
☐ Compared with specimen housed at: HAS NOT BEEN
☐ Compared with photo / drawing in: CONFIRMED
☐ By another person (name): _____
☐ Other: _____

Photographs: (check one or more) Slide Print
Plant / animal ☐ ☐
Habitat ☐ ☒
Diagnostic feature ☐ ☐
May we obtain duplicates at our expense? ☒ yes ☐ no


30
29
31
32
6
5
7
8
18
17
13
ELLIOT RANCH RD
Elliot
BM 15
BM 18
BM 20
BM 22
BM 21
BM 21
BM 13
Well 17
Well 23
Well 22
Well 19
Well 18
Well 19
Well 24
FRANKLIN BLVD
WESTERN
PACIFIC
VERNAL POOL TADPOLE SHRIMP
Franklin
15(BM 18)
5
5
632
R. 4 E.
R. 5 E.
2 150 000 FEET
634
27'30"
635
THORNTON 11 MI.
636

W13

W14

W16

VP1

102

103

W17

W23

W26

APPENDIX C

Contingency Plan for Horizontal Directional Drilling

Appendix C
Contingency Plan for Horizontal Directional Drilling

The natural gas pipeline extension to the Cosumnes Power Plant (CPP) is proposed to cross the Cosumnes River, Badger Creek, and Laguna Creek by Horizontal Directional Drilling (HDD). HDD is less intrusive than traditional open-cut trenching where habitats sustain direct soil disturbance.

Frac-out, or inadvertent return of drilling lubricant, is a potential concern when the HDD is used under sensitive habitats and waterways. The HDD procedure uses bentonite slurry, a fine clay material as a drilling lubricant. The bentonite is non-toxic and commonly used in farming practices, but benthic invertebrates, aquatic plants and fish and their eggs can be smothered by the fine particles if bentonite were discharged to waterways.

The purpose of a Contingency Plan or "Frac-out" plan is to:

- Minimize the potential for a frac-out associated with horizontal directional drilling activities
- Provide for the timely detection of frac-outs
- Protect areas that are considered environmentally sensitive (streams, wetlands, other biological resources, cultural resources)
- Ensure an organized, timely, and "minimum-impact" response in the event a frac-out and release of drilling mud occur
- Ensure that all appropriate notifications are made to the CEC and environmental monitors immediately, and to appropriate regulatory agencies in 24 hours and that documentation is completed

The "Frac-out" plan is prepared by the drilling contractor, to ensure that preventive and responsive measures can be implemented by the contractor. To minimize the potential for a Frac-out, the Contingency Plan includes:

- Design protocols to be implemented for the protection of sensitive cultural and biological resources
- Design protocols to require a geotechnical engineer or qualified geologist to make recommendations regarding the suitability of the formations to be bored to minimize the potential for frac-out conditions

Prior to construction, sensitive biological resources will be protected by implementing the following measures:

- Sensitive biological resources will be flagged for avoidance or construction limits will be clearly marked
- Barriers (straw bales or sedimentation fences) will be erected between the bore site and nearby sensitive resources prior to drilling, as appropriate, to prevent released material from reaching the resource
- On-site briefings will be conducted for the workers to identify and locate sensitive resources at the site
- Ensure that all field personnel understand their responsibility for timely reporting of frac-outs
- Maintaining necessary response equipment on-site or at a readily accessible location and in good working order
- Disallowing fill into waters of the United States unless proper permits have been obtained
- Monitoring for the duration of drilling activities by a qualified biologist
- Implement any of the mitigation measures specified by CDFG in its Streambed Alteration Agreement, pursuant to Fish and game Code Section 1603.

To further reduce the potential impacts of a frac-out, construction of the pipeline is expected to occur when there is least (or no) flow in the Cosumnes, Badger and Laguna Creeks. Construction is expected to begin in summer of 2003 and end in the fall of 2003. The drilling entry and exit areas will be clearly marked, surrounded by construction fencing and silt fencing to minimize the potential for all-site migration of drilling mud. Access and egress locations will be designated and clearly marked.

The primary areas of concern for inadvertent returns occur at the entrance and exit points where the drilling equipment are at depths of less than 12 to 20 feet deep. The likelihood of inadvertent return decreases as the depth of the pipe increases. To reduce the potential of a frac-out affecting sensitive resources, the entrance and exit points for drilling will be located at least 150 feet from riparian vegetation along the Cosumnes, Badger and Laguna Creeks.

To minimize the potential extent of impacts from a frac-out, all HDD will be attended by a full-time biological monitor, to look for observable “frac-out” conditions or lowered pressure readings on the drilling equipment. Early detection is key to minimizing the area of potential impact.

Contingency Response

Once a frac-out is identified:

- All work stops, including the recycling of drilling mud/lubricant. The pressure of water above the pipe keeps excess mud from escaping through the fracture.
- Determine the location and extent of the frac-out.

If the frac-out is terrestrial:

- Isolate the area with hay bales, sand bags, or silt fencing to surround and contain the drilling mud.
- Consult with CDFG and property owner representative (i.e., Nature Conservancy) regarding next appropriate action among the following:
  - A mobile vacuum truck will be used to pump the drilling mud from the contained area and recycled to the return pit.
  - The drilling mud will be left in place to avoid potential damage from vehicles entering the area.
- Once excess drilling mud is removed, the area will be seeded and/or replanted using species similar to those in the adjacent area, or allowed to re-grow from existing vegetation.
- Revegetated areas will be monitored twice per year for two years subsequent to frac-out to confirm revegetation is successful.

If the frac-out is aquatic (i.e., under water):

- Monitor frac-out for 4 hours to determine if the drilling mud congeals. (Bentonite will usually harden, effectively sealing the frac-out location).
- Consult with CDFG and property owner representative (i.e., Nature Conservancy) regarding next appropriate action among the following:
  - If drilling mud congeals, take no other action that would potentially suspend sediments in the water column.
  - If drilling mud does not congeal, erect isolation/containment environment (underwater boom and curtain).
  - If the fracture becomes excessively large, a spill response team would be called in to contain and clean up excess drilling mud in the water. Phone numbers of spill response teams in the area will be on site.
- If the spill affects and area that is vegetated, the area will be seeded and/or replanted using species similar to those in the adjacent area, or allowed to re-grow from existing vegetation.
- Revegetated areas will be monitored twice per year for two years subsequent to frac-out to confirm revegetation is successful.
- After frac-out is stabilized and any required removal is completed, document post-cleanup conditions with photographs and prepare frac-out incident report describing time, place, actions taken to remediate frac-out and measures implemented to prevent recurrence. Incident report will be provided to CEC and CDFG as part of project compliance not more than 30 days after the incident.

This page left blank

APPENDIX D

Fish Resources and Aquatic Habitat

SACRAMENTO MUNICIPAL UTILITY DISTRICT

COSUMNES POWER PLANT PROJECT

FISH RESOURCES AND AQUATIC HABITAT

FINAL

PREPARED BY:

SWRI SURFACE WATER RESOURCES, INC.

JANUARY 2003

1.0 INTRODUCTION

This appendix is a reference to Attachment BR-201-B3, *Revised Draft Biological Resources Assessment for Cosumnes Power Plant, Sacramento County, California* (November 27, 2002). Modeling data and discussion are provided to address the potential effects to fisheries resources as a result of the SMUD Cosumnes Power Plant Project diversion of a yearly average of 7.35 cfs (with a monthly average ranging from 6.5 cfs to 8.9 cfs).

Species of primary management concern evaluated in this analysis include federal- and/or state-listed species of the region, winter- and spring-run Chinook salmon, steelhead (*Oncorhynchus mykiss*), Delta smelt (*Hypomesus transpacificus*), Sacramento splittail (*Pogonichthys macrolepidotus*)), and candidate species under the federal ESA (fall-run Chinook salmon).

Special emphasis is placed on these species to facilitate compliance with applicable laws, particularly, the State and/or federal ESA, and to be consistent with state and federal restoration plans. This focus is consistent with: (1) CALFED's 1999 Ecosystem Restoration Program Plan (ERPP); (2) USFWS's 1997 Draft Anadromous Fish Restoration Program, which identifies specific actions on the lower American River to protect anadromous salmonids; (3) CDFG's 1996 Steelhead Restoration and Management Plan for California, which identifies specific actions on the lower American River to protect steelhead; and (4) CDFG's Restoring Central Valley Streams, A Plan for Action (1993), which identifies specific actions in the Sacramento River system to protect salmonids. Improvement of habitat conditions for these species of priority management concern will likely protect or enhance conditions for other fish resources, including native resident species.

In addition, this document analyzes potential impacts to Essential Fish Habitat (EFH) as required by the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). EFH only applies to the habitat of commercial fish species (i.e., all Chinook salmon habitat, but not steelhead habitat) and includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity. EFH includes all anadromous streams (including some intermittent streams) up to impassable barriers. In the American River Basin, EFH includes the lower American River up to Nimbus Dam. In the Central Valley, it also includes accessible waters of the Delta, Sacramento River, and tributaries up to impassable barriers. Keswick Dam represents the first impassable barrier on the Sacramento River, within the study area. The evaluation process conducted within this document may be used to satisfy EFH consultation requirements. Thus, a separate EFH document is not needed. Information contained within the analysis regarding potential effects to EFH indicate that implementation of the Proposed Project would not be expected to adversely affect fall-run Chinook salmon Essential Fish Habitat.

2.0 IMPACT METHODOLOGY

This analysis addresses the potential effects of the implementation of the Proposed Project on fisheries resources as a result of changes in surface water hydrology and are based on comparisons made between computer model simulations that represent existing and future hydrologic conditions with and without the Proposed Project.

An overview of the computer simulation models used for analysis, the simulations performed from which impacts were estimated, and the primary assumptions and model inputs used to represent hydrologic, regulatory, structural, and operational conditions is provided below.

Models Used for the Hydrologic Impact Analysis

Computer simulation models of water systems provide a means for evaluating changes in system characteristics such as carryover storage, reservoir water elevation, river flow rate and power generation, as well as the effects of these changes on environmental parameters such as water temperature, early-lifestage Chinook salmon survival, and recreational opportunities. The models used in this analysis include the following:

- United States Bureau of Reclamation's ("Reclamation") Project Simulation (PROSIM) model of the Central Valley Project ("CVP") and State Water Project ("SWP");
- DWR's Upper American River Model ("UARM") of the major reservoirs and river reaches above Folsom Reservoir;
- Reclamation's American and Sacramento river water temperature models; and
- Reclamation's American and Sacramento rivers early-lifestage Chinook salmon mortality models.

PROSIM provides a monthly simulation of the CVP and SWP water and power operations. Output from PROSIM serves as input to the temperature models that simulate monthly American River and Sacramento River water temperatures. Temperature model output serves as input to the early-lifestage Chinook salmon mortality models.

PROSIM Model

PROSIM simulates CVP and SWP operations and the hydrologic effects of those operations on the major Central Valley river and reservoir systems. The model simulates system operations within the geographical area affected by CVP and SWP facilities, including the Delta. PROSIM Version 2000 was used in this study and incorporates modifications to code and data sets determined through resource agency consultations and coordination meetings held in 1999 and 2000.

PROSIM uses a mass balance approach to simulate the occurrence, regulation, and movement of water from one node (i.e., computation point) to another. Various physical processes (e.g., surface water inflow or accretion, flow from another node, groundwater accretion or depletion, and diversion) are simulated or assumed. Operational constraints, such as reservoir size and seasonal storage limits or minimum flow requirements, also are defined for each node. The model uses a monthly time step. Flows are specified as a mean flow for the month and reservoir storage volumes are specified as end-of-month content.

Upper American River Model

The UARM simulates the American River system upstream of Folsom Reservoir by combining use of the U.S. Army Corps of Engineers (Corps) HEC-III Program for hydrologic routing and storage accounting purposes with a spreadsheet model that simulates operations of water projects upstream of Folsom Dam and Reservoir.

Temperature Models

Reclamation has developed water temperature models for five reservoirs (Trinity, Whiskeytown, Shasta, Oroville, and Folsom) and three river systems (Sacramento, Feather, and American). The models for reservoirs are distinctly different than the models for rivers. Because of the monthly time step and relatively small volumes, regulating reservoirs (Lewiston, Keswick, Thermalito, and Natoma) are modeled similar to river reaches rather than as storage reservoirs. These models estimate mean monthly water temperatures based on flow and storage quantities simulated by PROSIM. They are used to identify changes in water temperature caused by changes in CVP and SWP operations.

Reservoir Models

Reservoir inflow, outflow, and end-of-month storage content as calculated by PROSIM is input to the reservoir temperature models. Additional input data include meteorological information and monthly temperature targets which are used by the model to select the level from which reservoir releases are drawn. Temperature control devices (TCD), such as the outlet control device in Shasta Reservoir, the temperature curtains in Whiskeytown Reservoir, and the penstock shutters in Folsom Reservoir, are incorporated in the simulation. Model output includes water temperature at each level in the reservoir as well as temperature of the reservoir release. The reservoir release temperature is then used in the downstream river temperature model.

