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FERC/D-0237

Draft Environmental Impact Statement
For Hydropower License

McCloud-Pit Hydroelectric Project
FERC Project No. 2106, California

Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

FERC/D-0237

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

McCloud-Pit Hydroelectric Project—FERC Project No. 2106

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20426

July 2010

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Draft Environmental Impact Statement

Attached is the draft environmental impact statement (draft EIS) for the McCloud-Pit Project (Project No. 2106), located on the McCloud and Pit Rivers in Shasta County, California.

This draft EIS documents the view of governmental agencies, nongovernmental organizations, affected Indian tribes, the public, the license applicant, and Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations on the applicant's proposal and alternatives for relicensing the McCloud-Pit Project.

You are invited to file comments on the draft EIS. Any comments, conclusions, or recommendations that draw upon studies, reports, or other working papers should be supported by appropriate documentation. Your comments will be considered in staff's preparation of the final EIS.

Comments should be filed with Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street N.E., Washington, DC 20426. All comments must be filed by September 28, 2010, and should reference Project No. 2106. The Commission strongly encourages electronic filing. See 18 CFR 385.2001(a)(1)(iii) and instructions at http://www.ferc.gov under the "eLibrary" link.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The draft EIS will be part of the record from which the Commission will make its decision. The draft EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about July 30, 2010.

Copies of the EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, N.E., Washington DC 20426. The EIS also may be viewed on the Internet at http://elibrary.ferc.gov. For assistance, contact FERC Online Support at FERCOnlineSuppor@ferc.gov or toll-free at 1-866-208-3372, or for TTY, (202) 502-8659.

Attachment: Draft Environmental Impact Statement

COVER SHEET

a. Title: Relicensing the McCloud-Pit Hydroelectric Project, FERC Project No. P-2106

b. Subject: Draft Environmental Impact Statement

c. Lead Agency: Federal Energy Regulatory Commission

d. Abstract: On July 16, 2009, Pacific Gas and Electric (PG&E) filed an application to relicense its 368-megawatt (MW) McCloud-Pit Hydroelectric Project (P-2106). The McCloud-Pit Project is located on the McCloud and Pit Rivers in Shasta County, California. The project consists of three power developments (James B. Black, Pit 6, and Pit 7) and generates an average of about 1,542.2 gigawatt-hours (GWh) annually.

The project occupies 1,621.9 acres of federal lands managed by the U.S. Department of Agriculture and 29.5 acres of federal lands managed by the U.S. Bureau of Land Management.

The staff's recommendation is to relicense the project as proposed, with certain modifications, and additional measures recommended by the agencies.

e. Contact: Emily Carter
Federal Energy Regulatory Commission
Office of Energy Projects
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f. Transmittal: This draft Environmental Impact Statement (EIS) prepared by the Commission's staff on the hydroelectric license application filed by PG&E for the existing McCloud-Pit Hydroelectric Project (FERC No. P-2106) is being made available to the public on or about July 30, 2010, as required by the National Environmental Policy Act of 1969.[1]

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[1] National Environmental Policy Act of 1969, amended (Public Law [Pub. L.] 91-190, 42 United States Code [U.S.C.] 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act,[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric developments subject to its jurisdiction, on the necessary conditions:

> That the project...shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)...[4]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[5] Compliance with such conditions during the licensing period is required. The Commission's Rules of Practice and Procedure allow any person objecting to a licensee's compliance or noncompliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.[6]

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[2] 16 U.S.C. §791(a)-825r, as amended by the Electric Consumers Protection Act of 1986, Pub. L. 99-495 (1986) and the Energy Policy Act of 1992, Pub. L. 102-486 (1992), and the Energy Policy Act of 2005, Pub. L. 109-58 (2005).

[3] Pub. L. 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. §803(a) (2008).

[5] 16 U.S.C. §803(g) (2008).

[6] 18 Code of Federal Regulations (CFR) §385.206 (2008).

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ACRONYMS AND ABBREVIATIONS

ABA	Architectural Barriers Act
ac-ft	acre-feet
ADA	Americans with Disabilities Act
Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
basin plan	*Water Quality Control Plan for the Sacramento and San Joaquin River Basins*
BLM	Bureau of Land Management
BMP	best management practice
°C	degrees Celsius
California Boating	California Department of Boating and Waterways
California Fish and Game	California Department of Fish and Game
California Water Board	California State Water Resources Control Board
California Water Resources	California Department of Water Resources
CDEC	California Data Exchange Center
Central Valley Regional Water Board	Central Valley Regional Water Quality Control Board
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CRMP	Coordinated Resource Management Plan
CSU	California State University
CWA	Clean Water Act
CWHR	California Wildlife-Habitat Relationships
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
draft EIS	draft environmental impact statement
DWR	Department of Water Resources
EIR	environmental impact report
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
final EIS	final environmental impact statement
Forest Service	U.S. Department of Agriculture − Forest Service
FLA	Final License Application

FPA	Federal Power Act
FR	Forest Road
FSORAG	Forest Service Outdoor Recreation Accessibility Guidelines
FSSS	Forest Service special status
FSTAG	Forest Service Trail Accessibility Guidelines
ft	foot or feet
ft msl	feet above mean sea level
FWS	U.S. Department of the Interior − Fish and Wildlife Service
GIS	geographic information system
GWh	gigawatt-hour(s) (equals one million kilowatt-hours)
HCM	Habitat Criteria Mapping
HMBP	hazardous materials business plan
hp	horsepower
HPMP	Historic Properties Management Plan
IBM	Individual Base Modeling
IFIM	instream flow incremental methodology
ILP	Integrated Licensing Process
in.	inch(es)
Interior	U.S. Department of the Interior
KOP	key observation point
kV	kilovolt(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
licensee	Pacific Gas and Electric
LSR	Late Successional Reserve
LWD	large woody debris
m	meter(s)
mg/kg	milligram(s) per kilogram
mg/l	milligram(s) per liter
ml	milliliter(s)
mm	millimeter(s)
MMI	multimetric index
MOU	memorandum of understanding
MVA	megavolt-ampere
MW	megawatt
MWh	megawatt-hours
NA	not applicable
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council

NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NTU	nephelometric turbidity unit(s)
O&M	operation and maintenance
OHV	off-highway vehicle
PA	Programmatic Agreement
PAOT	people-at-one-time
Park Service	National Park Service
PG&E	Pacific Gas and Electric
PHABSIM	Physical Habitat Simulation Modeling
project	McCloud-Pit Hydroelectric Project
QA/QC	quality assurance / quality control
RMO	road management objective
RO	runoff
ROD	Record of Decision on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl
ROS	recreation opportunity spectrum
RRMP	Redding resource management plan
RV	recreational vehicle
SHPO	State Historic Preservation Officer
SPCC plan	spill prevention, control, and countermeasures plan
t	tonnes
TBMP	terrestrial biological management plan
TCP	Traditional Cultural Property
TMDL	total maximum daily load
Tribes	Winnemem Wintu Tribe, Pit River Tribe, and Redding Rancheria
TSS	total suspended solids
U.S.C.	United States Code
USGS	U.S. Geological Survey
VAOT	vehicles-at-one-time
VELB	valley elderberry longhorn beetle
VMP	vegetation management plan
VQO	visual quality objective
WECC	Western Electricity Coordinating Council
WROS	Water Recreation Opportunity Spectrum
WUA	weighted usable area

EXECUTIVE SUMMARY

On July 16, 2009, Pacific Gas and Electric (PG&E or licensee) filed an application for a new major license for its McCloud-Pit Hydroelectric Project, Project No. 2106 (project). The 368-megawatt (MW) project is located on the McCloud and Pit Rivers in Shasta County, California, and consists of three power generating developments (James B. Black, Pit 6, and Pit 7). These developments collectively include four reservoirs, three powerhouses, five dams, two tunnels, an afterbay, and associated equipment and transmission facilities. The project is described in more detail in section 2.1.1 *Existing Project Facilities*. The project occupies 1,621.9 acres of federal lands managed by the U.S. Department of Agriculture − Forest Service (Forest Service) and 29.5 acres of federal lands managed by the U.S. Bureau of Land Management (BLM).

Proposed Action

To improve aquatic resources, PG&E proposes changes to existing operations, including higher minimum instream flow releases in two project reaches: Lower McCloud River and Iron Canyon Creek. In addition, PG&E proposes measures to protect sensitive species and measures to maintain and enhance existing recreation opportunities as well as to provide additional recreational facilities. Furthermore, PG&E proposes to develop and/or implement the following plans: a large woody debris (LWD) management plan; an erosion and sediment monitoring and control plan; a gravel and coarse sediment monitoring plan; a water quality and temperature monitoring plan; an aquatic biological monitoring and management plan; a vegetation management plan; a terrestrial management plan; a recreation management plan; a project sign and education plan; a historic properties management plan; a road and transportation facilities management plan; a hazardous substance management plan; and a visual quality management plan. PG&E's measures are described in more detail in section 2.2, *Applicant's Proposal*. Finally, PG&E proposes to construct a new powerhouse at the base of McCloud dam and a powerhouse at Pit 7 afterbay dam, along with associated transmission facilities.

Alternatives Considered

This draft environmental impact statement (EIS) analyzes the effects of continued project operation and recommends conditions for a new license for the project. In addition to PG&E's proposal, we consider two alternatives: (1) staff alternative; and (2) no action—continued operation with no changes.

Staff Alternative

Under the staff alternative, the project would include most of PG&E's proposed measures and would be operated to maintain existing flows in the Pit 7 reach of the Pit River, but would include higher instream flows than proposed by PG&E in the Lower McCloud River bypassed reach and in the Iron Canyon Creek bypassed reach. The staff alternative also includes the following additional measures:

- development and/or implementation of plans for gravel and coarse sediment management, water quality and temperature monitoring, aquatic biological monitoring, vegetation and invasive species management, terrestrial biological management, recreation development and management, fish stocking, historic properties management, and visual resources, with staff modifications;
- ramping rates to protect fish, macroinvertebrates, and foothill yellow-legged frogs;
- operation and maintenance of gages to measure streamflows;
- foothill yellow-legged frog surveys; and
- real-time monitoring of water temperatures to assist in determining effects of mudflows from Mud Creek on project waters in the Lower McCloud River.

The staff alternative is based in part on recommendations made by the Forest Service, United States Department of Interior – Fish and Wildlife Service; California Department of Fish and Game (California Fish and Game), California Trout, Trout Unlimited, the McCloud River Club, and American Whitewater. We include most, but not all, of the section 4(e) conditions filed by the Forest Service in the staff alternative.

Public Involvement and Areas of Concern

PG&E utilized the Federal Energy Regulatory Commission's (FERC or the Commission) Integrated Licensing Process (ILP) to prepare its license application. The intent of the Commission's pre-filing process under the ILP is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, Tribes, and other interested parties to identify issues and information needs prior to an application being formally filed with the Commission. As part of the pre-filing process, we distributed Scoping Document 1 to interested parties on September 25, 2006, and issued a letter responding to comments made on Scoping Document 1 on October 8, 2007. Scoping meetings were held in Redding, California, on October 23 and 24, 2006. On December 1, 2009, after the final license application filing, we requested comments, conditions, and recommendations in response to our notice of application ready for environmental analysis.

The primary issues associated with relicensing the project are appropriate minimum flows in project-affected reaches, assessment of project effects on special status species, effects of any new minimum flow regime on angling and reservoir-based recreation, assessment of project effects on recreation facilities, and potential effects of project operation on water quality, aquatic habitat, and fish.

Project Effects

The project alters flows in the McCloud and Pit Rivers and Iron Canyon Creek via water storage in four reservoirs and one afterbay, and diversion of flows to generate power at three powerhouses. Project effects resulting from the operation and maintenance of the McCloud-Pit Project include: the lack of LWD below McCloud dam;

trapped sediments behind McCloud dam resulting in a degraded aquatic habitat below the dam; erosion and fine sediment delivery to stream channels; lower instream flows due to water diversions; a lack of flow ramping during spill events; increased water temperature, turbidity, and contaminants in project-stream reaches; introduction and spread of invasive weed species; avian collision and electrocution at project transmission lines; accessibility of project waters for recreational access (boating and angling); potential adverse effects to historic properties; and decreased aesthetic values throughout the project area.

In recognition of these project effects, the table below summarizes the measures proposed to mitigate these effects associated with the three alternatives considered in this draft EIS.

Resource	**No-action Alternative**	**Proposed Action**	**Staff Alternative**
Generation	1,542.2 GWh	1524.3 GWh	1,502.2 GWh
Geology and Soils	Continued removal of LWD behind McCloud dam	Prepare an LWD management plan to facilitate the placing of LWD downstream of McCloud dam	Same as proposed action
	Continue to maintain roadways and implement BMPs to reduce sediment input to project waters	Implement erosion and sediment monitoring and control plan to minimize erosion	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Monitor gravel and coarse sediment that could benefit downstream aquatic habitat	The proposed action plus implement a gravel and coarse sediment management plan to add 150 to 600 tons of gravel and coarse sediment, from Star City Creek or other potential sites, to the Lower McCloud River periodically for protection of geology and soil resources
Aquatic Resources	Provide existing minimum flows in all stream reaches	Higher minimum instream flows below McCloud and Iron Canyon dams	Higher minimum instream flows below McCloud and Iron Canyon dams consistent with a more natural spring hydrograph
		No ramping rates for seasonal minimum flow changes, but upramping at 100 cfs per hour prior to uncontrollable spills	Downramping at 150 cfs each 48 hours at McCloud dam during spills controllable by valve Maximum upramping during controllable spills at 200 cfs each 24 hours; implement water quality and temperature monitoring plan

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Move streamflow measurements for McCloud dam from gage MC-1 to MC-7	Measure streamflow compliance at two compliance points (MC-7 and MC-1)
		No aquatic biological monitoring plan	Implement an aquatic biological monitoring plan
		Implement water quality monitoring plan	Same as proposed action
Terrestrial Resources	Continue to implement vegetation management programs around project facilities	Implement vegetation management plan to guide restoration using native plants and manage invasive plants Implement BMPs to protect wetlands during construction of McCloud transmission line Use native vegetation during restoration of areas disturbed by project-related activities	Implement the vegetation management plan as proposed under Forest Service condition 25 with modifications to include language from the licensee's alternative condition and the use of BMPs and native vegetation during restoration activities

Resource	No-action Alternative	Proposed Action	Staff Alternative
	Monitor bald eagle territories	Implement wildlife management plan	Implement the terrestrial biological management plan as proposed under Forest Service condition 26 with modifications to include language from the licensee's alternative condition Monitor known bat habitat annually for five years after plan approval, then once every five years Prepare biological evaluations for special-status species prior to new construction within the project boundary
		Implement APLIC standards for transmission lines to minimize avian collision and electrocution hazards	Same as proposed action
Threatened and Endangered Species	Implement Valley Elderberry Longhorn Beetle Conservation Program	Same as no-action plus conduct preconstruction surveys for Pacific fisher and to minimize effects on northern spotted owl	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff Alternative
Recreation Resources	Fund California Fish and Game trout stocking program	Continue funding to California Fish and Game for stocking trout annually and to evaluate fish stocking program	Stock 60,000 pounds of trout annually at the project and develop and implement a fish stocking plan
	Continue to operate and maintain existing recreational facilities at the project	Implement recreation development and management plan to include rehabilitation and upgrades to existing recreation facilities, reservoir water surface management, recreation monitoring, and a signage and education plan, providing streamflow information to the public via the internet	Evaluation of fish stocking at the project and monitoring of boat use at the reservoirs as a part of the recreation monitoring
		Construct new day-use area at McCloud reservoir, include fish/swimming platform, reconstruct and extend existing boat ramp, and add parking at Tarantula Gulch	Same as proposed but add lighting at Tarantula Gulch boat ramp

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Provide a formal campground at McCloud reservoir at Star City	Same as proposed
		Conduct a feasibility study to find a suitable location for a floating dock or pier and trail at McCloud reservoir	Construct a floating dock or pier and trail at McCloud reservoir
		Construct a day-use site and access trail along the Lower McCloud River, at the base of McCloud dam	Same as proposed
		Reconstruct Hawkins Landing boat ramp and campground and provide additional parking, restroom facilities, and conduct a site evaluation to provide three paved parking areas with shoreline access points	Same as proposed with the inclusion of three paved parking areas with shoreline access points at Iron Canyon reservoir
		Construct new boat ramp and shoreline access at Iron Canyon reservoir	Same as proposed with the inclusion of adding lighting at the boat ramp

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Relocate (if feasible) and reconstruct Deadlun Campground if a suitable location is found	Same as proposed action with the exception of reconstructing, not relocating Deadlun Campground
		Remove snow at Iron Canyon dam boat ramp and access road when project operations require snow removal from Oak Mountain Road	Same as proposed
		Evaluate the feasibility of constructing a pedestrian shoreline access trail at the upper end of Pit 7 reservoir, downstream of Pit 6 powerhouse tailrace, and	Construct the shoreline access trail
		Conduct feasibility assessment for providing boat put-in or boat hand- launch at Montgomery Creek, near the lower end of Pit 7 reservoir, if not feasible construct a fishing access trail with boat hand-launch	Conduct a site evaluation to determine the location of a pedestrian shoreline access trail at the lower end of Pit 7 reservoir with paved parking. Once a suitable location is found, construct this facility within five years of license issuance

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Reconstruct Fenders Flat day-use area (above Pit 7 afterbay dam) and provide access near the proposed Pit 7 afterbay powerhouse, and provide parking at the end of the powerhouse access road	Same as proposed
		Conduct a site evaluation to determine the location of three paved parking areas along FR 37N78	Construct three paved parking areas along FR 37N78
		Provide project patrols	No requirement for project patrol plan, patrols, or funding for law enforcement position
Cultural Resources		Finalize and implement Historic Properties Management Plan (HPMP)	Implement HPMP with some additional measures
	Continue employee environmental training and sensitivity program	Continue employee environmental training and sensitivity program as part of the HPMP	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Provide program to educate public about cultural significance of area (with assistance from Pit River Tribe, Winnemem Wintu Tribe, and Forest Service)	Same as proposed action
Land Use and Aesthetics	Continue to maintain all project roads and facilities	Develop and implement a road and transportation facility management plan for project roads	Same as proposed action plus revise project boundary to include all project roads and existing recreational facilities
		Execute a separate MOU with the Forest Service for areas with shared responsibility	Outside of licensing processing
	Continue to implement the Spill Prevention Control and Countermeasure (SPCC) Plan and the Hazardous Materials Business Plan (HMBP)	Same as No-action, but provide the Forest Service with copies of the current SPCC plans and HMBPs	Same as proposed action
		Develop and implement visual quality management plan	Same as proposed action
		Develop and implement a fire response plan	Same as proposed action

Conclusions

Based on our analysis, we recommend licensing the project as proposed by PG&E, with some staff modifications and additional measures (staff alternative), as described previously under *Alternatives Considered*.

In section 4.1 of the EIS, we compare the total project cost of obtaining power from a likely alternative source of power in the region, for each of the alternatives identified above. Our analysis shows that during the first year of operation, under the no-action alternative the project produces power at a cost of $23,102,533, or about $72.52/megawatt-hours (MWh) more than the cost of alternative power. Under the applicant's proposal, the project would produce power at a cost of $33,354,853, or about $65.62/MWh, more than the cost of alternative power. Under the staff-recommended alternative, the project would produce power at a cost of $33,684,836, or about $65.08/MWh, more than the cost of alternative power.

We choose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (1,502,200 megawatt-hours annually); (2) the project may save the equivalent amount of fossil fueled generation and capacity, thereby continuing to help conserve non-renewable energy resources and reduce atmospheric pollution; (3) the recommended environmental measures proposed by PG&E, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

1.0 INTRODUCTION

1.1 APPLICATION

On July 16, 2009, Pacific Gas and Electric (PG&E) filed an application to relicense its 368-megawatt (MW) McCloud-Pit Project (P-2106) with the Federal Energy Regulatory Commission (FERC or Commission). The McCloud-Pit Project is located on the McCloud and Pit Rivers in Shasta County, California, and consists of three existing developments (James B. Black, Pit 6, and Pit 7; figure 1-1). Project features collectively include two storage reservoirs (McCloud and Iron Canyon reservoirs), two regulating reservoirs (Pit 6 and Pit 7 reservoirs), one afterbay (Pit 7 afterbay), two tunnels, three powerhouses (James B. Black, Pit 6, and Pit 7 powerhouses), and associated equipment and transmission facilities. PG&E proposes to construct two new generation facilities at the base of McCloud dam (5 to 8 MW) and at the base of Pit 7 afterbay dam (10 MW), including a transmission line. A portion of the route of the proposed McCloud transmission line would cross about 5 miles of the southern portion of Siskiyou County. The current license expires July 31, 2011. The average annual energy generation (1979-2004) for James B. Black, Pit 6, and Pit 7 powerhouses is 656.3, 373.8, and 512.1 gigawatt-hours (GWh), respectively.

The project currently occupies 1,651.4 acres of federal lands. Of those, 1,621.9 acres are managed by the U.S. Department of Agriculture − Forest Service (Forest Service), and 29.5 acres managed by the U.S. Bureau of Land Management (BLM). The proposed new generation facilities add about 45.4 additional acres within the project boundary, of which about 4.6 acres would be federally-owned lands managed by the Forest Service.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The Commission must decide whether to issue a license to PG&E for the project and what conditions should be placed in any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality.

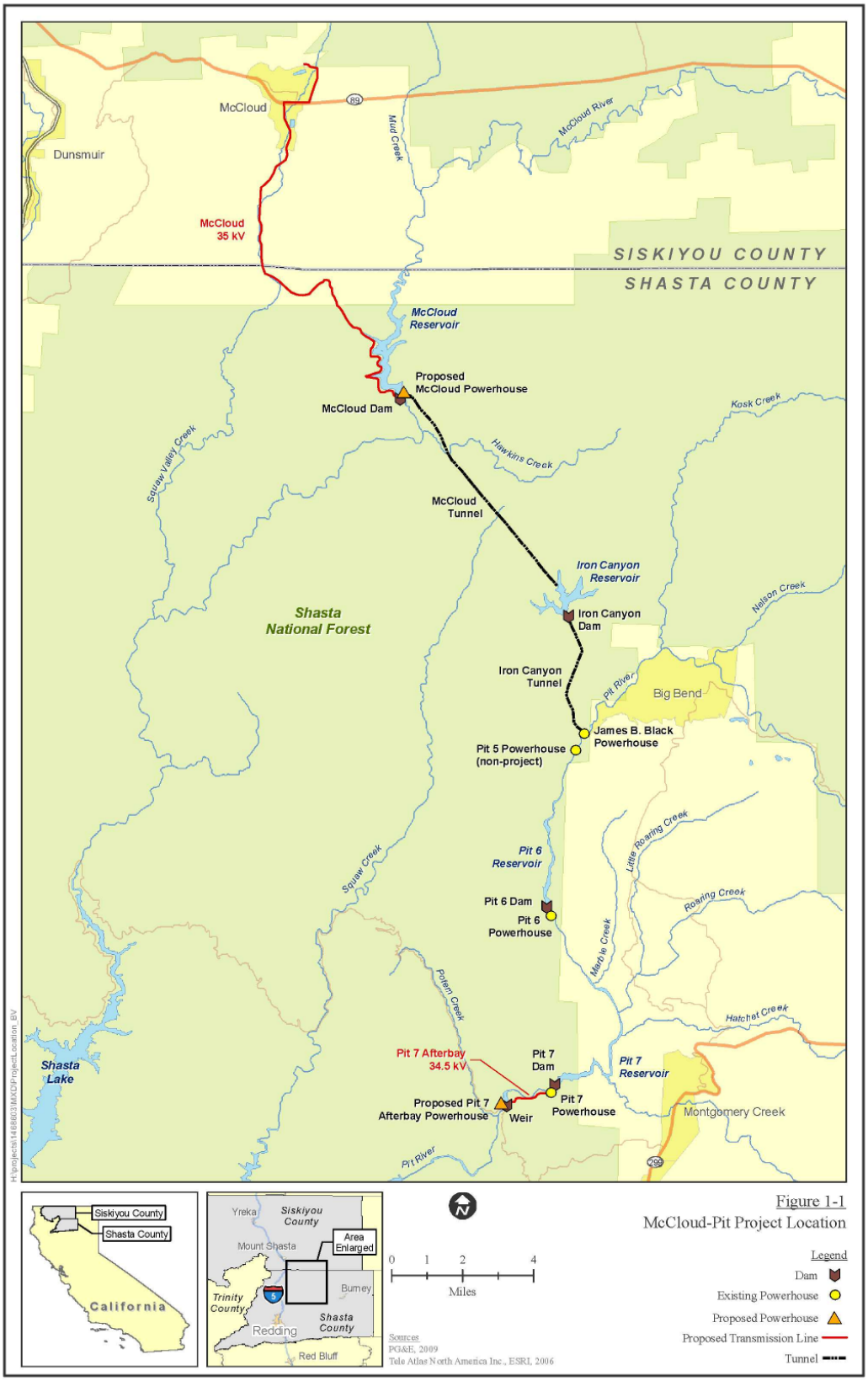

Figure 1-1. McCloud-Pit Project, location map. (Source: PG&E, 2009a)

Issuing a new license for the McCloud-Pit Project would allow PG&E to continue to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers.