River Models

The river temperature models utilize the calculated temperatures of reservoir release, much of the same meteorological data used in the reservoir models, and PROSIM output on river flow rates, gains and diversions. Mean monthly water temperatures are calculated at multiple locations on the Sacramento, Feather, and American rivers.

Automated Temperature Selection Procedure

The Folsom Reservoir and lower American River temperature models are utilized in an iterative manner referred to as the Automated Temperature Selection Procedure. This procedure operates the reservoir and river models with the objective of achieving multi-species fish monthly target water temperatures in the lower American River at Watt Avenue. Targets are achieved through choice of reservoir level from which the release is drawn.

Salmon Mortality Models

Water temperatures calculated for specific reaches of the Sacramento and American rivers are used in Reclamation's Chinook salmon mortality models to estimate annual percentage mortality

of early-lifestage Chinook salmon. On the Sacramento River, a calculation is performed for each of the four Chinook salmon runs: fall, late-fall, winter, and spring. On the American River, estimates are made for the fall-run Chinook salmon.

Application of Modeling Output

The models used in this analysis (DWR's UARM, Reclamation's PROSIM, reservoir temperature models, American and Sacramento water temperature models, and the lower American and Sacramento river Chinook salmon early-lifestage mortality models) are tools that have been developed for comparative planning purposes, not for predicting actual river conditions at specific locations at specific times. The 70-year and 69-year periods of record for PROSIM and temperature modeling, respectively, provide an index of the kinds of changes that would be expected to occur with implementation of a specified set of operational conditions. Reservoir storage, river flows, water temperature, and salmon survival output for the period modeled should not be interpreted or used as definitive absolutes depicting actual river conditions that will occur in the future. Rather, output for the with-project and the cumulative condition can be compared to that for the without-project condition to determine:

- Whether reservoir storage or river flows and temperatures would be expected to change with implementation of the Proposed Project;

- The months in which potential reservoir storage and river flow and temperatures changes could occur;

- A relative index of the magnitude of change that could occur during specific months of particular water year types, and whether the relative magnitude anticipated would be expected to result in impacts to fish resources within the regional area; and

- The relative degree to which alterations in operations of Folsom Dam and Reservoir, as directed by the principles of coldwater pool management, could eliminate or minimize temperature increases.

The models used, although mathematically precise, should be viewed as having "reasonable detection limits." Establishing reasonable detection limits is useful to those using the modeling output for impact assessment purposes, and prevents making inferences: (1) beyond the capabilities of the models; and (2) beyond an ability to actually measure changes. Although data from the models are reported to the nearest 1,000 AF, a foot in elevation, a cubic foot per second ("cfs"), a tenth of a degree Fahrenheit (F), and a tenth of a percent in salmon mortality, these values were rounded when interpreting differences for a given parameter between two modeling simulations. For example, two simulations having river flows at a given location within one percent of each other were considered to be essentially equivalent. Because the models provide reservoir storage data on a monthly time-step, measurable differences in reservoir storage were evaluated similarly. Similar rounding of modeled output was performed for other output parameters in order to assure the reasonableness of the impact assessments.

With regard to water temperature measurements, essentially equivalent is defined as two simulations having water temperatures at a given location within 0.3ºF of each other. Commonly used field-temperature monitoring equipment (in situ temperature loggers, thermometers,

electronic meters) has a total error of measurement of 0.2°F or more. Therefore, modeled differences in temperature of 0.2°F or less could not be consistently detected in the river by actual monitoring of water temperatures. In addition, output from Reclamation's water temperature models provides a "relative index" of water temperatures under the various operational conditions modeled. Output values indicate whether the temperatures would be expected to increase, remain unchanged, or decrease, and provide insight regarding the relative magnitude of potential changes under one operational condition compared to another. Therefore, modeled temperature changes that were within 0.3°F between modeled simulations were considered to represent no measurable change. Temperature differences of more than 0.3°F were assessed for their biological significance. This approach is very rigorous. For example, USFWS and Reclamation, in the Trinity River Mainstem Fishery Restoration Draft EIS/EIR (USFWS et al. 1999), used a change in long-term average water temperature of 0.5°F as a threshold of significance, and the Central Valley Regional Water Quality Control Board (RWQCB) generally uses a change of 1.0°F or more as a threshold of significance.

Description of Simulations and Impact Analysis Comparisons

Model simulations were developed to represent existing and future hydrologic conditions with and without implementation of the Proposed Project. The simulations were then compared to identify the potential changes in the CVP/SWP hydrologic conditions (i.e., instream flow, reservoir elevations, end-of-month storage, and water temperature) that could influence environmental resources. The evaluation of environmental impacts was performed by considering the modeling results from the comparison in light of the impact indicators and significance criteria developed for each resource topic.

Model Simulations

Four simulations were performed to meet the CEQA and NEPA analysis requirements for the project, as described below.

- Existing – represents existing conditions;
- Project – permanent Cosumnes Power Plant and corresponding additional SMUD diversions of 5.32 thousand acre-feet (TAF) CVP M&I water supply in context of 2000 hydrology;
- Cumulative without Project – SMUD diversions that would occur in the future in the absence of the proposed project in the context of 2020 hydrology and demands; and
- Cumulative Condition – future condition with the proposed project and all other reasonably foreseeable demands in the context of 2020 hydrology.

Modeling Simulation 1 - "Existing" - The Existing condition simulation represents the SMUD diversion at Folsom South Canal under existing practices. The historical maximum annual diversion amount for SMUD is 15 (TAF), consisting of water rights supply only.

Modeling Simulation 2 - "Project" - The proposed project represents the SMUD diversion at Folsom South Canal under existing practices with additional diversion for the CPP. Under the proposed project, the maximum annual diversion amount for SMUD at Folsom South Canal is

20.32 thousand acre-feet (TAF), with 15 TAF water rights supply and 5.32 TAF CVP M&I supply subject to dry year restrictions.

Modeling Simulation 3 - "Cumulative without the Project (Incremental)" - The Cumulative without the Project simulation incorporates all reasonably foreseeable demands with the exception of the future SMUD CPP demand. Under this model simulation, the maximum annual diversion amount for SMUD at Folsom South Canal is 24.68 thousand acre-feet (TAF), with 15 TAF water rights supply and 9.68 TAF CVP M&I supply subject to water year delivery restrictions.

Modeling Simulation 4 - "Cumulative Condition" - The Cumulative Condition includes all reasonably foreseeable future demands including implementation of the proposed project, increasing the SMUD annual Folsom South Canal diversion to 30 TAF, with 15 TAF water rights supply and 15 TAF CVP M&I supply subject to water year delivery restrictions. This simulation includes future build-out demands by all purveyors, subject to delivery restrictions defined through known agreements such as the WFP/Agreement, as well as any reasonably foreseeable system operational changes or environmental obligations. The cumulative condition simulation includes all relevant existing Biological Opinions.

Impact Assessment Comparisons

The following comparisons were performed to assess the potential environmental effects of the Proposed Project.

Project vs. Existing. Identifies, in an existing context, the potential impacts and benefits of installing the proposed permanent power plant facility. A permanent SMUD power plant facility with an annual diversion amount of 5,320 AF subject to dry year restrictions from Folsom South Canal will be compared to the existing condition with no SMUD power plant diversion.

Cumulative vs. Cumulative without the Project. Identifies, in a future context, the potential impacts and benefits of installing the proposed power plant facility. A permanent SMUD power plant facility with an annual diversion amount of 5,320 AF subject to dry year restrictions from Folsom South Canal will be compared to the existing condition with no SMUD power plant diversion.

Cumulative vs. Existing. Identifies the cumulative impacts of all reasonably foreseeable actions related to the American River Basin. A permanent power plant facility with an annual diversion amount of 5,320 AF under future conditions will be compared to permanent power plant facility with an annual diversion amount of 5,320 AF under existing conditions.

SMUD Folsom South Canal Demands

Tables 1a-1e indicates the monthly diversion pattern used for the SMUD CPP diversion from Folsom South Canal alone and in the Existing, Proposed Project, Cumulative without Project, and Cumulative simulations.

Table 1a - SMUD Folsom South Canal Diversions for the SMUD CPP Only

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly TAF	0.40	0.40	0.40	0.40	0.40	0.53	0.53	0.53	0.53	0.40	0.40	0.40	5.32
Average Monthly cfs	6.51	7.20	6.51	6.72	6.51	8.91	8.62	8.62	8.91	6.51	6.72	6.51	7.35
Percent of Annual	7.52	7.52	7.52	7.52	7.52	9.96	9.96	9.96	9.96	7.52	7.52	7.52	100

Table 1b - Existing Total SMUD Folsom South Canal Diversions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TAF	0.84	0.84	1.05	1.20	1.35	1.55	1.85	1.74	1.59	1.11	1.05	0.84	15
Percent of Annual	5.6	5.6	7.0	8.0	9.0	10.3	12.3	11.6	10.6	7.4	7.0	5.6	100

Table 1c - Proposed Project Total SMUD Folsom South Canal Diversions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TAF	1.24	1.24	1.45	1.60	1.75	2.08	2.38	2.27	2.12	1.51	1.45	1.24	20.32
Percent of Annual	6.1	6.1	7.1	7.9	8.6	10.2	11.7	11.2	10.4	7.4	7.1	6.1	100

Table 1d - Cumulative without Project Total SMUD Folsom South Canal Diversions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TAF	1.28	1.28	1.70	2.00	2.30	2.56	3.16	2.95	2.65	1.82	1.70	1.28	24.68
Percent of Annual	5.2	5.2	6.9	8.1	9.3	10.4	12.8	12.0	10.7	7.4	6.9	5.2	100

Table 1e - Cumulative Total SMUD Folsom South Canal Diversions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TAF	1.68	1.68	2.10	2.40	2.70	3.09	3.69	3.48	3.18	2.22	2.10	1.68	30
Percent of Annual	5.6	5.6	7.0	8.0	9.0	10.3	12.3	11.6	10.6	7.4	7.0	5.6	100

Modeling Assumptions

Modeling assumptions utilized in PROSIM to represent the four simulations are summarized in Appendix D (Table 1, SMUD Cosumnes Power Plant Project Modeling Assumptions). The four simulations are organized by column. Important modeling assumptions are organized by row. The major categories of modeling assumptions are demands, facilities and operations, Central Valley Project (CVP) allocation, and regulatory standards. Expanded information on demands is included in Appendix D, Tables 2 through 5.

Period of Record

The period of record used in the hydrologic modeling (UARM and PROSIM) extends from October 1921 through September 1991 (70 years). The period of record used for water temperature modeling and the associated simulations for early-lifestage Chinook salmon mortality extends from January 1922 through December 1990 (69 years) because the temperature model operates on a calendar year, rather than a water year basis. These periods are considered representative of the natural variation in climate and hydrology experienced in the Central Valley during recent times, and include periods of extended drought, high precipitation and runoff, and variations in-between.

Demands

CVP demands, except for the American River Basin and Contra Costa Water District (CCWD), are based on assumed future contract levels consistent with maximum historical use. CVP demands north of the Delta, excluding the American River Basin, are summarized for each purveyor in Appendix D, Table 2. CVP demands south of the Delta total approximately 3.4 MAF/year and are summarized for each purveyor in Appendix D, Table 3. CVP refuge demand corresponds to Firm Level 2. CCWD demand is defined by a time series that reflects operation of Los Vaqueros Reservoir. A contract of 140 TAF/year in the Existing simulation and 195 TAF/year in the Cumulative simulation is assumed.

SWP demand is modeled as variable depending on water supply and precipitation indices. The full demand approximates 3.6 MAF/year in the Existing simulation and 4.2 MAF/year in the Cumulative simulation.

American River Basin demands are shown in detail in Appendix D, Tables 4 and 5. Demands for the Existing simulation, shown in Appendix D, Table 5, are the same as in the Water Forum Proposal ("WFP") EIR Base condition except for a few purveyors where water use information has been updated since 1998.

Demands in the American River Basin for the Cumulative simulation (Appendix D, Table 5) also are consistent with the WFP. Reduced diversions or replacement for diversion is represented in the model when the Folsom Reservoir unimpaired inflow drops below 950 TAF for March through November.

Modeling of East Bay Municipal Utility District ("EBMUD") diversions is handled as directed by Reclamation.

Facilities and Operations

Appendix D, Table 1 summarizes the pertinent assumptions in the modeling regarding reservoir facilities and operations. In this regard, the simulations are identical except for the El Dorado Irrigation District temperature control device for water withdrawals. This proposed facility has not been installed so it is not included in the Existing or Project simulations.

Cold-water pool management is an important part of Folsom Reservoir operations. These simulations all assume implementation of operations designed to balance the temperature objectives for steelhead and fall-run Chinook salmon.

CVP Water Allocation

In years when water supply is deficient, water allocation is reduced based on specific water indices or the sufficiency of water supply. The Settlement and Exchange Contractors and the Wildlife Refuges receive a 75% allocation in years when the Shasta Index indicates a critical year. The other CVP contracts receive allocations based on a comparison of forecast supply and demand for the March through September period. CVP municipal and industrial Municipal and Industrial ("M&I") contracts receive allocations ranging from 100% to 50%. CVP agricultural contracts receive allocations ranging from 100% to 0%. Agricultural allocations are reduced

first; reductions to the M&I allocations start after the agricultural allocations have been reduced to 75% of contract.

Regulatory Standards

Various laws and regulatory decisions provide for protection of environmental conditions. These protections include minimum instream flow requirements, minimum reservoir storage content and protection of the Delta against excessive salinity. Specifics regarding these requirements, including references to the regulatory documentation are provided in Appendix D, Table 1. As an overview, **Table 2** summarizes the locations and applicable conditions which are incorporated into the modeling, and also are used as objectives in evaluating the modeling results.

State and federal standards mandate minimum river and reservoir conditions to ensure environmental protection. The standards are the same for all simulations except on the Trinity River. On the Trinity River, the minimum streamflow requirement below Lewiston Dam is 340 TAF/year for the Existing and Project simulations. The Future Base, Future No Project and Cumulative simulations all incorporate the higher minimum streamflow requirements found in the Preferred Alternative in the Trinity River Mainstem Fishery Restoration FEIS/EIR.

Simulation of water operations on the Mokelumne, Stanislaus, Tuolumne, and San Joaquin rivers is handled outside of PROSIM and becomes an input to the PROSIM simulations. SANJASM and STANMOD are the primary models used to represent these river basins. Additional, spreadsheet analyses compliment and extend the SANJASM and STANMOD modeling. On the Mokelumne River, simulated operation performed by EBMUD under the 1996 Joint Settlement Agreement was used to modify SANJASM representation of Mokelumne River flows.

Table 2. Modeling Standards and Applications

Location	Regulatory Standard	Modeling Application
Trinity River/Reservoir	Minimum instream flow requirements Minimum end-of-year reservoir storage	Both incorporated into PROSIM
Clear Creek	Minimum instream flow requirements below Whiskeytown Reservoir	Incorporated into PROSIM
Upper Sacramento River	Minimum end-of-year storage in Shasta Reservoir Minimum instream flow requirements below Keswick Dam Navigation flow requirement upstream of City of Sacramento (at Wilkins Slough-navigation control point)	Incorporated into PROSIM Incorporated into PROSIM Incorporated into PROSIM
Feather River	Minimum instream flow requirements	Incorporated into PROSIM
Upper American River	Minimum instream flow requirements below the American River pump station diversion site	Incorporated into UARM

Table 2. Modeling Standards and Applications		
Location	**Regulatory Standard**	**Modeling Application**
Lower American River	Minimum instream flow requirements (1) below Nimbus Dam and (2) for the reach from Nimbus Dam to the confluence with the Sacramento River	Incorporated into PROSIM
Lower Sacramento River	Minimum instream flow requirements at (1) Freeport and (2) Rio Vista	Incorporated into PROSIM
Mokelumne River	Minimum release rates from Camanche Reservoir	Incorporated into SANJASM modeling which serves as input to PROSIM
Stanislaus River	Minimum instream flows below Goodwin Dam	Incorporated into SANJASM/ STANMOD modeling which serves as input to PROSIM
Tuolumne River	Minimum instream flow requirements at LaGrange Bridge	Incorporated into SANJASM modeling which serves as input to PROSIM
San Joaquin River	Minimum instream flow requirements at Vernalis	Incorporated into SANJASM/ STANMOD modeling which serves as input to PROSIM
Delta	Maximum salinity, minimum dissolved oxygen, minimum outflow, and maximum export	Incorporated into PROSIM

3.0 IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Table 3 lists the impact indicators and significance criteria developed for use in assessing the significance of potential impacts upon fish resources and aquatic habitat that may result from implementation of the Proposed Project. Extensive consultations with public resource agencies, including NMFS and USFWS, have resulted in the wide acceptance of these criteria. Specifically, these significance criteria were recently used in the PCWA American River Pump Station Final EIS/EIR (June 2002).

Table 3. Fish Resources and Aquatic Habitat Diversion-Related Impact Indicators and Significance Criteria

Impact Indicators	Significance Criteria
Lower American River	
Fall-Run Chinook Salmon	
❑ Monthly mean flow (cfs) at the mouth for each month of the adult immigration period (i.e., September through December).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect upstream passage or olfactory response, for any month of this period over the 70-year period of record.
❑ Monthly mean water temperature (°F) at the mouth of the American River and at Freeport on the Sacramento River for each month of the adult immigration period (i.e., September through December).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect adult immigration, for any month of this period over the 69-year period of record.

Impact Indicators	Significance Criteria
❑ Monthly mean flows (cfs) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation and initial rearing period (i.e., October through February).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect long-term initial year-class strength, for any month of this period over the 70-year period of record.
❑ Monthly mean water temperatures (°F) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation and initial rearing period (i.e., October through February).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to result in substantial egg and alevin loss (e.g., resulting temperatures >56°F), for any month of this period over the 69-year period of record.
❑ Monthly mean flow (cfs) at Watt Avenue and the mouth for each month of the juvenile rearing and emigration period (i.e., February through June).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect juvenile rearing and emigration, for any month of this period over the 70-year period of record.
❑ Monthly mean water temperature (°F) at Watt Avenue, the lower American River mouth, and at Freeport for each month of the juvenile rearing and emigration period (i.e., February through June).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect juvenile rearing and emigration (e.g., resulting temperatures >65°F) for any month of this period over the 69-year period of record.
❑ Average annual early lifestage survival.	❑ Decrease in average annual early lifestage survival, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect long-term initial year-class strength over the 70-year period of record.
Steelhead	
❑ Monthly mean flow (cfs) at the mouth for each month of the adult immigration period (i.e., December through March).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect upstream passage or olfactory responses for any month of this period over the 70-year period of record.
❑ Monthly mean water temperature (°F) at the mouth of the American River and at Freeport on the Sacramento River for each month of the adult immigration period (i.e., December through March).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect adult immigration for any month of this period over the 69-year period of record.
❑ Monthly mean water temperature (°F) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation period (i.e., December through March), as well as juvenile rearing (i.e., year-round).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to result in substantial egg and alevin loss (e.g., resulting temperatures >56°F) or substantial adverse affects to juvenile rearing (e.g., resulting temperatures >65°F) for any month of these respective periods over the 69-year period of record.
❑ Monthly mean flow (cfs) at Watt Avenue for the spawning and incubation period (i.e., December through March), as well as juvenile rearing (i.e., July through September).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect initial year-class strength and juvenile rearing for any month of these respective periods over the 70-year period of record.
❑ Monthly mean flow (cfs) at Watt Avenue and the mouth for each month of the juvenile emigration period (i.e., February through June).	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency, to adversely affect juvenile emigration for any month of this period over the 70-year period of record.

Impact Indicators	Significance Criteria
❑ Monthly water mean temperature (°F) at Watt Avenue and the mouth for each month of the juvenile emigration period (February through June).	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect juvenile emigration (e.g., resulting temperatures >65°F) for any month of this period over the 69-year period of record.
Splittail	
❑ Long-term average mean acreage of flooded riparian habitat at Watt Avenue during each month of the February through May spawning period.	❑ Decrease in long-term average quantity of inundated riparian habitat, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect potential splittail habitat availability for each month of this period over the 70-year period of record.
❑ Monthly mean water temperatures (°F) at Watt Avenue and the mouth of the American River during each month of the February through May spawning period.	❑ Substantial increase in the frequency, relative to the basis of comparison, in which water temperatures exceed the reported upper temperature range for splittail spawning (i.e., 68°F) for any month of this period over the 69-year period of record.
Sacramento River	
❑ Monthly mean flows (cfs) released from Keswick Dam for each month of the year.	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to decrease the relative habitat availability for upper Sacramento River fish for any month of this period over the 70-year period of record.
❑ Monthly mean flows (cfs) at Freeport for each month of the year.	❑ Decrease in monthly mean flow, relative to the basis of comparison, of sufficient magnitude and frequency to decrease the relative habitat availability for lower Sacramento River fish for any month of this period over the 70-year period of record.
❑ Monthly mean water temperatures (°F) at Keswick Dam and Bend Bridge for each month of the year.	❑ Increase in monthly mean water temperature, relative to the basis of comparison, of substantial magnitude and frequency to adversely affect spawning and rearing of anadromous salmonids for any month of the year for the 69-year period of record.
❑ Number of years that water temperatures at Keswick Dam and Bend Bridge would exceed the temperature criteria identified by NMFS in its Biological Opinion for Winter-run Chinook Salmon (NMFS 1993).	❑ Increase in the number of years that water temperatures exceed those stipulated in the NMFS Biological Opinion (i.e., 56°F and 60°F), relative to the basis of comparison, which would adversely affect winter-run Chinook salmon over the 69-year period of record.
❑ Average annual early lifestage survival for fall-, late-fall-, winter-, and spring-run Chinook salmon.	❑ Decrease in the average annual early lifestage survival for any run Chinook salmon (i.e., fall-, late fall-, winter-, and spring-run Chinook salmon), relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect the long-term initial year-class strength over the 70-year period of record.
❑ Monthly mean water temperatures (°F) at Freeport for each month of the year.	❑ Increase in monthly mean temperature, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect spawning and rearing of anadromous salmonids for any month of the year for the 69-year period of record.

Impact Indicators	Significance Criteria
Delta	
❑ Monthly mean Delta outflow (cfs) for all months of the year.	❑ Decrease in monthly mean Delta outflow, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect Delta fish resources over the 70-year period of record.
❑ Monthly mean location of X2 and Delta export/inflow ratios for all months of the year, with an emphasis on the February through June period.	❑ Change in the monthly mean position of X2 and Delta export/inflow ratio, relative to the basis of comparison, of sufficient magnitude and frequency to adversely affect spawning and rearing habitat and downstream transport flows over the 70-year period of record.

3.1 Impact Analysis

This section presents the analysis of potential diversion-related fish resources and aquatic habitat impacts. Tables and figures displaying modeling results can be found in Appendices A through C. Each Appendix is composed of two sections, with the first section containing summary tables and figures that are denoted by a number in the bottom right-hand corner of each page. The second section is made up of tables containing the monthly model output, also numbered in the bottom right-hand corner of each page.

3.1.1 Proposed Project Compared to the Existing Condition

The following section of the analysis compares the Proposed Project to the Existing Condition. The Proposed Project, a 1000 MW gas-fired power plant, utilizes a yearly average of 7.35 cfs of water from Nimbus Reservoir, which would be diverted into Folsom South Canal. This would reduce flows in the American River by a yearly average of 7.35 cfs (with a monthly average ranging from 6.5 cfs to 8.9 cfs). For further discussion see the methodology section. Tables and figures referenced in this section can be found in Appendix A. **Table 4** summarizes the potential impacts, determination of impacts, and refers to the page number where further discussion can be found.

Table 4. Proposed Project vs. Existing Condition

Potential Impact	Determination of Impacts	Page
Lower American River Fisheries Impacts		
Impact 3.1-1: Impacts to Fall-Run Chinook salmon and steelhead in the lower American River	See subsections below	3-14
Flow-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)	Less than significant	3-14
Temperature-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)	Less than significant	3-15
Flow-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)	Less than significant	3-15
Temperature-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)	Less than significant	3-17
Flow- and Temperature-Related Impacts to Steelhead Spawning and Incubation (December Through March)	Less than significant	3-18
Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Less than significant	3-18

Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Less than significant	3-19
Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)	Less than significant	3-19
Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)	Less than significant	3-20
Flow-Related Impacts to Steelhead Rearing (July Through September)	Less than significant	3-21
Temperature-Related Impacts to Steelhead Rearing (July Through September)	Less than significant	3-21
Impact 3.1-2: Impacts to splittail in the lower American River.	Less than significant	3-22
Sacramento River Fisheries Impacts		
Impact 3.1-3: Flow-related impacts in the upper Sacramento River	Less than significant	3-23
Impact 3.1-4: Flow-related impacts in the lower Sacramento River	Less than significant	3-23
Impact 3.1-5: Water temperature-related impacts in the upper Sacramento River	Less than significant	3-23
Impact 3.1-6: Water temperature-related impacts in the lower Sacramento River	Less than significant	3-24
Delta Fisheries Impacts		
Impact 3.1-7: Impacts to Delta fish populations	Less than significant	3-24

Lower American River Fisheries Impacts

Flow- and temperature-related impacts are discussed separately below by species and lifestage. Organizationally, flow- and temperature-related impacts to fall-run Chinook salmon and steelhead are discussed together, followed by impact discussions for splittail.

Impact 3.1-1: Impacts to fall-run Chinook salmon and steelhead in the lower American River.

- Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)

Modeling results indicate that potential flow- and temperature- related impacts to fall-run Chinook salmon/steelhead adult immigration that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Flow-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration

Even at current minimum flow requirements (i.e., 250 cfs under D-893[1]), flow-related physical impediments to adult salmonid upstream passage are not known to occur. Therefore, flow-related impacts to Chinook salmon adult immigration would primarily be determined by flows at the mouth of the American River during the September through December period, when lower American River Chinook salmon adults immigrate through the Sacramento River in search of their natal stream to spawn. The same would be true for steelhead during the December through March period. Reduced flows at the mouth are of concern primarily because less flow

[1] The SWRCB Decision 893 is the current regulatory requirement for the lower American River, and is the minimum operational flow standard for the river. Under D-893, a minimum daily flow of 500 cfs is to be maintained at the mouth of the American River between September 15 and December 31, with a minimum of 250 cfs at all other times.

could result in insufficient olfactory cues for immigrating adult salmonids, thereby making it more difficult for them to "home" to the lower American River. Insufficient flow could result in higher rates of straying to other Central Valley rivers. Table 100 shows the long-term average flow at the mouth would differ by no more than 0.4 percent for all the months of the year under the Proposed Project compared to the existing condition. The small difference in flows that would be expected to occur at the mouth under the Proposed Project would not be of concern regarding attraction of adults immigrating into the lower American River.

Temperature-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration

Reclamation's Lower American River Temperature Model does not account for the influence of Sacramento River water intrusion on water temperatures at the mouth. Therefore, the temperature assessments are based on temperatures modeled at the mouth of the lower American River and at Freeport on the Sacramento River. The long-term average water temperatures modeled for the Proposed Project would not differ from those under the existing condition at the American River mouth and at Freeport on the Sacramento River during all months of the September through March adult immigration period, as shown in Table 325. Under the Proposed Project, monthly mean water temperatures at the American River mouth would be essentially equivalent to the existing condition for 481 months of the 483 months included in the analysis (Technical Appendix A pp. 433-438 and 444). Monthly mean water temperatures at Freeport on the Sacramento River would be essentially equivalent to the existing condition for all of the 483 months included in the analysis (Technical Appendix A pp. 481-486 and 492). Therefore, changes in temperature under the Proposed Project would represent a less than significant impact to fall-run Chinook salmon/steelhead adult immigration.

- Fall-Run Chinook Salmon/Steelhead Spawning and Incubation (October Through February)

Modeling results indicate that potential flow- and temperature- related impacts to fall-run Chinook salmon/steelhead spawning and incubation that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Flow-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

All flow-related impact assessments regarding fall-run Chinook salmon spawning and incubation were based on flows below Nimbus Dam and at Watt Avenue, with a greater emphasis placed on flows below Nimbus Dam. Aerial redd surveys conducted by CDFG in recent years have shown that 98 percent of all spawning occurs upstream of Watt Avenue, and 88 percent of spawning occurs upstream of RM 17 (located just upstream of Ancil Hoffman Park). Hence, the majority of spawning occurs upstream of RM 17.

Monthly mean flows below Nimbus Dam and at Watt Avenue under the Proposed Project would be essentially equivalent to the existing condition for 333 months of the 350 months included in the analysis (Technical Appendix A pp. 313-317 and 325-329). The long-term average flow below Nimbus Dam would be within 0.4 percent of the flow under the existing condition during

all months of the October through February period, as shown in Table 108. Changes in long-term average flows at Watt Avenue would be within 0.4 percent for each month of the October through February period, as shown in Table 123.

Figures 168 through 172 show exceedance curves for the American River release from Nimbus Dam for the October through February period. These curves demonstrate that the Proposed Project's flows would be similar to those under the existing condition during October through February. Differences in flows in the lower flow ranges are more crucial for salmon survival. During October through December and February, the Proposed Project would result in flows nearly identical to the existing condition flows. During January, under the Proposed Project, slight decreases in flow would occur below 2,000 cfs, though reductions would not be larger than 250 cfs (see discussion below). During January, there would be one additional occurrence in which flows would be below 2,000 cfs relative to the existing condition.

These findings indicate that, during the October through February period (when the majority of fall-run Chinook salmon spawning occurs), the Proposed Project could slightly reduce (i.e., 100 to 250 cfs) flows below Nimbus Dam and Watt Avenue in a few years when flows under the existing condition would be below 2,000 cfs. Flow reductions below 2,000 cfs could reduce the amount of available Chinook salmon spawning habitat, which could result in increased redd superimposition during years when adult returns are high enough for spawning habitat to be limiting. Since the Proposed Project is expected to reduce monthly flows ranging from 6.5 to 8.9 cfs, these small changes would not be likely to reduce available spawning habitat for fall-run Chinook salmon.

Modeling results indicate decreases of 250 cfs in mean monthly flows. Although the simulated flows decrease by 250 cfs, real-time flows may not decrease to this degree. This is a result of the mechanistic logic of the PROSIM model. For example, a small increase in reservoir releases may cause reservoir storage to decrease below a particular threshold, thus triggering the model to simulate a larger release than would occur in real-time operations. In other words, a fixed 250 cfs step difference change in magnitude is automatically calculated in the model regardless of the actual release due to the difference in storage. The result of this fixed step change is that a small reduction in simulated storage creates a condition that would result in greater than expected reductions in flow. Therefore the model does not have a choice to calculate a proportional change in the release consistent with the change in storage. However, by contrast to the model, in real-time operations, the operator has the ability to determine the actual flow-management objective based on reservoir storage, and the risk to storage associated with the determined fishery management objectives. Nonetheless, because examination of the modeling data indicates that the simulated reduction in flows are a result of a modeling anomaly related to step functions and to decision logic of PROSIM's response to fishery management flow objectives, flows appear to be decreased by 250 cfs when in fact, in real-time this would probably be less than 250 cfs. Specifically, the Proposed Project is not expected to reduce monthly average flows by more than 6.5 cfs to 8.9 cfs.

Therefore, these reductions in flow would not be expected to be of substantial magnitude or occur with enough frequency to have a significant adverse effect on long-term initial year-class strength of lower American River fall-run Chinook salmon. This impact would be considered less than significant.

Temperature-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

Under the Proposed Project, the long-term average water temperatures would be equivalent to those under the existing condition during the October through February period at both Watt Avenue and below Nimbus Dam, as shown in Table 328. Watt Avenue is the location of concern in October because air temperatures tend to warm the river as it moves downstream. Conversely, water temperatures below Nimbus Dam are usually warmer than water temperatures at Watt Avenue in the winter season.

The October monthly mean water temperatures at Watt Avenue under the Proposed Project would be essentially equivalent to the existing condition for 68 months of the 69 months included in the analysis. The October monthly mean water temperature at Watt Avenue would increase by a maximum of 0.4°F in only one year of the simulation (Technical Appendix A p. 421). The November through February monthly mean water temperatures below Nimbus Dam would be essentially equivalent to the existing condition for 274 of the 276 months included in the analysis. November water temperatures below Nimbus Dam would increase by more than 0.3°F in only two years of the 69 years modeled (Technical Appendix A pp. 410-413). Under the Proposed Project, there would not be any additional occurrences of October monthly mean water temperatures at Watt Avenue exceeding 56°F, relative to the existing condition (Technical Appendix A p. 421). Below Nimbus Dam, there would only be one additional occurrence during November in which water temperatures under the Proposed Project would exceed 56°F, relative to the existing condition. December, January and February water temperatures below Nimbus Dam would be below 56°F in all 69 years modeled (Technical Appendix A pp. 410-413).

The long-term average annual early lifestage survival for fall-run Chinook salmon in the American River would be 84.9 percent under the existing condition and 84.9 percent under the Proposed Project. Table 469 shows the annual survival estimates for the 69 years modeled. Substantial increases or decreases in survival would not occur in any individual year of the 69-year simulation. The largest relative difference between the Proposed Project and existing condition would be a 0.5 percent decrease in salmon survival, yet this would only occur in 1 of the 69 years modeled. In 11 of the 69 years modeled, the relative difference in fall-run Chinook salmon survival under the Proposed Project would decrease by 0.1 percent, relative to the existing condition. There would be no relative difference in salmon survival between the Proposed Project and existing condition in 35 of the 69 years modeled. In 17 of the 35 years modeled, the relative difference in fall-run Chinook salmon survival actually increased from 0.1 percent to 0.4 percent under the Proposed Project, relative to the existing condition (Technical Appendix A p. 570).

Based on these modeling results, any small temperature changes in the lower American River resulting from the Proposed Project during the October through February period would not adversely affect spawning and incubation success of fall-run Chinook salmon. This impact is therefore considered less than significant.

Flow- and Temperature-Related Impacts to Steelhead Spawning and Incubation (December Through March)

Monthly mean flows below Nimbus Dam and at Watt Avenue during December through March associated with the Proposed Project would be essentially equivalent to or greater than flows under the existing condition for 261 months of the 280 months included in the analysis (Technical Appendix A pp. 315-318 and 327-330). Modeling results indicate that the largest decrease in flow would be 250 cfs. As discussed above, this large decrease in flows only occurs in the model simulation runs. In real-time operations, any decreases in flow under the Proposed Project would be less than 250 cfs.

Also, monthly mean water temperatures below Nimbus Dam and at Watt Avenue would be similar to the existing condition for 275 months of the 276 months included in the analysis (Technical Appendix A pp. 411-414 and 423-426). Moreover, under the Proposed Project water temperatures below Nimbus Dam would remain below 56°F for all months of the 69 years modeled for the spawning and incubation period for steelhead. December, January, and February water temperatures at Watt Avenue under the Proposed Project would be below 56°F in all 69 years modeled. Under the Proposed Project and existing condition, there would only be one occurrence during March in which water temperatures at Watt Avenue would be greater than 56°F for all the 69 years modeled. Changes in temperature would not occur with sufficient frequency or magnitude to adversely affect steelhead spawning and incubation. Therefore, no flow- or temperature-related impacts to steelhead spawning or incubation would be expected to occur resulting from the Proposed Project and impacts would be considered less than significant. For flow data supporting this impact determination, see Tables 108, 123 and Figures 170 through 173 and 182 through 185. For the water temperature data supporting this impact determination, see Tables 286 and 293.

- Fall-Run Chinook Salmon/ Steelhead Juvenile Rearing (March Through June)

Modeling results indicate that potential flow- and temperature- related impacts to fall-run Chinook salmon/steelhead juvenile rearing that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Flow-Related Impacts to Fall-Run Chinook Salmon/ Steelhead Juvenile Rearing (March through June)

Because the majority of juvenile salmonid rearing is believed to occur upstream of Watt Avenue, and because depletions generally exceed tributary accretions to the river throughout the March through June period (generally resulting in lower flows at Watt Avenue than below Nimbus Dam), all flow-related impact assessments for fall-run Chinook salmon and steelhead rearing are based on flows at Watt Avenue.

Small changes in monthly mean flows would be expected to occur at Watt Avenue under the Proposed Project relative to the existing condition. The long-term average flow at Watt Avenue would be within 0.4 percent of the flow under the existing condition for any given month during the March through June period (Table 123). Flow exceedance curves for March through June at

Watt Avenue are shown in Figures 185 through 188. An approximate decrease of 250 cfs represents the largest decrease in flow during the March through June period when flows under the existing condition are 2,000 cfs or less. Again, this 250 cfs decrease in flows would result from a modeling anomaly and would not occur under real-time operations. The Proposed Project is not expected to reduce monthly average flows during the March through June period by more than 6.5 cfs to 8.9 cfs. These small differences in flow would not be expected to adversely affect long-term juvenile fall-run Chinook salmon or steelhead rearing success.

Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March through June)

Modeling of the Proposed Project indicates that the long-term average water temperature at Watt Avenue would not change during any month of the March through June period, compared to the existing condition, as shown in Table 286. Monthly mean water temperatures at Watt Avenue would be essentially equivalent to the existing condition for 274 of the 276 months included in the analysis (Technical Appendix A pp. 426-429). Moreover, under the Proposed Project, there would not be any additional occurrences during May or June for all the 69 years modeled in which water temperatures at Watt Avenue would be above 65°F, relative to the existing condition. March and April water temperatures at Watt Avenue under the Proposed Project would remain below 65°F for all the 69 years modeled (Technical Appendix A pp. 426-429). Consequently, although small temperature increases at Watt Avenue would occur during the March through June period, resultant water temperatures would not be expected to adversely affect the success of juvenile salmon rearing.

- Fall-Run Chinook Salmon/Steelhead Juvenile Emigration (February through June)

Modeling results indicate that potential flow- and temperature- related impacts to fall-run Chinook salmon/steelhead juvenile emigration that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Flow-Related Impacts to Fall-Run Chinook Salmon/Steelhead Juvenile Emigration (February through June)

The primary period of fall-run Chinook salmon juvenile emigration occurs from February to June, with the majority of juvenile steelhead emigration occurring during this same period. Generally little, if any, emigration occurs during July and August. Flow-related impacts to salmonid immigration discussed above addressed flow changes in February and March. As previously concluded for adult immigration, potential changes in flows under the Proposed Project during February through March would not adversely affect juvenile fall-run Chinook salmon or steelhead rearing and, therefore, also would not adversely affect emigration. Hence, this discussion focuses primarily on the April through June period.