This draft environmental impact statement (draft EIS) assesses the effects associated with operation of the proposed project, examines alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become a part of any license issued.

In this draft EIS, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by PG&E; (2) as proposed by PG&E with our recommended measures (the staff alternative); and (3) under the staff alternative with mandatory conditions. We also consider the effects of the no-action alternative. Important issues that are addressed include appropriate minimum flows in project-affected reaches, assessment of project effects on special status species, effects of any new minimum flow regime on reservoir-based recreation, and potential effects of project operation on water quality, aquatic habitat, and fish.

1.2.2 Need for Power

The project is located in the California-Mexico Power area of the Western Electricity Coordinating Council (WECC). According to the North American Electricity Reliability Corporation (NERC, 2009), which forecasts electrical supply and demand nationally and regionally, summer total internal demands for the California-Mexico Power area is projected to grow at an annual compound rate of 0.9 percent from 2009 to 2018. Annual energy use is projected to grow at an annual compound rate of 1.3 percent. NERC forecasts that approximately 31,613 MW of capacity will be added to the California-Mexico Power area of WECC over the project planning period (2009 – 2018). The project could continue to meet part of the existing load requirements within a system in need of resources. In addition, pursuant to California Senate Bill 1078 passed in September 2002, the proposed new small hydro powerhouses may qualify as “eligible renewable energy resources,” and could be used to help meet California’s Renewable Portfolio Standard.

California’s principal energy agencies (the California Energy Commission, California Public Utility Commission, and California Power Authority) developed a common policy vision calling for: optimizing energy conservation and resource efficiency; meeting new generation needs first with renewable energy resources and distributed generation, then with clean fossil fuel generation; and improving the bulk electricity transmission grid and distribution infrastructure. The California Energy Commission projects that the statewide annual peak demand will grow an average of 1.35 percent between 2008 and 2018.

We conclude that power from the McCloud-Pit Project could continue to meet a need for power in the WECC region in both the short- and long-term. The project

provides low-cost power that may displace non-renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities may avoid some power plant emissions and creates an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

The license for the McCloud-Pit Project is subject to numerous requirements under the Federal Power Act (FPA) and other applicable statutes. Major regulatory and statutory requirements are summarized in table 1-1 and described below.

Table 1-1. Major statutory and regulatory requirements for the McCloud-Pit Hydroelectric Project.

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	U.S. Department of Interior (Interior) – Fish and Wildlife Service (FWS); U.S. Department of Commerce – National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS)	FWS reserved its authority to prescribe fishways on January 28, 2010. NMFS reserved its authority on January 29, 2010.
Section 4(e) of the FPA (land management conditions)	Forest Service	The Forest Service provided conditions on January 29, 2010, and one revised condition on March 1, 2010.
Section 10(j) of the FPA	California Department of Fish and Game (California Fish and Game); NMFS	On January 29, 2010, NMFS provided section 10(j) recommendations. Fish and Game provided recommendations on February 2, 2010.
Clean Water Act water quality certification	California State Water Resources Control Board (California Water Board)	Application for water quality certification filed with the California Water Board on January 27, 2010. Certification due by January 27, 2011.

Requirement	Agency	Status
Endangered Species Act consultation	U.S. Department of the Interior − Fish and Wildlife Service (FWS)	We conclude that the project is not likely to adversely affect VELB, Pacific fisher, or northern spotted owl. We will seek concurrence with FWS on this matter.
Coastal Zone Management Act consistency	California Coastal Commission	Relicensing the project would not influence resources in the designated coastal zone.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the secretaries of Commerce or Interior. By letter filed January 28, 2010, the U.S. Department of the Interior (Interior) requested that a reservation of authority to prescribe fishways be included in any project license for the McCloud-Pit Project. NMFS filed a request for reservation of authority on January 29, 2010.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. The Forest Service filed 34 section 4(e) conditions for the McCloud-Pit Project on January 29, 2010, and one revised condition on March 1, 2010. These conditions are described under section 2.2.4, *Modifications to the Applicant's Proposal—Mandatory Conditions*, summarized in table 5-2, analyzed in the appropriate resource sections of section 3, and discussed in section 5, *Staff's Conclusions*.

1.3.1.3 Alternative Conditions Under the Energy Policy Act of 2005

The Energy Policy Act of 2005 provides parties to this licensing proceeding the opportunity to propose alternatives to 4(e) conditions. PG&E provided 16 alternative 4(e) conditions; Trout Unlimited, California Trout, and the McCloud River Club provided one alternative condition; and the McCloud RiverKeepers provided one alternative condition. We discuss these alternative conditions in the appropriate resource analysis sections of this draft EIS and in section 2.2.4.2, *Alternative 4(e) Conditions Pursuant to the Energy Policy Act of 2005*. We discuss our conclusions in section 5, *Staff's Conclusions*.

1.3.1.4 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project, unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

On January 29, 2010, NMFS filed recommendations under section 10(j) for the McCloud-Pit Project. California Department of Fish and Game (California Fish and Game) filed recommendations on February 2, 2010. We summarize these recommendations in table 5-1, analyze them in the appropriate resource sections in section 3, and present our conclusions in section 5. We also discuss and address the agency recommendations in section 5.4.1, *Recommendations of Fish and Wildlife Agencies*.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. By letter dated January 27, 2010, PG&E submitted its application for water quality certification to the California State Water Resources Control Board (California Water Board). By letter dated February 26, 2010, the California Water Board documented receipt of the application on January 27, 2010. Consequently, the water quality certification is due by January 27, 2011.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. Four federally-listed species have the potential to occur in the project vicinity: northern spotted owl, valley elderberry longhorn beetle (VELB), California red-legged frog, and Pacific fisher. Our analyses of project effects on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

We conclude that relicensing of the McCloud-Pit Project, as described under the staff alternative with mandatory conditions, would have no effect on the California red-legged frog. Relicensing the project would not likely adversely affect the VELB, Pacific fisher, and northern spotted owl. We will seek concurrence with the U.S. Department of

the Interior − Fish and Wildlife Service (FWS) on our conclusions regarding the VELB, Pacific fisher, and northern spotted owl.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code (U.S.C.) § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The project is located in the Sierra Nevada Mountains and is not located within the boundary of a designated Coastal Zone Management Program, which extends from a few blocks to 5 miles inland from the sea (www.ceres.ca.gov/coastal.com), and relicensing the project would not affect resources within the boundary of a designated coastal zone. Therefore, the project is not subject to California coastal zone program review and no consistency certification is needed. We have provided a copy of this draft EIS to the California Coastal Commission for review.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute a Programmatic Agreement (PA) for the protection of historic properties from the effects of the operation of the McCloud-Pit Hydroelectric Project. The terms of the PA would ensure that PG&E addresses and treats all historic properties identified within the project's area of potential effects through the implementation of PG&E's Historic Properties Management Plan (HPMP).

1.3.6 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is the California counterpart to the National Environmental Policy Act (NEPA). CEQA went into effect in 1970 for the purpose of monitoring land development in California through a permitting process. This statute, enacted to protect the health of the environment from current and future development, requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA applies to all discretionary activities proposed to be undertaken or approved by California state and local government agencies. The California Water Board, which must act on PG&E's

request for water quality certification for the project (see section 1.3.2, *Clean Water Act*), is the lead agency under CEQA.

Under CEQA, an environmental impact report (EIR) is prepared when the public agency finds substantial evidence that the project may have a significant effect on the environment. An EIR is the public document used to analyze the significant environmental effects of a proposed project, to identify alternatives, and to disclose possible ways to reduce or avoid the possible environmental damage. CEQA guidelines state that when federal review of a project is also required, state agencies are encouraged to integrate the two processes to the fullest extent possible, which may include a joint EIS/EIR. While this document is not a joint EIS/EIR, the California Water Board has the opportunity to use this document, as appropriate, to satisfy its responsibilities under CEQA. As such, we invite the California Water Board's comments on this draft EIS as they may pertain to the agency's use of the final EIS for CEQA purposes.

One element needed in an EIR, but not required by NEPA, is a discussion of a program for monitoring or reporting on mitigation measures that were adopted or made conditions of project approval. The monitoring or reporting program must ensure compliance with mitigation measures during project implementation. The program may also provide information on the effectiveness of mitigation measures. Although discussion of the mitigation reporting or monitoring program can be deferred until the final EIR or, in some cases, after project approval, it is often included in the draft EIR to obtain public review and comment.

In section 3 of this draft EIS, *Environmental Analysis*, we describe each potential environmental resource impact, our analysis of each recommended mitigation measure, and our conclusion with respect to the effectiveness of each measure in addressing the impact. In section 5.2, *Comprehensive Development and Recommended Alternative*, we list the mitigation measures, and monitoring and reporting requirements we recommend for inclusion in any license issued for the McCloud-Pit Project. Additionally, any conditions of the water quality certification that may be issued for this project will become an enforceable part of any license issued for this project. To specifically address CEQA requirements with respect to mitigation monitoring, appendix A, *McCloud-Pit Project Mitigation and Monitoring Summary*, identifies each potentially significant impact of relicensing the McCloud-Pit Project, lists the project changes or mitigation measures that are recommended for inclusion in a new license to avoid or reduce the impact, and describes the monitoring and reporting measures PG&E would undertake to ensure the project changes and mitigation measures are implemented as intended.

Another analysis required under CEQA but not required in an EIS is a description of any growth-inducing effects caused by the project. For this relicensing, higher minimum instream flows would translate to less annual power generation of the project. A net reduction in power generation would not facilitate population growth or remove an obstacle to growth. PG&E, however, also is proposing to construct new powerhouses at the McCloud and Pit 7 afterbay dams, and associated transmission lines. Increased

power generation would facilitate population growth and remove a potential obstacle to growth.

1.4 PUBLIC REVIEW AND CONSULTATION

The Commission's regulations (18 Code of Federal Regulations [CFR] §16.8) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Under the Commission's regulations, issuing a licensing decision for any project first requires preparation of either an environmental assessment or an EIS, in accordance with NEPA. The preparation of an environmental assessment or EIS is supported by a scoping process to ensure the identification and analysis of all pertinent issues. We issued a notice of intent to prepare an EIS on December 1, 2009.

On September 25, 2006, the Commission issued Scoping Document 1 to enable resource agencies; the Winnemem Wintu Tribe, Pit River Tribe, and Redding Rancheria [Tribes]; and other interested parties to more effectively participate in and contribute to the scoping process. In Scoping Document 1, we requested clarification of preliminary issues concerning the McCloud-Pit Project and identification of any new issues that needed to be addressed. On October 8, 2007, we issued a letter responding to comments made on Scoping Document 1.

We held two public scoping meetings regarding the project, on October 23 and 24, 2006, in Redding, California. The scoping meetings were noticed in a local newspaper and the *Federal Register*. Based on completion of sign-in sheets at the scoping meetings, 25 individuals attended the October 23 evening scoping meeting, and 32 individuals attended the October 24 morning scoping meeting. In addition, an environmental site review of the project area was conducted on September 19 and 20, 2006, and was attended by several of the individuals who also attended one or both of the scoping meetings. The environmental site review also was noticed in a local newspaper and the *Federal Register*.