Small decreases in monthly mean flows would be expected to occur at the American River mouth associated with implementation of the Proposed Project compared to the existing condition. Under the Proposed Project, the simulated long-term average flow at the mouth of the American River would be within 0.4 percent of flows under the existing condition during April through June (Table 100). Figures 210 through 212 show the difference in flows simulated

under the Proposed Project at the lower flow ranges. Again, modeling results show that flows would decrease up to 250 cfs under the Proposed Project, though this would not occur in real-time operations. The Proposed Project is not expected to reduce monthly average flows during the February through June period by more than 6.5 cfs to 8.9 cfs. (refer to discussion on page 3-16).

Juvenile salmonid emigration surveys conducted by CDFG have shown no direct relationship between peak emigration of juvenile Chinook salmon and peak spring flows (Snider et al. 1997). Moreover, emigrating fish are more likely to be adversely affected by events when flows are high, then ramp down quickly (resulting in isolation and stranding). Adverse changes in flow ramping rates would not be expected to occur under the Proposed Project. Consequently, although small flow reductions at the mouth would occur in a few years during the April through June period, resultant flows would not be expected to adversely affect the success of juvenile salmonid emigration.

Temperature-Related Impacts to Fall-Run Chinook Salmon/Steelhead Juvenile Emigration (February through June)

With the possible exception of a small percentage of fish that may rear near the mouth of the lower American River, impacts due to elevated water temperatures at the mouth to fall-run Chinook salmon and steelhead would be limited to the several days that it takes emigrants to pass through the lower portion of the river and into the Sacramento River en route to the Delta. Water temperatures near the mouth during the primary emigration period (February into June) are often largely affected by intrusion of Sacramento River water, which is not accounted for by Reclamation's Lower American River Temperature Model. Consequently, actual temperatures near the mouth would likely be somewhere between temperatures modeled for the mouth, and temperatures modeled for the Sacramento River at Freeport (RM 46), located 14 miles downstream of the lower American River's confluence. For this reason, the long-term average temperatures are discussed for both of these locations.

Monthly mean temperatures at the American River mouth under the Proposed Project would be essentially equivalent to or less than the existing condition for 342 months of the 345 months included in the analysis (Technical Appendix A pp. 437-441). Monthly mean temperatures at Freeport on the Sacramento River would be essentially equivalent to or less than the existing condition for all of the months of the 345 months included in the analysis (Technical Appendix A pp. 485-489). The long-term average water temperature at the American River mouth and on the Sacramento River at Freeport during February through June under the Proposed Project would be the same during the February through May period with a 0.1 percent difference in June at the American River mouth, as shown in Table 325. In the 69-year simulation, monthly mean water temperature at the mouth increased by a maximum of 0.5°F in one year during March, 0.2°F in one year during April, 0.4ºF in one year during May and 1ºF in one year during June under the Proposed Project (Technical Appendix A pp. 437-441). At Freeport on the Sacramento River, long-term average temperature would not differ in the months of February through June, relative to the existing condition (Table 325). Moreover, under the Proposed Project, there would not be any additional occurrences during the February through June period in which water temperatures at the mouth of the lower American River and on the Sacramento River at Freeport would be above 65°F, relative to the existing condition (Technical Appendix A pp. 437-441 and

485-489). Under the Proposed Project, February through April water temperatures at Freeport would remain below 65°F for all the 69 years modeled (Technical Appendix A pp. 485-489).

Based on the results discussed above, water temperatures under the Proposed Project would not adversely affect emigration during the February through June period, relative to the existing condition.

Flow-Related Impacts to Steelhead Rearing (July Through September)

Small decreases in monthly mean flows would be expected to occur below Nimbus Dam under the Proposed Project relative to the existing condition. The long-term average flow below Nimbus Dam would decrease by 0.2 percent or less compared to the existing condition for the July through September period (Table 108). The difference in flow would be similar at Watt Avenue (Table 123).

Figures 177 through 179 provide flow exceedance curves for American River release from Nimbus Dam during July, August and September. These curves demonstrate that flows would not differ by greater than 100 cfs under the Proposed Project compared to the existing condition. The exceedance curves show flows under the Proposed Project would be both less than and greater than the flows under the existing condition when flows are 1,500 cfs or less.

Based on these findings, flow reductions under the Proposed Project are not expected to reduce juvenile steelhead rearing habitat. Further, steelhead populations in the lower American River are believed to be limited by instream temperature conditions during the July through September period, rather than by flows. Therefore, small and infrequent reductions in flow would not be expected to adversely affect long-term rearing success of juvenile steelhead.

Temperature-Related Impacts to Steelhead Rearing (July Through September)

The long-term average water temperatures at Watt Avenue and the mouth would be the same during July, August and September under the Proposed Project and the existing condition (Tables 286, and 293, respectively). Long-term average water temperatures below Nimbus Dam would be within 0.1°F of the existing condition during July through September, as shown in Table 279. Monthly mean water temperatures below Nimbus Dam would be essentially equivalent to the existing condition for 203 months of the 207 months included in the analysis (Technical Appendix A pp. 418-421). Monthly mean water temperatures at Watt Avenue would be essentially equivalent to the existing condition for 205 months of the 207 months included in the analysis (Technical Appendix A pp. 430- 432). Moreover, under both the Proposed Project and the existing condition, there would be the same number of occurrences in which water temperatures would be above 65°F during the July through September period at Watt Avenue. Monthly mean water temperatures at the mouth of the American River under the Proposed Project would be essentially equivalent to or less than the existing condition for 206 months of the 207 months included in the analysis (Technical Appendix A pp. 442-444). Therefore, small and infrequent increases in water temperature would not be expected to adversely affect long-term rearing success of juvenile steelhead.

Impact 3.1-2: Impacts to splittail in the lower American River.

Modeling results indicate that potential flow- and temperature- related impacts to splittail that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Monthly mean flows at Watt Avenue during February through May under the Proposed Project would be essentially equivalent to or greater than the existing condition for 270 months of the 280 months included in the analysis (Technical Appendix A pp. 329-332). The long-term average flow at Watt Avenue during the period February through May would range between 0.1 percent to 0.2 percent less than flows under the existing condition, as shown in Table 123.

Using flows at Watt Avenue, the acreage of usable riparian vegetation inundated between RM 8 and RM 9 was used as an index of the relative amount of inundated riparian vegetation that would occur in the lower portion of the river for a given flow rate. The amount of riparian habitat inundated in this portion of the river under the Proposed Project would remain unchanged in 61 years (87 percent of the time) during February, 66 years (94 percent of the time) during March, 65 years (93 percent of the time) during April, and 68 years (97 percent of the time) during May (Technical Appendix A pp. 558-561). Therefore, substantial change in the frequency of habitat reductions would not be expected to occur during March, April, or May of any year. In some years, riparian vegetation would not be inundated under the Proposed Project or the existing condition.

During the February through May splittail spawning period, the long-term average usable inundated riparian habitat between RM 8 and RM 9 under the Proposed Project would not decrease relative to the existing condition (Table 113). In addition, flow changes under the Proposed Project would have little, if any, effect on the availability of in-channel spawning habitat availability, or the amount of potential spawning habitat available from the mouth up to RM 5, the reach of the river influenced by Sacramento River stage. Ultimately, these reductions in flow would not be expected to be of substantial magnitude and/or to occur with enough frequency to have a significant adverse effect on the long-term population trends of lower American River splittail.

Monthly mean temperatures at Watt Avenue under the Proposed Project are essentially equivalent to or less than the existing condition for 275 months of the 276 months included in the analysis. Over the 69-year period of simulation, water temperatures at Watt Avenue under the Proposed Project would be below 68°F, the upper limit of the reported preferred range for splittail spawning, in all 69 years simulated during the February through April period, relative to the existing condition (Technical Appendix A pp. 425-428). During May, water temperatures at Watt Avenue would be greater than 68ºF in two of the 69 years simulated under both the Proposed Project and the existing condition (Technical Appendix A pp. 425-428). Therefore, temperature-related impacts to splittail spawning would be considered less than significant because no substantial change in the frequency of water temperature exceeding the reported preferred range for splittail spawning would occur.

Sacramento River Fisheries Impacts

Modeling results indicate that potential flow- and temperature- related impacts in the upper and lower Sacramento River that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Impact 3.1-3: Flow-related impacts in the upper Sacramento River.

The long-term average Sacramento River flow released from Keswick Dam under the Proposed Project would be within 0.1 percent of flows under the existing condition during all months of the year, as shown in Table 110. Monthly mean flows below Keswick Dam in the upper Sacramento River would be essentially equivalent to the existing condition in 832 of the 840 months included in the analysis (Technical Appendix A pp. 349-360).

The minimum flow objective for Keswick Dam releases stipulated in the NMFS Biological Opinion (1993, as revised in 1995) for the protection of winter-run Chinook salmon rearing and downstream passage is 3,250 cfs between October 1 and March 31. Modeling output shows that monthly mean flows below Keswick Dam would not be reduced below 3,250 cfs in any additional months of the October through March period in any of the 70 years modeled under the Proposed Project or the existing condition.

These findings indicate that flow changes below Keswick Dam that would occur under the Proposed Project would result in less than significant impacts to upper Sacramento River fish resources.

Impact 3.1-4: Flow related impacts in the lower Sacramento River.

Monthly mean flows at Freeport in the lower Sacramento River under the Proposed Project would be essentially equivalent to the existing condition for 832 months of the 840 months included in the analysis (Technical Appendix A pp. 385-396). The long-term average flow at Freeport would be within 0.1 percent of the long-term average under the existing condition during all months of the year, as shown in Table 111. Therefore, neither physical habitat availability for fish residing in the lower Sacramento River nor immigration of adult or emigration of juvenile anadromous fish would be substantially affected under the Proposed Project relative to the existing condition. Consequently, any flow-related impacts to lower Sacramento River fisheries or migrating anadromous fish that could occur under the Proposed Project are considered to be less than significant. Overall, this constitutes a less-than-significant impact.

Impact 3.1-5: Water temperature related impacts in the upper Sacramento River.

Under the Proposed Project, long-term average temperatures at Bend Bridge would not differ during all months except July, relative to the existing condition. In July, there would be a 0.1ºF decrease in water temperatures relative to the existing condition. Keswick Dam long-term average water temperatures would not differ during all months except September, relative to the existing condition. In September, there would be a 0.1ºF increase in water temperatures relative to the existing condition (Table 307). In 826 of the 828 months simulated, monthly mean

temperatures at Keswick Dam would be essentially equivalent to or less than, the existing condition (Technical Appendix A pp. 445-456). Monthly mean temperatures at Bend Bridge under the Proposed Project would be essentially equivalent to the existing condition for 827 months of the 828 months included in the analysis (Technical Appendix A pp. 469-480). Also, relative to the existing condition, there would be no additional months throughout the entire simulation where the temperature could exceed 56°F or 60°F at Keswick Dam or Bend Bridge under the Proposed Project, as shown in Table 327. In fact, during August water temperatures at Bend Bridge would exceed 56ºF in one less occurrence under the Proposed Project relative to the existing condition. Therefore, the Proposed Project would not result in significant additional exceedances of the temperature criteria identified in the NMFS Biological Opinion for Winter-run Chinook Salmon. In addition, there would not be any substantial decreases in annual early lifestage survival of fall-run, late fall-run, winter-run, or spring-run Chinook salmon in any individual year relative to the existing condition. Based on these findings, temperature-related impacts to upper Sacramento River fisheries under the Proposed Project would be less than significant.

Impact 3.1-6: Water temperature related impacts in the lower Sacramento River.

Monthly mean temperatures at Freeport under the Proposed Project would be essentially equivalent to the existing condition for all of the 828 months included in the analysis (Technical Appendix A pp. 481-492). The long-term average water temperature at Freeport in the lower Sacramento River would not change during any month of the year, as shown in Table 321. Also, the number of years in which water temperature at this location would exceed 56°F, 60°F, and 70°F would not differ from the existing condition during the period March through November, as shown in Table 324. Overall, potential water temperature impacts to fish species within the lower Sacramento River would be considered less than significant.

Impact 3.1-7: Impacts to Delta fish populations.

Modeling results indicate that potential impacts to Delta outflow and the position of X2 that could result from implementation of the Proposed Project would be considered less than significant. (See discussion of modeling results below.)

Delta outflow is considered to have a substantial effect on a number of fish species relying on Delta habitats for one or more of their lifestages. Reductions in the long-term average Delta outflow of up to 0.1 percent for any given month could occur under the Proposed Project relative to the existing condition, as shown in Table 413. Delta outflow during the period of February through June is believed to be of greatest concern for potential effects to spawning and rearing habitat and downstream transport flows for delta smelt, longfin smelt, splittail, striped bass, salmonids, and other aquatic species in the Delta. Throughout the entire 70-year period of record included in the analysis, Delta outflow reductions of more than three percent occurred during only three individual months (out of 840 months) under the Proposed Project relative to the existing condition. However, during the critical February through June period, Delta outflow reductions of more than three percent did not occur (Technical Appendix A pp. 13-24).

Under the Proposed Project, there would be no shift in the long-term average position of X2 relative to the existing condition. The maximum upstream shift for any individual month of any year (i.e., 840 months) in the position of X2 would be 0.4 km. In fact, during the February

through June period considered important for providing appropriate spawning and rearing conditions and downstream transport flows for various fish species, the maximum upstream shift for any individual month of any year in the position of X2 would be 0.1 km (Technical Appendix A pp. 13-24).

The model simulations conducted for the Proposed Project included conformance with X2 requirements set forth in the SWRCB Interim Water Quality Control Plan. Also, the Delta export-to-inflow ratios under the Proposed Project would not exceed the maximum export ratio as set by the SWRCB Interim Water Quality Control Plan. Overall, impacts to Delta fish populations would be less than significant.

3.1.2 Cumulative Impacts

The following section of the analysis first compares the Cumulative Condition to the Existing Condition. The Cumulative Condition consists of all reasonable and foreseeable projects including the Proposed Project, until the year 2020. Embedded in this analysis, is the comparison between the Cumulative Condition and the Cumulative without the Project Condition. The Cumulative Condition without the Project simulates the Proposed Project's incremental contribution to the cumulative condition. In other words, this illustrates the contribution that the Proposed Project's diversion of a yearly average of 7.35 cfs (monthly average ranging from 6.5 cfs to 8.9 cfs) would have on the cumulative condition. For further discussion see the methodology section. This incremental contribution discussion only occurs if impacts under the Cumulative Condition relative to the Existing Condition are found to be potentially significant. Tables and figures referenced in the cumulative section can be found in Appendix B. In addition, tables and figures referenced in the incremental section can be found in Appendix C. **Tables 5 and 6** summarize potential impacts and determination of impacts under the Cumulative Condition and Incremental Condition, respectively.

Table 5. Cumulative Condition vs. Existing Condition

Potential Impact	Determination of Impacts	Page
Lower American River Fisheries Impacts		
Impact 3.1-8: Impacts to Fall-Run Chinook Salmon/Steelhead in the lower American River	See subsections below	3-27
Flow-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)	Less than significant	3-27
Temperature-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)	Less than significant	3-27
Flow-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)	Potentially significant	3-28
Temperature-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)	Less than significant	3-29
Flow- and Temperature-Related Impacts to Steelhead Spawning and Incubation (December Through March)	Less than significant	3-30
Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Potentially significant	3-30
Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Potentially significant	3-31
Flow-Related Impacts to Steelhead Rearing (July Through September)	Potentially significant	3-32

Potential Impact	Determination of Impacts	Page
Temperature-Related Impacts to Steelhead Rearing (July Through September)	Potentially significant	3-33
Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)	Less than significant	3-34
Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)	Less than significant	3-34
Impact 3.1-9: Impacts to splittail in the lower American River	Potentially significant	3-35
Sacramento River Fisheries Impacts		
Impact 3.1-10: Flow-related impacts in the upper Sacramento River	Less than significant	3-36
Impact 3.1-11: Flow-related impacts in the lower Sacramento River	Less than significant	3-36
Impact 3.1-12: Water temperature-related impacts in the upper Sacramento River	Potentially significant	3-37
Impact 3.1-13: Water temperature-related impacts in the lower Sacramento River	Potentially significant	3-39
Delta Fishery Impacts		
Impact 3.1-14: Impacts to Delta fish populations	Potentially significant	3-40

Table 6. Cumulative Condition vs. Cumulative without the Project (Incremental) Condition

Potential Impact	Determination of Impacts	Page
Lower American River Fisheries Impacts		
Impact 3.1-8: Impacts to Fall-Run Chinook Salmon/Steelhead in the lower American River	See subsections below	3-27
Flow-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)	Less than significant	3-28
Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Less than significant	3-31
Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)	Less than significant	3-32
Flow-Related Impacts to Steelhead Rearing (July Through September)	Less than significant	3-32
Temperature-Related Impacts to Steelhead Rearing (July Through September)	Less than significant	3-33
Impact 3.1-9: Impacts to splittail in the lower American River	Less than significant	3-35
Sacramento River Fisheries Impacts		
Impact 3.1-12: Water temperature-related impacts in the upper Sacramento River	Less than significant	3-38
Impact 3.1-13: Water temperature-related impacts in the lower Sacramento River	Less than significant	3-39
Delta Fishery Impacts		
Impact 3.1-14: Impacts to Delta fish populations	Less than significant	3-40

Lower American River Fisheries Impacts

Flow- and temperature-related impacts are discussed separately below by species and lifestage. Organizationally, flow- and temperature-related impacts to fall-run Chinook salmon and steelhead are discussed together, followed by impact discussions for splittail.

Impact 3.1-8: Impacts to fall-run Chinook salmon/steelhead in the lower American River.

- Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)

Modeling results indicate that potential flow- and temperature- related impacts to fall-run Chinook salmon and steelhead adult immigration that could occur under the cumulative condition would be considered less than significant. (See discussion of modeling results below.)

Flow-Related Impacts to Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March).

Under the cumulative condition, reduction in the 70-year average proportion of Sacramento River flow immediately downstream of the mouth that would be composed of American River water during the September through March period (the combined primary period of upstream adult immigration for Chinook salmon and steelhead) would range from about one percent in January to less than 14 percent in September. Hence, although monthly mean lower American River flows at the mouth under the cumulative condition would decrease during each month of this period, relative to the existing condition, these reductions would not be expected to adversely affect immigrating adult fall-run Chinook salmon or steelhead.

Temperature-Related Impacts to Fall-Run/Steelhead Adult Immigration (September Through March)

The long-term average water temperatures modeled for the cumulative condition would not increase by more than 0.2°F, relative to the existing condition, at the mouth or at Freeport on the Sacramento River, during all months of the September through March adult immigration period, as shown in Table 325.

The largest long-term average water temperature increase at the mouth under the cumulative condition for the September through March period is 0.2°F for the month of October (Table 325). Moreover, under the cumulative condition, water temperatures at the lower American River mouth would remain essentially equivalent to or less than those under existing conditions in 432 out of the 483 months included in the analysis (Technical Appendix B pp. 433-444). Water temperatures at Freeport under the cumulative condition would remain essentially equivalent to or less than those under the existing condition in 449 out of the 483 months included in the analysis (Technical Appendix B pp 481-492). Therefore, September through March water temperatures in the lower portion of the lower American River would not be expected to adversely affect fall-run Chinook salmon and steelhead adult immigration. Overall, changes in flow and temperature in the lower American River associated with the cumulative condition relative to the existing condition represent a less than significant impact to adult salmonid immigration in the lower American River.

- Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

Modeling results indicate that potential temperature-related impacts to fall-run Chinook salmon and steelhead spawning and incubation that could occur under the cumulative condition would be considered less than significant. Potential flow-related impacts to steelhead spawning and incubation that could occur under the cumulative condition would be considered less than significant.

Potential flow-related impacts to fall-run Chinook salmon spawning and incubation that could occur under the cumulative condition would be considered potentially significant. However, the incremental contribution of the Proposed Project to the cumulative condition would be considered less than significant. (See discussion of modeling results below)

Flow-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

The long-term average flow below Nimbus Dam under the cumulative condition would be up to 13.6 percent less (October) than the flow under the existing condition during all months of the October through February fall-run Chinook salmon spawning and incubation period, as shown in Table 108. Similarly, changes in long-term average flows at Watt Avenue would be up to 14.3 percent less (October) during the October through February period, as shown in Table 123.

Figures 168 through 172 show exceedance curves for the American River release from Nimbus Dam for the October through February period. These curves demonstrate that flows under the cumulative condition would be significantly different than those under the existing condition. Differences in flows in the lower flow ranges would be of particular concern. In October, November and December, when the existing condition flow would be 2,500 cfs or less, the cumulative condition would result in flow reductions of up to 750 cfs nearly 50 percent of the time. Effects on flow in January and February would be relatively smaller.

These reductions in flows would reduce the amount of available Chinook salmon spawning habitat, which could result in increased redd superimposition during years when adult returns are high enough for spawning habitat to be limiting. These reductions in flow are of sufficient magnitude and occur with enough frequency to have a significant adverse effect on long-term initial year-class strength of lower American River fall-run Chinook salmon, resulting in a significant impact.

Proposed Project's Incremental Contribution to the Cumulative Condition

As shown in Table 108, the long-term average flow below Nimbus Dam under the cumulative condition would be within 0.3 percent of the flow under the cumulative without the Project condition during all months of the October through February period. In addition, as presented in Table 123, changes in long-term average flows at Watt Avenue under the cumulative condition also would be within 0.3 percent for each month in the October through February period. The incremental contribution analysis indicates that monthly mean flows would be essentially equivalent or higher at both below Nimbus Dam and at Watt Avenue in 331 of the 350 months simulated (Technical Appendix C pp. 313-317 and 325-329).

Figures 168 through 172 show exceedance curves for the American River release from Nimbus Dam for the months of October through February. These figures demonstrate that although similar most of the time, flows under the cumulative condition would be, at times, lower than the flows associated with the cumulative without the Project condition, particularly when flows are 3,000 cfs or less. Anticipated decreases in flow when the cumulative without the Project flow would be at or below 2,000 cfs are of particular importance to salmon survival. During October through December, there would only be one year in which flows below Nimbus Dam under the cumulative condition would be lower than the corresponding flow under the cumulative without the Project condition by more than 10 percent. In January and February, decreases in flow of 10 percent or more when the flows would be at or below 2,000 cfs would not occur (Technical Appendix C pp. 313-317). Again, this decrease of 10 percent or more in flows represents the 250 cfs decrease in flows, which would result from a modeling anomaly and would not occur under real-time operations. The Proposed Project is not expected to reduce monthly average flows during the October through February period by more than 6.5 cfs to 7.2 cfs, which would not result in reductions of 10 percent in flows.

Therefore, flow reductions would not occur with sufficient magnitude or frequency to significantly adversely affect fall-run Chinook salmon spawning and incubation, and therefore represent a less than significant contribution to the cumulative condition.

Temperature-Related Impacts to Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

Under the cumulative condition, the long-term average water temperature would be 0.2°F greater than the existing condition during October at Watt Avenue. Long-term average water temperatures below Nimbus Dam under the cumulative condition would result in decreases of up to 0.4°F (December) relative to the existing condition for the October through February period (Table 328).

October monthly mean water temperatures at Watt Avenue would increase by more than 0.3°F under the cumulative condition relative to the existing condition in 23 of the 69 years simulated (Technical Appendix B p. 421). Conversely, monthly mean water temperatures for October, under the cumulative condition relative to the existing condition, would decrease by more than 0.3°F in 12 of the 69 years simulated. November monthly mean water temperatures below Nimbus Dam would increase by more than 0.3°F in only four years of the 69 years modeled (Technical Appendix B p. 410). Under the cumulative condition, there would not be any additional occurrences of October water temperatures at Watt Avenue above 56°F, relative to the existing condition. Below Nimbus Dam, there would be four occurrences less during November in which water temperatures under the cumulative condition would exceed 56°F, relative to the existing condition. December, January and February monthly mean water temperatures below Nimbus Dam would be below 56°F in all 69 years modeled (Technical Appendix B pp. 411-413).

The long-term average annual early lifestage survival for fall-run Chinook salmon in the American River would be 84.9 percent under the existing condition and 85.3 percent under the

cumulative condition, as shown in Table 469. Substantial increases or decreases in survival would not occur in any individual year of the 69-year simulation.

Based on these modeling results, small temperature changes in the lower American River resulting from the cumulative condition during the October through February period represents a less-than-significant impact to spawning and incubation success of fall-run Chinook salmon.

Flow- and Temperature-Related Impacts to Steelhead Spawning and Incubation (December Through March)

The largest percent decrease in long-term average flows would be 8.5 percent at Watt Avenue during the month of December, for the December through March steelhead spawning and incubation period (Table 123). However, the resultant long-term December average flow remains relatively high (i.e., 3,300 cfs). The only long-term average water temperature increase for the December through March period would be 0.1°F for the month of March below Nimbus Dam, although the resultant temperature (i.e., 50.7°F) would still be well below the identified index of 56°F (Table 279). Moreover, under the cumulative condition, water temperatures below Nimbus Dam would remain below 56°F for all months of the 69 years modeled for the spawning and incubation period for steelhead (Technical Appendix B pp.411-414). December, January and February water temperatures at Watt Avenue under the cumulative condition would be below 56°F in all 69 years modeled (Technical Appendix B pp. 423-425). Under the cumulative condition, there would not be any additional occurrences in which water temperatures at Watt Avenue would be greater than 56°F during December through March, relative to the existing condition, for all the 69 years modeled. Therefore, flow- or temperature-related impacts to steelhead spawning or incubation would not be expected to result from the cumulative condition. For flow data supporting this impact determination, see Tables 108 and 123 and Figures 170 through 173.

- Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)

Potential flow-related impacts to fall-run Chinook salmon and steelhead juvenile rearing that could occur under the cumulative condition would be considered potentially significant. However, the incremental contribution of the Proposed Project to the cumulative condition would be considered less than significant. (See discussion of modeling results below)

Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)

Relatively small differences in flow would occur between the cumulative condition and the existing condition during the March through June juvenile fall-run Chinook salmon and steelhead rearing period. Under the cumulative condition, the largest reduction in the long-term average flow at Watt Avenue would occur during May (i.e., 6.3 percent) for any given month of the March through June period (Table 123). However, most reductions in flow during the month of May occurred during the driest 20 percent of the years, when flows are already at relatively low levels (i.e., less than 2,000 cfs). These differences in flow may adversely affect long-term

juvenile fall-run Chinook salmon or steelhead rearing habitat availability, and therefore represent a potentially significant impact.