We requested that written comments regarding the project be filed with the Commission by November 23, 2006. In addition to the oral comments received during the scoping meetings, we received written scoping comments from the following entities:

Commenting entity	Date of filing
Redding Rancheria	November 13, 2006
PG&E	November 20, 2006
National Park Service (Park Service)	November 21, 2006
Forest Service	November 21, 2006
California Fish and Game	November 21, 2006
California Trout, Friends of the River, and Trout Unlimited	November 22, 2006
Pit River Tribe	November 24, 2006
California Water Board	November 22, 2006
Hearst Corporation	November 24, 2006
Sierra Pacific Industries	November 28, 2006

1.4.2 Interventions

On December 1, 2009, the Commission issued a public notice accepting the application and soliciting motions to intervene. This notice set a 60-day period during which interventions could be filed, ending February 1, 2010. In response to these notices, the following entities filed motions to intervene in this proceeding:

Entity	Date of filing
California Fisheries and Water Unlimited	December 3, 2009; amended December 4, 2009
Forest Service	December 10, 2009
Anglers Committee	December 10, 2009
Friends of the River and American Whitewater	December 18, 2009
Winnemem Wintu Tribe	December 22, 2009
California Salmon and Steelhead Association	December 30, 2009
Center for Water Advocacy	January 8, 2010
California Sportfishing Protection Alliance	January 13, 2010
California Trout, Trout Unlimited, and Northern California Council Federation of Flyfishers	January 26, 2010

Entity	Date of filing
California Water Board	January 28, 2010
McCloud River Club	January 28, 2010
Interior	February 1, 2010
NMFS	January 29, 2010
The Fly Shop	January 29, 2010
McCloud RiverKeepers	February 1, 2010
California Fish and Game	February 1, 2010
Pit River Tribe	February 8, 2010[a]
Hearst Corporation	February 16, 2010 [a]

[a] Late intervention granted by Commission notice issued February 25, 2010.

1.4.3 Comments on License Application

On December 1, 2009, the Commission issued a Ready for Environmental Analysis Notice and requested comments, recommendations, and terms and conditions (subject to sections 4(e), 10(a), 10(j) and 18 of the FPA) with a filing deadline of February 1, 2010.[7] The following entities filed comments, terms, conditions, prescriptions, or recommendations:

Commenting entity	Date of filing
Forest Service	December 21, 2009 January 29, 2010 – filed one 4(e) condition revised in part
California Fisheries and Water Unlimited	January 19, 2010
FWS	January 28, 2010
NMFS	January 29, 2010
American Whitewater	February 2, 2010
Winnemem Wintu Tribe	February 1, 2010
California Fish and Game	February 2, 2010

[7] Several comments were received after the filing deadline, but are still considered in this EIS.

Commenting entity	Date of filing
Forest Service	March 1, 2010
PG&E	March 3, 2010
California Trout, Trout Unlimited, and McCloud River Club	March 4, 2010
California Water Board	March 8, 2010
Hearst Corporation	March 16, 2010
PG&E	March 16, 2010
PG&E	March 22, 2010
Hearst Corporation	March 22, 2010
American Whitewater and Friends of the River	March 30, 2010
American Whitewater and Friends of the River	March 31, 2010
McCloud RiverKeepers	April 14, 2010
McCloud RiverKeepers	April 22, 2010
PG&E	April 23, 2010
Winnemem Wintu Tribe	May 26, 2010

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the McCloud-Pit Project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.1.1 Existing Project Facilities

Located in the McCloud and Pit River drainages of Northern California, the McCloud-Pit Project involves the transfer of water from the McCloud River basin to the Lower Pit River basin. McCloud reservoir is located on the McCloud River, which originates at Moosehead Creek, southwest of Mt. Shasta, and flows in a southwesterly direction before entering Shasta Lake, a reservoir formed by the U.S. Department of Interior – Bureau of Reclamation's Shasta dam at the confluence of the Pit, Sacramento, and McCloud Rivers. From McCloud reservoir, water is transferred via a tunnel to Iron Canyon reservoir, which is located on Iron Canyon Creek, a tributary of the Pit River. Water from Iron Canyon reservoir flows, via a tunnel, to the James B. Black powerhouse, located on the Pit River, just downstream of PG&E's Hat Creek and Pit 3, 4, 5 projects. The water from the McCloud River drainage then enters the Pit River and travels through the Pit 6 and Pit 7 developments before entering Shasta Lake. Although the project diverts water from the McCloud River basin to the Lower Pit River basin, both basins drain to Shasta Lake. The project is located entirely within the Sacramento River Hydrologic Region of California and both drainages are located along the western slope of the Cascade Range.

The McCloud-Pit Hydroelectric Project commenced commercial operation in 1965-1966. The project is composed of three hydroelectric developments: James B. Black, Pit 6, and Pit 7, each of which is described below. During the period from 1979 to 2004, the developments have annually generated an average of 1,542 GWh of power, respectively. The locations of the various facilities and features are presented in figures 2-1 and 2-2.

2.1.1.1 James B. Black Development

McCloud Dam and McCloud Reservoir

McCloud dam is a 241-foot (ft)-high, 630-ft-long earth- and rock-filled dam located on the McCloud River that impounds McCloud reservoir. The McCloud reservoir has a surface area of 520 acres and a maximum storage capacity of about 35,197 acre-feet (ac-ft). The spillway (elevation 2,696.0 ft above mean sea level [ft msl]) is on the south side of the dam. The reservoir has a normal maximum water surface elevation of 2,680 ft msl. The dam's spillway is equipped with three radial gates

measuring 27 ft by 24.5 ft that returns spillage flows to the McCloud River. The dam also has a 7-ft-diameter diversion/outlet tunnel that runs under the dam to a 24-inch (in.) Howell-Bunger valve for releasing instream flows to the McCloud River, as well as an 84-in.-diameter butterfly valve for emergency use to control reservoir levels. Controls for the diversion/outlet tunnel are located at the intake within McCloud reservoir.

McCloud Tunnel

McCloud dam diverts flows from the McCloud River via a 7.2-mile-long lined and unlined tunnel and a 563-ft-long pipeline section at Hawkins Creek crossing that hydraulically links McCloud reservoir and Iron Canyon reservoir. An intake tower within McCloud reservoir collects water for the McCloud tunnel, which is about 17 ft in diameter, and heads easterly to Iron Canyon reservoir. The differential in water surface elevations between the two reservoirs controls the amount of water drafted through the tunnel. The McCloud tunnel diversion results in an approximately 24-mile-long bypassed reach of the McCloud River, between the project reservoir and Shasta Lake.

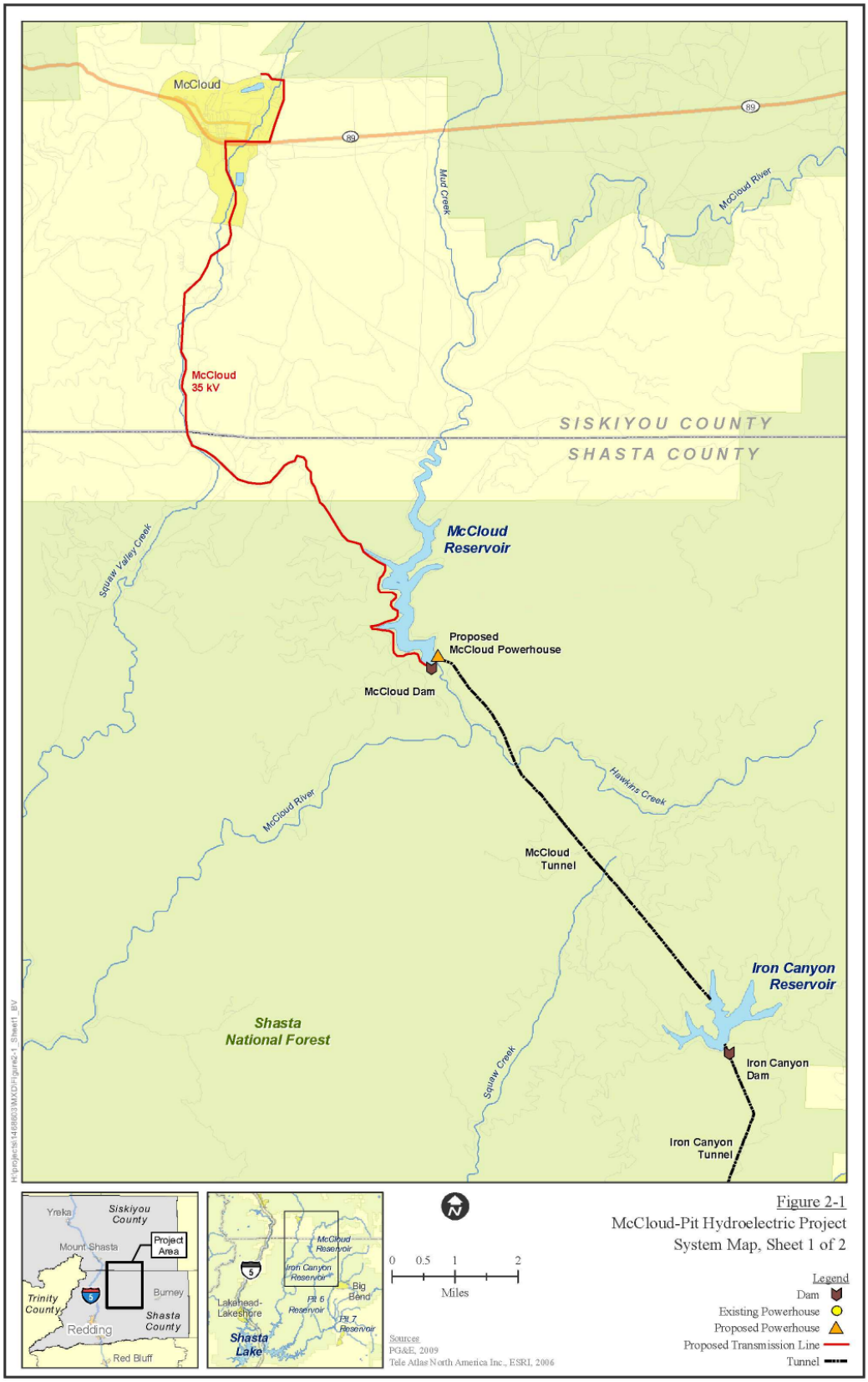

Figure 2-1. McCloud-Pit Project, system map. (Source: PG&E, 2009a)