Proposed Project's Incremental Contribution to the Cumulative Condition

The incremental contribution analysis indicates that under the cumulative condition, the long-term average flow at Watt Avenue would be within 0.3 percent of the flow under the cumulative without the Project condition during the March through June period (Table 123). Monthly mean flows would be essentially equivalent for 262 months of the 280 months included in the analysis (Technical Appendix C pp. 330-333).

Figures 185 through 188 show the exceedance curves for the lower American River flow at Watt Avenue for the months of March through June. For flows below 2,000 cfs during May, the cumulative condition would result in slight decreases compared to the cumulative without the Project condition. In April (Figure 186), the cumulative condition provided a decrease in flow when flows range between 2,000 cfs and 2,500 cfs. The long-term average flows during May would increase by 0.1 percent under the cumulative condition relative to the cumulative without the Project condition, as shown in Table 123. These small differences in flow would not be expected to adversely affect long-term juvenile fall-run Chinook salmon or steelhead rearing success. Therefore, implementation of the Proposed Project would not significantly contribute to future potentially significant cumulative flow-related impacts to fall-run Chinook salmon and steelhead juvenile rearing.

Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)

Under the cumulative condition, there would be two more occurrences during May, and the same number of occurrences during March, April, June and July, in which water temperatures at Watt Avenue would be above 65°F, relative to the existing condition (Technical Appendix B pp. 426-430). Under the cumulative condition, long-term average water temperature at Watt Avenue would not change by more than 0.3°F during any month of the March through June period, compared to the existing condition, as shown in Table 286. Temperature data at Watt Avenue shows a water temperature increase greater than 0.3°F occurring in 7 years during the month of March, in nine years during the month of April, in 15 years during the month of May and in 19 years during the month of June. However, temperature decreases greater than 0.3°F occur in five years during the month of March, 9 years during the month of April, three years during the month of May, and in 10 years during the month of June. The largest temperature increase associated with the cumulative condition, relative to the existing condition, would be expected to occur during the month of May. Although the long-term average temperature during May increased by only 0.3°F, the cumulative condition would increase the frequency and magnitude of relatively warm temperatures (i.e., greater than or equal to 65°F). Therefore, these increases in water temperatures may represent a potentially significant impact to fall-run Chinook salmon and steelhead juvenile rearing.

Proposed Project's Incremental Contribution to the Cumulative Condition

Under the cumulative condition, the long-term average water temperature at Watt Avenue would not change by more than an estimated 0.1°F during any month of the March through June period, compared to the cumulative without the Project condition (Table 286). Monthly mean water temperatures are expected to exceed 65°F approximately 10 percent of the time during May and approximately 33 percent of the time during June under both the cumulative without the Project and the cumulative condition (Technical Appendix C pp. 426-429). Further, examination of the exceedance graphs for water temperatures at Watt Avenue during May and June comparing the cumulative without the Project and the cumulative condition indicates no substantial differences in water temperatures between the two conditions, as shown in Figures 348 and 349.

Therefore, implementation of the Proposed Project would not significantly contribute to potentially significant cumulative temperature-related impacts to fall-run Chinook salmon and steelhead juvenile rearing.

Flow-Related Impacts to Steelhead Rearing (July Through September)

Under the cumulative condition, the long-term average flow below Nimbus Dam would decrease, compared to the existing condition, by about 7.2 percent in July, 9.9 percent in August and 15.3 percent in September (Table 108). The long-term average flow at Watt Avenue would decrease compared to the existing condition by 7.9 percent in July, 10.9 percent in August, and 16.4 percent in September (Table 123).

Figures 189 through 191 provide flow exceedance curves for American River flows at Watt Avenue during July, August and September. These curves demonstrate that flow reductions at Watt Avenue under the cumulative condition relative to the existing condition would occur at flows below 4000 cfs during July, at flows between 2,800 and 5,000 cfs and 500 to 2,000 cfs during August, and at flows between 500 and 5,000 cfs during September. Furthermore, relatively large reductions in flow (i.e., 500 cfs) would occur when flows are already at low levels (i.e., 1,500 cfs or less).

Flow reductions under the cumulative condition may reduce juvenile steelhead summer rearing habitat. Nonetheless, reductions in flow associated with the cumulative condition may adversely affect long-term rearing success of juvenile steelhead, and therefore represent a potentially significant impact.

Proposed Project's Incremental Contribution to the Cumulative Condition

The incremental contribution analysis indicates that, under the cumulative condition, the long-term average flow on the American River below Nimbus Dam would decrease by approximately 0.4 percent during July, and 0.1 percent during August and September (Table 108). Long-term average flows at Watt Avenue would exhibit similar decreases to those below Nimbus Dam (Table 123).

Figures 189 through 191 present the comparison of flow exceedance curves for the cumulative condition and cumulative without the Project condition flows at Watt Avenue during July, August, and September. Although small reductions in flows potentially would occur during July,

these reductions would not be expected to be of such magnitude to adversely affect long-term summer rearing success of juvenile steelhead. Flows under the cumulative condition and cumulative without the Project condition are essentially equivalent during August and September.

Based on these findings, flow reductions under the cumulative condition, relative to the cumulative without the Project condition, would not be expected to significantly reduce juvenile steelhead rearing habitat. The potential small and infrequent reductions in flow would not be expected to adversely affect long-term rearing success of juvenile steelhead. Therefore, the implementation of the Proposed Project would not significantly contribute to future potentially significant cumulative flow-related impacts to steelhead rearing.

Temperature-Related Impacts to Steelhead Rearing (July Through September)

Temperature modeling indicates that the long-term average water temperature at Watt Avenue would increase slightly in July and August under the cumulative condition, relative to the existing condition (Tables 328). In September, long-term average water temperature would decrease slightly by 0.2ºF under the cumulative condition relative to the existing condition. The cumulative condition would result in no additional occurrences during July, one less occurrence during August, and two less occurrences during September, in which water temperatures at Watt Avenue would be above 65°F, relative to the existing condition (Technical Appendix B pp. 430-432).

Figures 350 through 352 present the exceedance curves for water temperature at Watt Avenue under the existing condition and the cumulative condition during the months of July, August, and September, respectively. During July and August, water temperatures under the cumulative condition are higher than those under the existing condition when temperatures would already be relatively warm (i.e., 68°F). In fact, water temperatures could increase by as much as 3.0°F when temperatures under the existing condition are at 70°F or more. During September, water temperatures at Watt Avenue under the cumulative condition are generally equal to or lower than those under the existing condition. However, water temperature increases that would be expected to occur during July and August represent a potentially significant cumulative impact to juvenile steelhead summer rearing.

Proposed Project's Incremental Contribution to the Cumulative Condition

The long-term average monthly mean water temperatures at Watt Avenue under the cumulative condition would not differ to those under the cumulative without the Project condition during August (Tables 286). During July, there would be a 0.1ºF increase and in September, a 0.1ºF decrease in long-term average monthly mean water temperatures under the cumulative condition relative to the cumulative without the Project condition.

Figures 350 through 352 show water temperature exceedance curves at Watt Avenue during July, August and September under the cumulative condition and cumulative without the Project condition. As shown, water temperatures are essentially identical for both conditions, though small and infrequent differences in water temperatures at Watt Avenue would occur between both conditions. The cumulative condition would result in no additional occurrences in July and August and two fewer occurrences in September of water temperatures at Watt Avenue

exceeding 65° F, relative to the cumulative without the Project condition (Technical Appendix C pp. 430-432). Therefore, implementation of the Proposed Project would not significantly contribute to future potentially significant cumulative temperature-related impacts to steelhead rearing.

- Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)

Potential flow-related impacts to fall-run Chinook salmon and steelhead juvenile emigration that could occur under the cumulative condition would be considered less than significant.

Flow-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)

As can be concluded from previous discussions, potential changes in flows under the cumulative condition during February and March would not adversely affect juvenile fall-run Chinook salmon or steelhead emigration. Hence, this discussion focuses primarily on the April through June period.

Under the cumulative condition, the simulated long-term average flow at the mouth of the lower American River would decrease about two percent in April, seven percent in May, and 3.4 percent in June (Table 100). Figures 210 through 212 show the difference in flows simulated under the cumulative condition at flows 6,000 cfs or less. Flows at the confluence would frequently be reduced during all months with substantial reductions at the lower flow ranges occurring during May. However, flows under the cumulative condition would not be reduced to levels that could physically block emigration from the river. Although flow reductions at the mouth would occur in a few years during the April through June period and particularly during May, resultant flows represent a less-than-significant impact to juvenile salmonid emigration.

Temperature-Related Impacts to Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)

Examination of the exceedance curves indicates that water temperatures at the mouth of the lower American River and at Freeport under the cumulative condition would remain at or below 65°F during all years of the 69-year period of record during the months of February, March and April (Tables 291 and 319). Under the cumulative condition, there would not be any additional occurrences during May and June that water temperatures at the mouth of the lower American River would exceed 65°F, relative to the existing condition (Technical Appendix B pp. 440-441). At the mouth of the lower American River, water temperatures under the cumulative condition relative to the existing condition would be warmer during May but cooler 25 percent of the time during June. Under the cumulative condition, there only would be two additional occurrences during May, and the same number of occurrences during June, in which water temperatures at Freeport would exceed 65°F, relative to the existing condition (Technical Appendix B pp. 488-489). At Freeport, water temperatures would be essentially equivalent to or less than those under the existing condition in 105 of the 138 months simulated during May and June, relative to the cumulative conditions. Overall, this would represent a less-than-significant impact to fall-run Chinook salmon and steelhead juvenile emigration.

Impact 3.1-9: Impacts to splittail in the lower American River.

Potential flow-related impacts to splittail in the Lower American River that could occur under the cumulative condition would be considered potentially significant. However, the incremental contribution of the Proposed Project to the cumulative condition would be considered less than significant. Potential temperature-related impacts to splittail that could occur under the cumulative condition would be considered less than significant. (See discussion of modeling results below.)

Under the cumulative condition, the long-term average flow at Watt Avenue during the period February through May would be 1.6 percent to 6.3 percent less than under the existing condition, as shown in Table 123.

Using flows at Watt Avenue, the acreage of usable riparian vegetation inundated between RM 8 and RM 9 was calculated and employed as an index of the relative amount of inundated riparian vegetation that would occur in the lower portion of the river for a given flow rate. The amount of long-term riparian habitat inundated in this portion of the river under the cumulative condition would remain unchanged in 46 years (66 percent of the time) during February, 56 years (80 percent of the time) during March, 56 years (80 percent of the time) during April, and 57 years (81 percent of the time) during May (Table 113). Therefore, habitat reductions may be expected to occur during most months of this period. In many years, riparian vegetation would not be inundated under either the cumulative or the existing condition.

The amount of riparian habitat between RM 8 and RM 9 under the cumulative relative to the existing condition would be reduced for each month of the February through May splittail spawning period, particularly during April (i.e., 11.1 percent) and May (i.e., 8.3 percent), as shown in Table 113. Under the cumulative condition, reductions in inundated riparian habitat would occur virtually every month during the February through May period, during those years when habitat would be inundated under the existing condition. Relatively little splittail habitat is available under either the cumulative or existing condition. Given the uncertainty as to the magnitude and extent of splittail spawning habitat in the lower American River, and the actual amount of potential spawning habitat at specific flow rates throughout the river, the effects of flow reductions from the February through May period also are uncertain and, therefore, represent a potentially significant impact.

During the February through May period, there would be three additional occurrences (i.e., during the month of May) of the 69-year period of record in which water temperatures at Watt Avenue would increase above 68°F (the reported preferred range for splittail spawning) under the cumulative condition relative to the existing condition (Technical Appendix B pp. 425-428). During February, March and April, water temperatures would not increase above 68°F under the cumulative condition for any year of the 69-year period of record. Therefore, significant temperature-related impacts would not be expected to occur to splittail under the cumulative condition.

Proposed Project's Incremental Contribution to the Cumulative Condition

Under the cumulative condition, relative to the cumulative without the Project condition, average long-term usable inundated riparian habitat would not change for any month of the February

through May splittail spawning period, as shown in Table 113. In five of the 70 years modeled, mean monthly usable riparian splittail habitat would decrease (i.e., largest decrease of 0.1 acres) under the cumulative condition, relative to the cumulative without the Project condition (Technical Appendix C pp. 558-561). Although these small and infrequent decreases in the amount of usable inundated riparian habitat associated with the cumulative condition relative to the cumulative without the Project condition occur during this period, these differences would not be of sufficient magnitude or occur with enough frequency to represent a significant contribution to the identified potentially significant cumulative impact.

Sacramento River Fisheries Impacts

Potential flow-related impacts in the upper and lower Sacramento River that could occur under the cumulative condition would be considered less than significant. Potential temperature-related impacts in the upper and lower Sacramento River that could occur under the cumulative condition would be considered potentially significant. However, the incremental contribution of the Proposed Project to the cumulative condition would be considered less than significant. (See discussion of modeling results below.)

Impact 3.1-10: Flow-related impacts in the upper Sacramento River.

The long-term average Sacramento River flow released from Keswick Dam under the Proposed Project would be within one percent of flows under the existing condition during all months of the year, as shown in Table 110. Monthly mean flows below Keswick Dam in the upper Sacramento River would be essentially equivalent to the existing condition in 832 of the 840 months included in the analysis (Technical Appendix A pp. 349-360).

The minimum flow objective for Keswick Dam releases stipulated in the NMFS Biological Opinion (1993, as revised in 1995) for the protection of winter-run Chinook salmon rearing and downstream passage is 3,250 cfs between October 1 and March 31. Modeling output shows that monthly mean flows below Keswick Dam would not be reduced below 3,250 cfs in any additional months of the October through March period in any of the 70 years modeled under the Proposed Project or the existing condition.

These findings indicate that flow changes below Keswick Dam that would occur under the Proposed Project would result in less than significant impacts to upper Sacramento River fish resources.

Impact 3.1-11: Flow related impacts in the lower Sacramento River.

The long-term average flow at Freeport under the cumulative condition would be within five percent of the long-term average under the existing condition during all months of the year, as shown in Table 111. In 459 out of the 840 months simulated, the flow at Freeport under the cumulative condition would be greater or essentially equivalent to the existing condition (Technical Appendix B pp. 385-396). Neither physical habitat availability for fish residing in the lower Sacramento River nor immigration of adult or emigration of juvenile anadromous fish would be substantially affected relative to the existing condition. Consequently, flow-related impacts to lower Sacramento River fisheries or migrating anadromous fish that could occur

under the cumulative condition are considered to be less than significant. Overall, this constitutes a less-than-significant impact.

Impact 3.1-12: Water temperature related impacts in the upper Sacramento River.

The cumulative condition relative to the existing condition would result in changes to the long-term average temperature at Keswick Dam and Bend Bridge. There would be several additional months in the simulation when temperatures exceed 56°F or 60°F at Keswick Dam or Bend Bridge under the cumulative condition relative to the existing condition (Table 327). For example, there would be 22 more occurrences where the 56°F index would be exceeded, and 8 more occurrences where the 60°F index would be exceeded at Keswick Dam relative to the existing condition. At Bend Bridge, there would be 31 more occurrences where the 56°F index would be exceeded and seven more occurrences where the 60°F index would be exceeded relative to the existing condition. Therefore, the cumulative condition would result in significant additional exceedances of the temperature criteria identified in the NMFS Biological Opinion for winter-run Chinook salmon.

Early lifestage survival also was examined for winter-run, spring-run, fall-run and late fall-run Chinook salmon in the Sacramento River. Winter-run Chinook salmon long-term average early-lifestage survival would be 93.4 percent under the cumulative condition compared to 96 percent under the existing condition. Winter-run Chinook salmon absolute long-term average early lifestage survival would decrease more than 10 percent in 4 of the 69 years studied relative to the existing condition (Technical Appendix B p. 568). Winter-run Chinook salmon relative long-term average early lifestage survival would decrease more than 10 percent in 5 of the 69 years studied. For fall-run Chinook salmon, long-term average early-lifestage survival would be 86.2 percent under the cumulative condition compared to 89.6 percent under the existing condition. Absolute and relative long-term average early lifestage survival of fall-run chinook salmon would decrease more than 10 percent in 11 of the 69 years studied compared to the existing conditions (Technical Appendix B p. 566). Spring-run Chinook salmon long-term average early-lifestage survival would be 81.7 percent under the cumulative condition compared to 87.5 percent under the existing condition. Absolute long-term average early lifestage survival for spring-run Chinook salmon would decrease more than 10 percent in 8 of the 69 years studied (Technical Appendix B p. 569). The long-term average relative percent change in early lifestage survival for spring-run Chinook salmon would decrease by approximately 6.2 percent compared to the existing condition. Relative long-term average early lifestage survival would decrease more than 10 percent in 10 of the 69 years studied The long-term average early lifestage survival for late-fall-run Chinook salmon would be 98.7 percent under the cumulative condition compared to 99.1 percent under the existing conditions. No decreases of more than 10 percent in absolute or relative long-term average early lifestage survival are expected for late-fall-run Chinook salmon (Technical Appendix B p. 567).

Based on the increased number of exceedances of the temperature criteria identified in the NMFS Biological Opinion for winter-run Chinook salmon, and decreases in absolute and relative long-term early lifestage survival of fall-run, winter-run and spring-run Chinook salmon, water temperature-related impacts to upper Sacramento River fisheries under the cumulative condition would represent a significant impact.

Proposed Project's Incremental Contribution to the Cumulative Condition

The cumulative condition would not result in a change in the long-term average water temperature at Keswick Dam or Bend Bridge for any month of the year, relative to the cumulative without the Project condition (Tables 300 and 307). Also, relative to the cumulative without the Project condition, the cumulative condition would result in only one additional month (October) throughout the entire simulation where the water temperature exceeded 56°F or 60°F below Keswick Dam or at Bend Bridge under the cumulative condition, as shown in Table 327. Monthly mean water temperatures at Keswick Dam under the cumulative condition would be essentially equivalent to or less than the cumulative without the Project condition in 826 of the 828 months simulated and at Bend Bridge in 827 of the 828 months simulated (Technical Appendix C pp. 445-456 and 469-480). Therefore, the cumulative condition would not result in significant additional exceedances of the water temperature criteria identified in the NMFS Biological Opinion for winter-run Chinook salmon, relative to the cumulative without the Project condition.

In addition, there would not be substantial decreases in absolute or relative annual early lifestage survival of fall-run and late-fall-run Chinook salmon in any individual year under the cumulative condition relative to the cumulative without the Project condition (Technical Appendix C pp. 566-569). For winter-run Chinook salmon, the long-term average early-lifestage survival would be 93.4 percent for both the cumulative without the Project and the cumulative conditions. There would not be substantial decreases in absolute annual early-lifestage survival of winter-run Chinook salmon in any individual year of the 69-year period of record. The long-term average relative percent change in early-lifestage survival would only decrease by 0.5 percent, relative to early-lifestage survival under the cumulative without the Project condition. The long-term average relative percent change in early lifestage survival is primarily due to one individual year of the 69-year period of record included in the simulation. For this individual year of the simulation (i.e., 1934), the estimated absolute survival under the cumulative without the Project condition is 3.9 percent and under the cumulative condition is 2.8 percent. Therefore, the absolute difference between the cumulative condition and the cumulative without the Project condition is 1.1 percent. However, because early-lifestage survival would be low under the cumulative without the Project condition for this particular year, the relatively small absolute change in early lifestage survival translates into a very large (i.e., 28.2 percent) relative change in early lifestage survival. Excluding this one year, the long-term average relative percent change for the remaining 68 years included in the simulation would be a 0.1 percent decrease.

For spring-run Chinook salmon, the long-term average early-lifestage survival would be 81.9 percent under the cumulative without the Project condition and 81.7 under the cumulative condition. There would not be substantial decreases in absolute annual early-lifestage survival of spring-run Chinook salmon in any individual year of the 69-year period of record. The long-term average relative percent change in early-lifestage survival would only decrease by 0.4 percent, relative to early-lifestage survival under the cumulative without the Project condition. The long-term average relative percent change in early lifestage survival is primarily due to two individual years of the 69-year period of record included in the simulation. For the year 1935, the estimated absolute survival under the cumulative without the Project condition is 3.8 percent and under the cumulative condition is 3.2 percent. Therefore, the absolute difference between the cumulative condition and the cumulative without the Project condition is only 0.6 percent. However, because early-lifestage survival would be low under the cumulative without the

Project condition for this particular year, the relatively small absolute change in early lifestage survival translates into a large (i.e., 15.8 percent) relative change in early lifestage survival. Similarly, for the year 1990, the estimated absolute survival under the cumulative without the Project condition is 19.8 percent and under the cumulative condition is 16.1 percent. Therefore, the absolute difference between the cumulative condition and the cumulative without the Project condition is 3.7 percent. However, because early-lifestage survival would be relatively low under the cumulative without the Project condition for this particular year, the relatively small absolute change in early lifestage survival translates into a large (i.e., 18.7 percent) relative change in early lifestage survival. Excluding these two years, the long-term average relative percent change for the remaining 67 years included in the simulation would be a 0.1 percent increase.

Based on these findings, temperature-related impacts to upper Sacramento River fisheries associated with the implementation of the Proposed Project would represent a less-than-significant contribution to the significant cumulative temperature-related impacts to upper Sacramento River fisheries.

Impact 3.1-13: Water temperature related impacts in the lower Sacramento River.

The long-term average water temperature at Freeport in the lower Sacramento River would not change more than 0.3°F under the cumulative condition during any month of the year, as shown in Table 321. The number of years that temperatures at this location would exceed 56°F, 60°F, and 70°F would be greater (i.e., 2 occurrences more often for the 56°F index, 11 occurrences more often for the 60°F index, and 9 occurrences more often for the 70°F index) under the cumulative condition than the existing condition during the period March through November, as shown in Table 324. Also, 18 percent of the time in the months of March through November, the monthly mean temperature at Freeport would increase more than 0.3°F under the cumulative condition relative to the existing condition (Technical Appendix B pp. 481-492). Overall, potential temperature-related impacts to fish species within the lower Sacramento River represent a potentially significant impact.

Proposed Project's Incremental Contribution to the Cumulative Condition

The incremental contribution analysis indicates that the long-term average water temperature at Freeport in the lower Sacramento River would not change under the cumulative condition relative to the cumulative without the Project condition during any month of the year, as shown in Table 321. The number of years that water temperatures at this location would exceed 60°F and 70°F would be slightly greater (i.e., one occurrence more often for both the 60°F index and the 70°F index) under the cumulative condition, relative to the cumulative without the Project condition during the March through November period (Table 324). Monthly mean water temperatures at Freeport in the lower Sacramento River under the cumulative condition would be essentially equivalent to the cumulative without the Project condition for all of the 828 months included in the analysis (Technical Appendix C pp. 481-492). Therefore, implementation of the Proposed Project would not significantly contribute to potentially significant cumulative water temperature-related impacts to fisheries of the lower Sacramento River.

3.1.3 Delta Fishery Impacts

Impact 3.1-14: Impacts to Delta fish populations.

Potential impacts Delta outflow and the position of X2 that could occur under the cumulative condition would be considered potentially significant. However, the incremental contribution of the Proposed Project to the cumulative condition would be considered less than significant. (See discussion of modeling results below.)

The greatest reduction in the monthly long-term average Delta outflow under the cumulative condition was 8.3 percent (during the month of October) relative to the existing condition, as shown in Table 413. Delta outflow during the period of February through June is believed to be of greatest concern for potential effects to spawning and rearing habitat and downstream transport flows for delta smelt, longfin smelt, splittail, striped bass, salmonids, and other aquatic species in the Delta. During 11 percent of the time (i.e., 37 months of the 350 months included in the analysis) for the February through June period, Delta outflow would decrease by 10 percent or more relative to the existing condition (Technical Appendix B pp. 5-9).

The long-term average position of X2 would move upstream less than one km relative to the existing condition for any given month (Table 429). However, during the February through June period considered important for providing appropriate spawning and rearing conditions and downstream transport flows for various fish species, the upstream shift in the position of X2 under the cumulative condition relative to the existing condition would exceed one km 11 percent of the time (i.e., 37 more occurrences out of 350) (Technical Appendix B p. 17-21).

The model simulations conducted for the cumulative condition included conformance with X2 requirements set forth in the SWRCB Interim Water Quality Control Plan. Also, the Delta export-to-inflow ratios under the cumulative condition would not exceed the maximum export ratio as set by the SWRCB Interim Water Quality Control Plan. Even though the cumulative condition would not cause X2 or Delta outflow standards to be violated, the cumulative condition would result in decreased outflow and upstream shift in the position of X2, which could be considered a potentially significant impact to Delta fisheries. Overall, impacts to Delta fish populations would be potentially significant.

Proposed Project's Incremental Contribution to the Cumulative Condition

The incremental contribution analysis indicates that reductions in the long-term average Delta outflow of up to 0.1 percent could occur under the cumulative condition relative to the cumulative without the Project condition during any given month, as shown in Table 413. Throughout the entire 70-year period of record there would be only one individual month (i.e., May) when Delta outflow is reduced by as much as two percent for the February through June period, relative to the cumulative without the Project condition (Technical Appendix C pp. 5-9).

In addition, under the cumulative condition, there would not be a shift in the long-term average position of X2 relative to the cumulative without the Project condition for any given month (Table 429). Furthermore, during the February through June period, the maximum upstream shift in the position of X2 for the entire 70-year period of record would be 0.2 km (Technical

Appendix C pp. 17-21). Based on these results, the Proposed Project would not significantly contribute to potentially significant cumulative impacts to Delta fish populations.