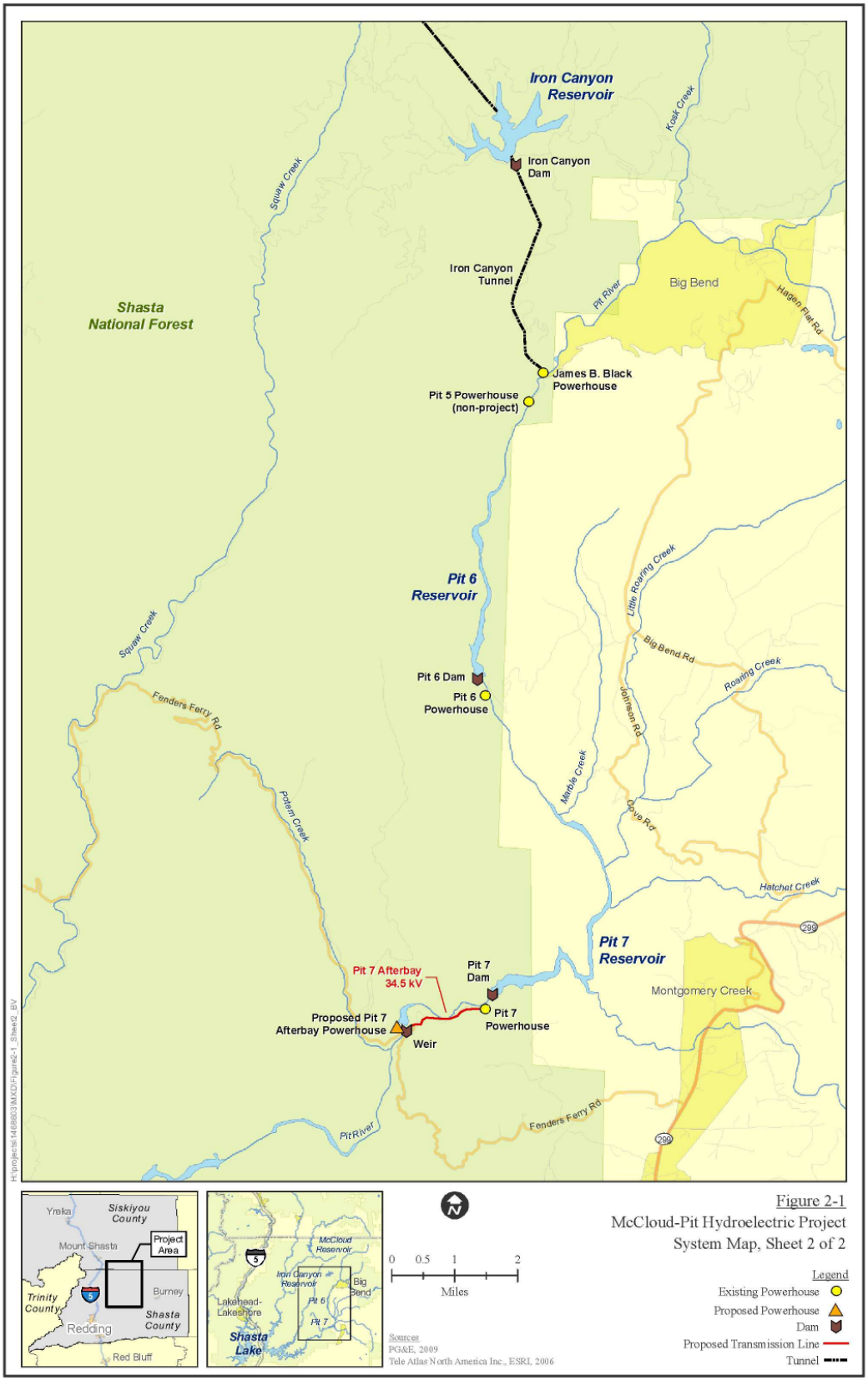

Figure 2-1
McCloud-Pit Hydroelectric Project
System Map, Sheet 2 of 2

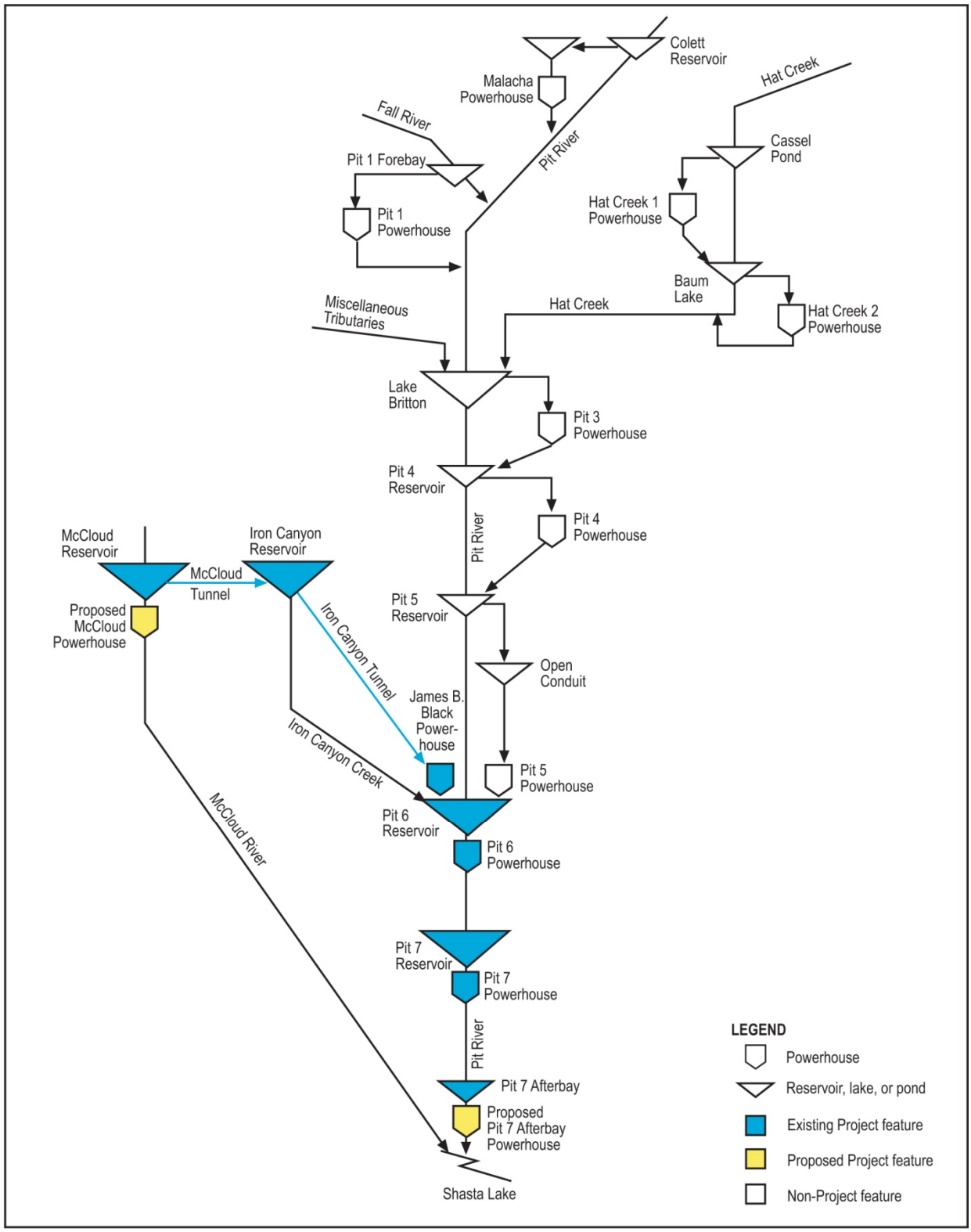

Figure 2-2. Schematic of the McCloud-Pit Project.

Iron Canyon Dam and Reservoir

An earth-filled dam 214-ft-high and 1,130-ft-long impounds Iron Canyon Creek water to create Iron Canyon reservoir. The reservoir has a maximum storage capacity of 24,241 ac-ft with about a 500-acre surface area. The dam has a slide gate leading to a 48-in.-diameter pipe for instream flow releases to Iron Canyon Creek. Normal maximum water surface elevation within the reservoir is 2,664 ft msl.

Iron Canyon Tunnel and Penstock

The 2.9-mile-long, 18-ft-diameter Iron Canyon tunnel diverts water from Iron Canyon reservoir. An associated 1,194-ft-long, 11.5-ft-diameter pipeline at the Willow Spring Creek crossing, and a 5,467-ft-long, 11.5-ft-diameter steel penstock provides water to James B. Black powerhouse. The penstock bifurcates before James B. Black powerhouse to deliver water flow to the two turbine generator units. The tunnel and penstock have a total flow capacity of 2,000 cubic feet per second (cfs). The Iron Canyon tunnel diversion results in an approximately 4-mile-long Iron Canyon Creek bypassed reach leading to the Pit 6 reservoir.

James B. Black Powerhouse

James B. Black powerhouse is located on the northwest bank of the Pit River, about 0.5 mile upstream of the Pit 5 powerhouse (FERC project no. 233). The powerhouse is a three-level, reinforced-concrete structure containing two vertical shaft impulse turbines rated at 104,000 horsepower (hp) each. They operate at a normal maximum gross head of 1,226 ft. Two vertical axis outdoor generators, Unit 1 rated at 94.8 megavolt-ampere (MVA) and Unit 2 rated at 92.6 MVA, are connected to a three-phase, 86-MVA transformer bank. Their combined maximum capacity is 172 MW. Average annual generation within the past 25 years at the station is 656.3 GWh. Flows discharge from this powerhouse via a tailrace leading directly from the generation units to the Pit River.

Transmission

The primary transmission lines (230 kilovolt [kV]) extend about 0.5 mile from the transformer bank in the switchyard adjacent to James B. Black powerhouse to the switchyard adjacent to the non-project Pit 5 powerhouse.

2.1.1.2 Pit 6 Development

Pit 6 Dam and Reservoir

Pit 6 dam and reservoir are located on the Pit River downstream of James B. Black powerhouse. The 183-ft-high, 560-ft-long concrete gravity Pit 6 dam has a crest elevation of 1,432 ft msl. The top of the dam contains a trash rake, motors for two 42-ft-high by 49-ft-long slide gates, and a control building. The control building houses a hydraulic system for two low-level 8-ft-diameter outlets at the base of the dam. The Pit 6 reservoir has a maximum storage capacity of about 15,619 ac-ft and a maximum surface area of about 268 acres. The normal maximum water surface elevation of the reservoir is

1,425 ft msl. The reservoir serves as the forebay for Pit 6 powerhouse. Two 18-ft-diameter steel penstocks with a total flow capacity of 6,470 cfs extend 602 ft from the dam to the Pit 6 powerhouse turbines located at the base of the dam.

Pit 6 Powerhouse

Pit 6 powerhouse is located along the east bank of the Pit River at the base of Pit 6 dam. The powerhouse is a four-level, reinforced concrete structure, three levels of which are below grade. The structure contains two vertical-shaft, Francis reaction turbines, rated at 53,000 hp each and operating at a normal maximum gross head of 155 ft. There are two outdoor vertical axis generators, rated at 44 MVA each, with each unit connected to a three-phase, 44-MVA transformer bank that steps up plant output to 230 kV. The maximum generator capacity is 80 MW. Average annual generation over the last 25 years is 373.8 GWh. Water is discharged from the Pit 6 powerhouse directly into the Pit 7 reservoir.

Transmission

The primary transmission lines extend about 3.3 miles from the switchyard adjacent to Pit 6 powerhouse to PG&E's interconnected transmission system.

2.1.1.3 Pit 7 Development

Pit 7 Dam and Reservoir

Pit 7 dam and reservoir are located on the Pit River downstream of Pit 6 powerhouse. Pit 7 dam is a 228-ft-high and 770-ft-long concrete gravity dam. The top of the dam contains a trash rake, motors for two 49-ft by 42-ft slide gates at the crest of the dam, and a control building. The control building houses hydraulic controls for two 8-ft-diameter low-level outlets at the base of the dam. Pit 7 reservoir has a maximum storage capacity of 34,142 ac-ft and a surface area of about 468 acres at a normal maximum water surface elevation of 1,270 ft msl. As with Pit 6 reservoir, Pit 7 reservoir serves as the forebay for Pit 7 powerhouse. Two penstocks, 15 ft in diameter, extend 572 ft from the dam to the turbines in the powerhouse, located at the base of the dam. Total flow capacity within the penstocks is 7,440 cfs.

Pit 7 Powerhouse

Pit 7 powerhouse is located along the east bank of the Pit River at the base of the Pit 7 dam. The powerhouse consists of a four-level, reinforced concrete structure, three levels of which are below grade. The powerhouse contains two vertical-shaft, reaction turbines that are rated at 70,000 hp each and operate at a normal maximum gross head of 205 ft. Two vertical axis generators are rated at 52.2 (Unit 2) and 62.1 (Unit 1) MVA, respectively. Their maximum combined capacity is 112 MW. Each unit is connected to a three-phase, 58-MVA transformer bank that steps up plant output to 230 kV. The average annual generation over the last 25 years is 512 GWh. Water is discharged from Pit 7 powerhouse directly into Pit 7 afterbay.

Transmission

The primary transmission lines extend about 3.5 miles from the switchyard adjacent to Pit 7 powerhouse to the licensee's interconnected transmission system.

Pit 7 Dam and Afterbay

Pit 7 afterbay has a surface area of about 69 acres at a normal "maximum" water surface elevation of 1,067 ft msl (maximum water surface of Shasta Lake). The afterbay dam is a 30-ft-high, steel reinforced, rock-fill structure, including a variable width concrete gravity regulations weir section. Pit 7 afterbay serves to attenuate changes in the water flow from Pit 7 dam and powerhouse before entering Shasta Lake, which abuts and sometimes inundates the afterbay.

2.1.1.4 Existing Project Boundary

The existing project boundary, consisting of lands necessary for the safe operation and maintenance (O&M) of the project and other purposes, such as recreation, shoreline control, and protection of environmental resources, includes about 3,707.6 acres of land in Shasta and Siskiyou Counties, California.

The project boundary generally only encompasses project facilities, including: dams and diversions; impoundments; water conveyances and associated structures; access roads and trails; transmission, communication, and control lines; powerhouses; gaging stations; and helicopter landing sites used for access to project structures. The project boundary also includes land adjacent to project features and the width of these zones varies depending on the feature. The current project boundary encloses the project facilities associated with the three developments (James B. Black, Pit 6, and Pit 7) along the McCloud and Pit Rivers, and lands within Shasta-Trinity National Forest.

The project currently contains six existing recreation sites within the project boundary. These sites include: (1) the Forest Service's Star City dispersed recreation site at McCloud reservoir; (2) the existing Tarantula Gulch boat launch at McCloud reservoir; (3) PG&E's Hawkins Landing campground at Iron Canyon reservoir; (4) PG&E's Hawkins Landing boat launch at Iron Canyon reservoir; (5) the Forest Service's Fenders Flat car-top boat launch at Pit 7 afterbay dam; and (6) the Forest Service's existing Deadlun Creek campground.

PG&E proposes to expand the project boundary to include: (1) an existing project road (access road to Hawkins Landing campground); (2) a proposed project road (access road for the proposed Pit 7 afterbay powerhouse); and (3) the right-of-way for the proposed McCloud and Pit 7 afterbay transmission lines.

In addition, PG&E proposes to construct nine new recreation sites, seven of which would be located within the existing project boundary and two of which would need to be brought into the project boundary after construction. The seven sites PG&E proposes to construct within the project boundary include: (1) a white-water access trail at McCloud reservoir; (2) a floating swim/fish dock at McCloud reservoir; (3) an additional boat

launch at Iron Canyon reservoir; (4) a day-use area at Iron Canyon reservoir; (5) a shoreline access site at Pit 6 reservoir; (6) the Montgomery Creek car-top boat launch at Pit 7 reservoir; and (7) shoreline access at Pit 7 afterbay. The two proposed sites that would need to be brought into the project boundary after construction include: (1) the Tarantula Gulch boat launch day-use area at McCloud reservoir; and (2) the Red Banks day-use area at McCloud reservoir.

About 44 percent of the land (1,621.9 acres) within the project boundary is owned by the United States and is managed by the Forest Service as part of Shasta-Trinity National Forest. Another 29.5 acres where Montgomery Creek enters Pit 7 reservoir is United States-owned land managed by BLM. The licensee owns 1,239.4 acres (33 percent) of the land within the project boundary, and the remaining 816.8 acres are privately owned.

2.1.2 Project Safety

The McCloud-Pit Project has been operating under the existing license for more than 48 years, during which time Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operation, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every five years by an independent consultant, and a consultant's safety report has been filed for Commission review. As part of the relicensing process, the Commission staff would evaluate the continued adequacy of the proposed project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the new license term to assure continued adherence to the Commission-approved plans and specifications; special license articles relating to construction, operation, and maintenance; and accepted engineering practices and procedures.

2.1.3 Existing Project Operation

The project operates both as a peaking system and a load-following system throughout the year, using the available water supply after satisfying minimum instream flow requirements.

James B. Black, Pit 6, and Pit 7 powerhouses are typically operated on a peaking basis. The powerhouses' output varies on an hourly basis from minimum or no load during the off-peak periods, up to the powerhouses' maximum output during peak demand periods. During the mid-peak demand periods, the powerhouses are operated near their more efficient loads depending on the available flow. During periods of high flow, the powerhouses are operated at their maximum capacities in order to minimize spill.

Operations of McCloud and Iron Canyon reservoirs are coordinated to optimize use of water. The movement of water through the tunnel from McCloud reservoir to Iron

Canyon reservoir and through a tunnel and penstock from Iron Canyon reservoir to James B. Black powerhouse is carefully planned to prevent spills at Iron Canyon reservoir and minimize spills at McCloud reservoir. The water surface elevation in Iron Canyon reservoir is regulated through the operation of James B. Black powerhouse. The relative level of McCloud reservoir and Iron Canyon reservoir determines the rate of flow through the tunnel connecting the two reservoirs. When spill conditions are forecast because of high inflows to the reservoirs, Iron Canyon reservoir is drawn down to avoid use of its spillway while maximizing the tunnel flow and minimizing spill at McCloud dam. Iron Canyon reservoir generally does not spill, while McCloud reservoir, on average, spills about 4 out of every 10 years.

2.1.4 Existing Environmental Measures

The current license for the project includes minimum flow requirements for McCloud and Iron Canyon dams (article 31). For McCloud dam, requirements include a 50-cfs flow release from May through November and a 40-cfs flow release from December through April, as measured at gage MC-7, with additional releases as necessary to maintain minimum flows of 160 to 210 cfs at gage MC-1 near Ah-Di-Na. Flows of at least 3 cfs are required to be released to Iron Canyon Creek downstream of Iron Canyon dam at all times.

To facilitate use of the boat ramp during the recreation season from May 15 to October 15, PG&E voluntarily keeps the water surface elevation of Iron Canyon reservoir at or above elevation 2,615 ft msl, instead of the minimum elevation of 2,593 ft msl allowed by the current license.

Land use is regulated under article 56 and is subject to the Shasta County general plan, Shasta-Trinity National Forest Land and Resource Management Plan (LRMP), BLM's resource management plan, and the McCloud River Coordinated Resource Management Plan (CRMP). The current license articles also include requirements for fire prevention and suppression.

PG&E is a participant in the McCloud River CRMP, which provides for coordinated management of the McCloud River by federal and state resource agencies, adjacent landowners, and conservation organizations. Any changes in the operation of the McCloud dam are expected to undergo review by the CRMP coordinating group (McCloud River CRMP, 1991). Also, the Shasta-Trinity National Forest LRMP guides protection of environmental resources (Forest Service, 1995).

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

PG&E proposes to construct a new powerhouse at the base of McCloud dam and a new powerhouse at Pit 7 afterbay dam, along with associated transmission facilities. PG&E also proposes to construct four new recreational facilities at McCloud reservoir,

two new recreation facilities at Iron Canyon reservoir, one new recreation facility at Pit 6 reservoir, and two new recreation facilities at Pit 7 afterbay dam.

2.2.1.1 McCloud Development

At McCloud Development, PG&E proposes to construct a powerhouse located at the base of McCloud dam. Generation output from the proposed powerhouse would be connected to a new transmission line that would be routed from the proposed powerhouse to connect to an existing substation located about 14 miles to the north, in the town of McCloud, California. The McCloud Development would use water stored in McCloud reservoir and released into the Lower McCloud River to meet instream flow requirements, and no new impoundments are proposed. With a flow range of 150 to 400 cfs, the turbine and generator set would have an installed capacity of about 5 to 8 MW. The proposed McCloud Development would have an average range of annual energy production of 30 to 40 GWh, and average monthly generation would be about 2.5 to 3.3 GWh. PG&E proposes to base the final size of the unit, powerhouse hydraulic capacity, and average annual energy production on instream flow requirements included in the new project license.

The proposed powerhouse would be positioned to the south of the current outlet works control building and would be a reinforced concrete-and-block masonry structure designed to enclose and protect the electro-mechanical generation equipment, withstand area snow loads, and prevent vandalism. It would be accessed via the existing project road that connects to Forest Road (FR) 38N11.

The powerhouse would be equipped with a single vertical-axis Francis turbine. The turbine, which would have a discharge diameter of about 54 in., would operate at about 450 revolutions per minute. The direct-coupled synchronous generator rating would range from 5,600 to 7,500 kilowatts (kW).

The proposed transmission line route from the powerhouse would follow FR 38N11 and then county roads to the existing substation about 14 miles north in the town of McCloud.

2.2.1.2 Pit 7 Afterbay Development

PG&E also proposes to construct facilities at Pit 7 Afterbay Development, including a powerhouse located on the west side of Pit 7 afterbay dam at the regulating weir. Generation output from the proposed powerhouse would be connected to a new transmission line that would be routed from the powerhouse to connect to the switchyard located about 1.6 miles to the east at the existing Pit 7 powerhouse. The proposed facilities would have no meaningful storage and would operate in a run-of-the-river mode. The available flows for energy production would be dictated by the operation of the upstream Pit 7 powerhouse.

The proposed Pit 7 afterbay powerhouse would use water released upstream from Pit 7 powerhouse and dam and no new impoundments are proposed. The proposed powerhouse would be configured for two horizontal-axis synchronous generating units,

each rated at 5,500 kW and housed in a 30-ft-wide by 110-ft-long intake approach bay. Each of the generating bays would have a design flow of 2,500 cfs. The upstream entrance to each intake bay would include a trash rack to stop large debris from entering the unit. Two radial gates about 26 ft wide by 52 ft high would be constructed upstream of the unit to regulate flow and for dewatering the turbine pit. A roller gate would be constructed at the downstream end of each bay or the tailrace to prevent backwatering during maintenance. A combination of ramps, walkways, and ladders would be used in each bay to allow for maintenance access and to support the gate operator mechanism. A 20-ft-wide bypass flow bay, which would house a radial gate and operator, would be built in the first phase of construction. The bypass flow bay would be used to pass river flows during the second phase of construction and during times of non-generation. The bypass flow bay also would require a walkway to allow maintenance and operation access and support the gate operator mechanism. A new access road would be constructed to access the powerhouse for construction, operation, and maintenance. The access road would extend between Fenders Ferry Road and the afterbay, just west of Fenders Ferry Bridge. Based on a flow range of 2,500 to 5,000 cfs, the two-unit powerhouse would accommodate turbine and generator sets capable of an installed capacity of about 5 MW each for a total of 10 MW. The average monthly generation from this proposed powerhouse would be about 4.2 GWh.

The proposed powerhouse substation would be fenced and located on the ground near the control house, but above the maximum anticipated flood and tailwater levels. Substation equipment would include a step-up substation to transform energy for the transmission line. Powerhouse controls and switchgear would be installed in a separate building located on the right bank of the river, positioned above the maximum anticipated water level and inside the substation fence. The building would house the required equipment for control and protection of the generation units and would be equipped with electric heating and cooling. The transmission line would be a 1.6-mile-long, 34.5-kV, wooden-pole line connecting the proposed powerhouse to a new 34.5- to 230-kV transformer, positioned at or near the existing 230-kV Pit 7 switchyard. A new 230-kV circuit breaker and disconnect switch would be connected by a short span to the main bus of the existing Pit 7 switchyard.

2.2.2 Proposed Project Operation

Future operation of existing project structures would be generally consistent with existing operation. One significant change in future operation, however, is related to minimum flow releases, as described below (Measures 5, 7, and 8). PG&E also proposes to release recreational flows below McCloud dam (Measure 6).

The proposed McCloud powerhouse would generate electricity with water stored in McCloud reservoir and released into the Lower McCloud River to meet instream flow requirements, and no new impoundments are proposed. The final size of the unit, powerhouse hydraulic capacity, and average annual energy production would be determined based on instream flow requirements included in the new project license.

The proposed Pit 7 afterbay powerhouse would operate in run-of-the-river mode.

2.2.3 Proposed Environmental Measures

In its new license application, PG&E proposed the following protection and enhancement measures:

General

- Consult annually with the Forest Service (Measure 1).
- Conduct annual training in coordination with the Forest Service, to familiarize project staff with local resource issues, special status species, noxious weeds, procedures for reporting to the Forest Service, and applicable Forest Service orders (Measure 2).
- Obtain Forest Service approval of designs and schedules for any changes to project construction and activities (Measure 4).

Geology and Soils

- Implement a large woody debris (LWD) management plan that calls for transporting LWD from McCloud reservoir and depositing it in the Lower McCloud River (Measure 11).
- Develop and implement an erosion and sediment monitoring and control plan that specifies treatment criteria; methods for inventorying, monitoring, and reporting; and protocols for emergency erosion control. The plan would include provisions for detecting and treating new erosion sites, as well as treating and monitoring existing sites (Measure 12).

Aquatic Resources

- Increase minimum instream flow releases below McCloud dam to the McCloud River, and move the point for measuring compliance about 4 miles upstream to the base of McCloud dam. The proposed target minimum instream flow below McCloud dam is 220 cfs from December through April and 150 cfs from May through November (Measure 5).
- Increase minimum instream flows below Iron Canyon dam to Iron Canyon Creek from 3 cfs, year-round, to a varied scenario of flows from 5 to 20 cfs, depending on time of year and water year type (Measure 7).
- Implement an upramping rate measure for the Lower McCloud River, identical to the existing voluntary operational practice, which would be implemented during uncontrolled spill events (e.g., temporary bridges and angling activities) (Measure 9).

- Continue providing a minimum flow release of 150 cfs to the Pit River below Pit 7 dam when Shasta Lake is lower than 1,055 ft msl to maintain water flow in the Pit 7 afterbay (Measure 8).
- Develop and implement a water quality monitoring plan, which would provide for continued monitoring of water temperature and turbidity for selected sites at which PG&E has been monitoring since about 1987, and add monitoring the effects of changes to instream flow releases on water temperature and turbidity and monitoring bacteria in McCloud and Iron Canyon reservoirs (Measure 10).
- Prepare, for Forest Service approval, a biological evaluation of the potential effects of any proposed action to construct project features on Forest Service lands on special status species. The evaluation would include procedures to minimize any adverse effects, meet any management plan restrictions, and monitor implementation and effectiveness of any measures taken as part the construction (Measure 15).
- Develop a wildlife management plan for aquatic and terrestrial species that includes monitoring methodologies, preconstruction survey protocols, and avoidance and protection measures for special status mollusks, Shasta salamander, foothill yellow-legged frog, and northwestern pond turtle (Measure 14).

Terrestrial Resources

- Develop a vegetation management plan in consultation with resource agencies to ensure that the licensee: (1) identifies, monitors, and protects individuals and populations of special status species, and culturally significant plant species to maintain well-distributed, viable populations; (2) specifies allowable treatment methods for project O&M practices to minimize the introduction and spread of invasive plant species; (3) protects wetland areas; and (4) restores native vegetation in areas disturbed by project operation and activities (Measure 13).
- Develop a wildlife management plan for aquatic and terrestrial species that describes monitoring methodologies, preconstruction survey protocols, and avoidance and protection measures for VELB, northern goshawk, bald eagle, peregrine falcon, willow flycatcher, communities of breeding birds, special status bats, and forest carnivores (Measure 14).
- Modify any existing power line that does not meet established Avian Power Line Interaction Committee (APLIC) standards for preventing bird electrocution; any new power lines would be constructed to meet the established standards (Measure 16).
- Prepare, for Forest Service approval, a biological evaluation of the potential effects of any proposed action to construct project features on Forest Service

lands. The evaluation would include procedures to minimize any adverse effects, meet any management plan restrictions, and monitor implementation and effectiveness of any measures taken as part the construction. This measure would apply to and protect terrestrial and aquatic Forest Service special status species (Measure 15).

Threatened and Endangered Species

- Pacific fisher: Perform pre-construction surveys using passive detection systems, such as baited camera stations. Survey methods from the scientific literature, and any available standard species survey protocols, would be considered in defining the survey approach. Avoidance, protection, and mitigation measures would be used at construction sites (Measures 14 and 15).
- Northern spotted owl: Conduct protocol-level surveys prior to construction and implement appropriate mitigation measures if required, or alternatively assume the presence of spotted owls, and propose measures, as appropriate, to address potential project-related effects. If spotted owls are detected, implement restrictions on project activities near nest sites documented during pre-construction surveys or other observations. Define the seasonal timing and the buffer distance around occupied sites for each type of activity. Ensure that these restrictions are generally consistent with those applied by the Forest Service at other occupied sites in the vicinity (Measure 14).

Recreation Resources

- Obtain Forest Service approval of final design before construction of project facilities occurs on National Forest System (NFS) lands to ensure that any concerns about consistency with the Shasta-Trinity National Forest LRMP, including visual quality objectives, are addressed when planning, designing, and constructing project facilities and implementing project measures (Measures 3 and 19).
- Continue funding to California Fish and Game for stocking rainbow trout or kokanee in the drainages of the Pit and McCloud Rivers below the uppermost project development to Shasta Lake. This measure would continue to enhance recreational fishing in project waters (Measure 17).
- Develop and implement a recreation development and management plan to address recreation resource needs at the project. A number of sub-plans are proposed in the project recreation plan: (1) a signage plan to provide directions to project recreation opportunities and inform visitors about applicable rules and regulations; (2) a surface water and shoreline management plan to manage reservoir use at McCloud reservoir; (3) an interpretive and education plan to enhance visitor experience; and (4) a recreation monitoring plan to provide information that could be used to implement actions to address the effects of recreation use throughout the license term (Measure 19).

- Include the following facilities at McCloud reservoir in the project recreation plan: a walk-in campground at Star City, four day-use facilities, reservoir shoreline access (i.e., parking areas with pedestrian shoreline access trails) at three access points, and a whitewater put-in at the base of McCloud dam (Measure 19).
- Include the following facilities at Iron Canyon reservoir in the project recreation plan: a boat launch near the dam and reservoir shoreline access after conducting a site evaluation (i.e., three parking areas with pedestrian shoreline access trails) (Measure 19).
- Reconstruct Forest Service facilities (Tarantula Gulch boat launch, if feasible, and Deadlun Campground) and PG&E-owned facilities at Hawkins Landing. Reconstruction at Deadlun Campground would include redesigning the facility to include additional overnight capacity. Upgrade Hawkins Landing to Forest Service standards, resurface the access road, and replace or repair the surfacing that connects to the concrete ramp. If feasible within site constraints, extend the boat ramp at Tarantula Gulch. After construction or reconstruction, the facilities would become project recreation facilities, and PG&E would be responsible for O&M for the facilities, including fee collection (Measure 19).
- Provide hosts at project campgrounds (Measure 19).
- Develop in consultation with the Forest Service and implement a project patrol plan to include NFS lands within the project area or affected by project facilities, access areas, and dispersed use sites to respond to concerns about trash, vandalism, and improper or disruptive visitor behavior near project reservoirs (Measure 20).
- Include the following proposed facilities at Pit 7 afterbay in the project recreation plan: a day-use area at Fenders Flat and, if the Pit 7 afterbay powerhouse is constructed, pedestrian access to the shoreline between the powerhouse and the bridge. Grade and maintain the access road to the car-top boat launch and continue to prohibit public access to the Pit 7 afterbay water surface and shoreline (Measure 19).
- Assess and implement, in coordination with the Forest Service, closures of existing and future user-created roads leading to the shoreline. This measure would prohibit vehicle access between certain forest roads and the shoreline except to developed facilities and prohibit dispersed camping and off-highway vehicle (OHV) use between the roads and the shoreline (Measure 19).
- Provide a recreation flow event from McCloud dam when natural spill of at least 300 cfs for seven consecutive days during the period of April 1 through October 31 has not occurred at any time in the three previous calendar years (Measure 6).

- Provide real-time flow information on the internet (gage MC-1) in the Lower McCloud River. Inform the public via internet if the project reservoir levels are sufficient for launching boats (i.e., end of the launch lanes are sufficiently submerged). Provide flow and boat launch information so visitors will know when conditions are suitable for their activities (Measure 19).
- Conduct feasibility studies to evaluate the potential for constructing a few recreation facilities as suggested at meetings among relicensing participants and construct if feasible. At McCloud reservoir, evaluate locations for a floating dock or pier and trail for fishing and swimming. At Pit 7 reservoir, evaluate the feasibility of providing shoreline access at the upper end of the reservoir and a hand launch boat put-in where Montgomery Creek enters the reservoir (Measure 19).

Cultural Resources

- Develop and implement the HPMP. The plan has been developed in consultation with the Tribes and Forest Service; however, consultation will continue until the Commission approves the HPMP. Specifications are included in the plan to avoid or manage any potential project-related adverse effects on properties that are unevaluated, eligible for, or listed on the National Register (Measure 22).

Land Use and Aesthetic Resources

- Prepare a road and transportation facilities management plan for NFS roads or project roads affecting NFS resources (Measure 18).
- Plan and create, in coordination with the Forest Service, shaded fuel breaks around all project recreation facilities that would be constructed and maintained by PG&E (Measure 19).
- Develop a fire response plan to address ongoing concerns about wildland fire and potential damage to project infrastructure and forest resources. This measure would provide pre-suppression coordination with fire management agencies; describe hazard reduction treatments; and identify contacts, equipment, personnel, and access routes that can be immediately referenced to support suppression actions. It would also specify requirements for reporting project-caused fires and supporting fire investigations (Measure 21).

2.2.4 Modifications to the Applicant's Proposal—Mandatory Conditions

The following mandatory conditions have been provided and are evaluated in this document.

2.2.4.1 Section 4(e) Federal Land Management Conditions

In a January 29, 2010, filing with the Commission, the Forest Service submitted terms and conditions pursuant to section 4(e) of the FPA, including 18 standard Forest

Service conditions and 16 project-specific resource protection conditions. On March 1, 2010, the Forest Service revised one condition in part, condition 19, *Streamflow*.

Of the Forest Service's 34 conditions, we consider the 18 standard conditions (conditions 1 through 18) to be administrative or legal in nature and not specific environmental measures. With the exception of Forest Service condition 1, *Consultation*, condition 11, *Protect Forest Service Special Status Species*, and condition 15, *Pesticide Use Restrictions on NFS Lands*, we do not analyze these conditions in this EIS. We analyze conditions that we consider to be environmental measures in section 3, and we summarize our analysis of these measures in section 5.4.2, *Forest Service 4(e) Conditions*.

The initial and revised Forest Service conditions that we analyze in this document specify that PG&E:

- Consult with the Forest Service annually on measures needed to ensure protection and utilization of the National Forest resources affected by the project. [Forest Service condition 1]
- Prepare and submit a biological evaluation to the Forest Service before taking action to construct new project features that may affect Forest Service special status species or their critical habitat. [Forest Service condition 11]
- Obtain prior written approval from the Forest Service for use of pesticides on NFS lands or in areas affecting NFS lands. Pesticide use would be excluded from NFS lands within 500 ft of known locations of Shasta salamanders, northwestern pond turtles, foothill yellow-legged frogs, or known locations of Forest Service special status or culturally significant plant populations. [Forest Service condition 15]
- Maintain specified minimum streamflows in project reaches in accordance with the provisions described in the Forest Service filing. The minimum instantaneous 15-minute streamflow shall be at least 80 percent of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cfs, and at least 90 percent of the streamflows required to be greater than 10 cfs. Should the mean daily flow as measured be less than the required mean daily flow but more than the instantaneous flow, licensee shall begin releasing the equivalent under-released volume of water within seven days of discovery of the under-release. [Forest Service condition 19 and revised condition 19]
- Determine the water type year for minimum flow compliance based on the Department of Water Resources (DWR) Bulletin 120 water year forecast of unimpaired runoff for the Sacramento River near Redding. [Forest Service condition 19, part 2]

- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflow, and measure and document all instream flow releases in publicly available formats. [Forest Service condition 19, part 3]
- Prepare a water quality and temperature monitoring plan in consultation with agencies and approved by the Forest Service. [Forest Service condition 20]
- Prepare an LWD management plan in consultation with agencies and approved by the Forest Service. [Forest Service condition 21]
- Prepare an erosion and sediment control management and monitoring plan developed in consultation with agencies and approved by the Forest Service. [Forest Service condition 22]
- Develop a gravel and coarse sediment management plan in consultation with agencies and approved by the Forest Service. [Forest Service condition 23]
- Prepare a reservoir dredging plan in consultation with and approved by the Forest Service not less than 90 days prior to any proposed reservoir dredging operations. [Forest Service condition 24]
- Develop a vegetation and invasive species management plan, in consultation with agencies and approved by the Forest Service, to address special status species, aquatic and terrestrial invasive species, and culturally significant plants within the project boundary and adjacent to project features directly affecting NFS lands including roads and distribution and transmission lines. [Forest Service condition 25]
- Develop a terrestrial biological management plan, including Forest Service special status species potentially affected by the project on NFS lands. File an avian collision and electrocution hazards plan. [Forest Service condition 26]
- Develop an aquatic biological monitoring plan, in consultation with agencies and approved by the Forest Service, for fish, benthic macroinvertebrates, special status aquatic mollusks, special status species, and invasive aquatic species in the McCloud reservoir, Iron Canyon reservoir, Pit 6 reservoir, Pit 7 reservoir, Lower McCloud River, and Pit River. Provide fish passage structures at stream crossings at listed streams. [Forest Service condition 27]
- File a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup. [Forest Service condition 28]
- File a road and transportation facility management plan, approved by the Forest Service, for protection and maintenance of project and project-affected roads on or affecting NFS lands. [Forest Service condition 29]
- Prepare a recreation development and management plan in consultation with agencies and approved by the Forest Service to address recreation resource needs associated with the project that includes the following components:

O&M of project recreation facilities, recreation monitoring, project patrol, reservoir surface water management, evaluation of OHV road closures and dispersed use, and construction and reconstruction of recreation facilities. All new and reconstructed project recreation facilities would comply with federal accessibility standards and include the following facilities:

- Reconstruct Tarantula Gulch boat ramp and develop day-use area at the boat ramp;
- Develop campground and day-use area at Star City;
- Develop day-use areas at Tarantula Gulch inlet and Red Banks;
- Create reservoir access points at Battle Creek and on each side of McCloud dam;
- Construct a day-use area at the base of McCloud dam;
- Upgrade and relocate the river access trail from Ash Camp to Ah-Di-Na Campground;
- Provide three day-use parking areas with shoreline access at Iron Canyon reservoir;
- Construct Iron Canyon dam boat ramp;
- Reconstruct Hawkins Landing Campground and boat ramp;
- Relocate Deadlun campground;
- Develop a shoreline trail at Pit 6 reservoir if determined necessary based on six-year recreation use monitoring;
- Construct an access trail at the upper end of Pit 7 reservoir;
- Conduct feasibility assessment and construct, if feasible, a hand-launch boat put-in where Montgomery Creek enters Pit 7 reservoir;
- If Montgomery Creek is not feasible, construct a second access trail with hand-launch boat put-in at the lower end of Pit 7 reservoir;
- Reconstruct day-use area below Pit 7 afterbay at Fenders Flat;
- Reconstruct car-top boat launch below Pit 7 afterbay near Fenders Flat; and
- Construct, if Pit7 afterbay powerhouse is constructed, a day-use area with river access trail. [Forest Service condition 30]

- In collaboration with the Forest Service, develop a project sign plan which includes road and trail safety, directional and traffic signs, and an interpretive and educational component that includes a website for public information and informational kiosks. [Forest Service condition 31]

- Develop procedures and a timeline for mitigation measures to provide for visual quality of project and project-affected NFS lands. [Forest Service condition 32]
- Develop a fire and fuels management plan, in consultation with agencies and approved by the Forest Service, for prevention, reporting, and emergency response to fires in the vicinity of the project resulting from project operations. The plan shall address fuels treatment, prevention and response, and investigation of project-related fires. [Forest Service condition 33]
- File an HPMP approved by the Forest Service with the Commission. [Forest Service condition 34]

2.2.4.2 Alternative 4(e) Conditions Pursuant to the Energy Policy Act of 2005

The Energy Policy Act of 2005 provides parties to this licensing proceeding the opportunity to propose alternatives to mandatory conditions. On March 4, 2010, PG&E filed alternatives to 16 of the Forest Service's 4(e) conditions:

- PG&E alternative condition 12 − proposes that access to Forest Service lands within the licensed area be permitted by the Forest Service specifically for the protection, administration, management, and utilization of Forest Service lands, in a manner that does not require the licensee to disproportionately bear costs;
- PG&E alternative condition 18 − proposes that this Forest Service condition be limited to licensee-proposed ground-disturbing activities on or directly affecting Forest Service lands and eliminates requirements for the licensee to bear Forest Service staff-related time and expenses;
- PG&E alternative condition 19, part 1, subpart b − proposes minimum streamflow requirements and measurement for McCloud River below McCloud dam;
- PG&E alternative condition 19, part 1, subpart c − proposes minimum streamflow requirements and measurement for Iron Canyon Creek below Iron Canyon dam and allows for a longer scheduling timeframe for the adjustment of flows and dam tests;
- PG&E alternative condition 19, part 2 − proposes that compliance with flow changes be implemented within five business days for Iron Canyon dam between February and May, to account for potential weather-related access difficulties;
- PG&E alternative condition 20 − addresses the timeframe for the development of the water quality and temperature monitoring plan as well as access issues,

such as those related to private property and inclement weather, associated with the installation of water quality sensors and temperature monitoring;

- PG&E alternative condition 23 − addresses the conditions for implementation of a gravel and coarse sediment management and monitoring plan, and defines the monitoring area and sediment augmentation metric and methods;
- PG&E alternative condition 24 − states that the licensee does not anticipate a need for development of a dredging plan;
- PG&E alternative condition 25 − proposes a new timeframe for development of a vegetation and invasive weed management and monitoring plan, the definition of culturally significant plants, invasive weed monitoring priorities and intervals, and geographic monitoring boundaries;
- PG&E alternative condition 26 – proposes a new timeframe for development of a terrestrial biological management and monitoring plan, identifies targeted populations and habitat for monitoring, monitoring intervals, and the timeline and focus for APLIC recommended upgrades;
- PG&E alternative condition 27 − proposes a new timeframe for development of an aquatic biological management and monitoring plan, identifies non-project roads and eliminates associated fish passage responsibilities, and addresses fish monitoring in project reservoirs;
- PG&E alternative condition 28 − proposes that the licensee would provide the Forest Service copies of its existing spill prevention, control, and countermeasures (SPCC) plans and hazardous materials business plans (HMBPs) for the project in lieu of a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup;
- PG&E alternative condition 29 − clarifies road segments that would be covered by the road and transportation facility management plan;
- PG&E alternative condition 30 − proposes to remove the requirement for Forest Service approval of the recreation development and management plan; modifies specific components of the recreation plan, including recreation facility enhancements and recreation facility construction and site assessment schedules; clarifies the applicability of recreation monitoring to project facilities and project lands and waters; specifies that existing recreation facilities would be included within the project boundary after reconstruction; and modifies the schedule for surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps;
- PG&E alternative condition 31 − specifies that for the informational sign plan, the licensee will provide project recreation information, except for confidential business information, to the Forest Service for posting on the Forest Service's website;

- PG&E alternative condition 32 − proposes to define the applicability of specific mitigation measures as existing and proposed project facilities, clarifies terminology, and accounts for an apparent inconsistency between the assigned visual quality objective (VQO) and the appearance of the project area;
- PG&E alternative condition 33 − proposes minor clarifications to the fire and fuels plan; and
- PG&E alternative condition 34 − proposes clarifications in terminology and allowances for modifications to the HPMP upon completion of an ethnographic study, clarifies conditions for National Register site evaluation, and ensures collaborative HPMP development and appropriate consideration of new cultural materials.

On March 4, 2010, California Trout, Trout Unlimited, and the McCloud River Club filed an alternative to Forest Service condition 19:

- Forest Service condition 19, part 1 − California Trout, Trout Unlimited, and the McCloud River Club recommend modifications to streamflow requirements for McCloud River below McCloud dam, including a minimum baseflow of 200 cfs at MC-1 and summer base flows at MC-1 of 200 cfs or the historic average summer base flows, whichever is higher.

On March 30, 2010, American Whitewater and Friends of the River filed an alternative to Forest Service condition 19:

- Forest Service condition 19, part 1 – American Whitewater and Friends of the River recommend modifications to streamflow requirements for McCloud River below McCloud dam, including minimum flows of 400 cfs in April in below normal water years, peak flows of 600 cfs in April ramping down in May in wet and above normal years, and flows of 300 cfs ramping down to 200 cfs base flows by opening day of trout season in dry and critically dry years).

On April 14, 2010, the McCloud RiverKeepers filed an alternative to Forest Service condition 19: [8]

- Forest Service condition 19, part 1 – the McCloud RiverKeepers recommend minimum flow releases at McCloud dam (MC-7) of 100 cfs year-round and a second compliance point at MC-7 with minimum flows ranging from 160 to 210 cfs).

We evaluate these alternative conditions in sections 3 and 5 of this draft EIS.

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[8] McCloud RiverKeepers alternative condition 19 was filed after the conclusion of the required response period, which concluded on March 18, 2010.

2.3 STAFF ALTERNATIVE

After evaluating PG&E's proposal and recommendations from resource agencies and other interested parties, we compiled a set of environmental measures that we consider appropriate for addressing the resource issues raised in this proceeding, calling this the staff alternative. The staff alternative includes some measures included in PG&E's proposal and some of the Forest Service's section 4(e) conditions and PG&E's alternative section 4(e) conditions, section 10(j) recommendations, section 10(a) recommendations, and measures developed by Commission staff.

PG&E Protection, Mitigation, and Enhancement Measures Modified by Staff

The staff alternative incorporates PG&E's proposed environmental measures (see section 2.2.2, *Proposed Environmental Measures*), as modified by staff (indicated by *italics*):

Geology and Soils

- Prepare an LWD management plan.
- Prepare an erosion and sediment monitoring and control plan.

Aquatic Resources

- Continue to implement the current minimum flow release schedule for the Pit 7 afterbay reach.
- Implement upramping rates of no more than 100 cfs per hour prior to the start of an uncontrolled spill event at McCloud dam.
- Develop and implement a water quality monitoring plan.

Recreation Resources

- *Implement* a recreation development and management plan that would include: location, conceptual designs, and schedules for upgrading existing recreation facilities and constructing new recreation facilities; plans using Forest Service design standards (including applicable standards for providing access to users with disabilities); and details regarding O&M activities at *all recreation facilities including existing and new project recreation facilities. The plan also should incorporate the following components:*
    - A *project sign plan that includes an interpretive and education component;*
    - Monitoring, visitor surveys, and use estimation concurrent with the recreation Form 80 reporting. This measure also should include details addressing collection of annual use data at facilities where passes/fees are collected; consult with Forest Service on the survey methods for the Recreational Resource Survey and consult every six years (concurrent with the FERC Form 80) with the Forest Service, appropriate agencies, and

interested parties to review and adjust project-wide recreation management objective, if needed; and

- A water surface management plan to manage reservoir use at McCloud reservoir. This plan component would include installing speed limit signs in the northern end of the reservoir, LWD removal from the reservoir, points of public access to the shoreline, and boating speeds. This measure would also include details addressing monitoring and management of recreation user safety, including developing protocols for all project reservoirs for preventing/removing unapproved buoy courses, approved use of docks, and measures to prevent unauthorized access to project lands and waters; *annual* surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps to remove logs and other debris; *monitoring boat use on McCloud and Iron Canyon reservoirs every six years coinciding with the Commission recreation Form 80 schedule*; and reassessing water surface management mitigations every six years.

- Provide real-time stream flow (gage MC-1) and drawdown information to the public via PG&E's webpage on the internet.
- At McCloud and Iron Canyon reservoirs, assess and implement closures of user-created roads, *trails, and dispersed use sites* leading to the shoreline of McCloud and Iron Canyon reservoirs, in coordination with the Forest Service.

<u>McCloud Reservoir</u>

- Within five years of Commission approval of the recreation plan, if feasible within site constraint limitations, reconstruct the Tarantula Gulch boat ramp to California Department of Boating and Waterways (California Boating) standards, provide a boarding dock, and extend the launch ramp to 3 ft (vertical) below the minimum operating pool elevation, including the specifications for reconstructing the boat ramp to California Boating standards to provide one lane ramp with boarding dock and sidewalk; redesigning the parking lot to maximize parking spaces; developing a paved parking area and turnaround; designating parking spaces; and maintaining or relocating and maintaining a vault restroom.
- Within five years of Commission approval of the recreation plan, provide access points (paved parking and shoreline access trail) at Battle Creek, West dam, and East dam. *This measure is modified to include details for picnic tables and the number of vehicles that can be accommodated at the parking areas (three).*
- Within five years of Commission approval of the recreation plan, develop a formal campground at Star City with walk-in sites (estimate 6 sites), paved parking, vault restroom, potable water, tables, fire rings/grills, trash receptacles/removal, and host site. *This measure is modified to include*

specifications for the camping area, including campsites, restroom, and potable water.

Lower McCloud River

- Within five years of Commission approval of the recreation plan, provide a *day-use facility* at the base of McCloud dam and provide parking, vault restroom, trash receptacle/removal, and shoreline pedestrian access trail on river left to the pool below the spillway. *This measure is modified to include details for a day-use area with paved parking for a minimum of three vehicles, signage, and a shoreline access trail from the base of the dam to splash pool below the spillway that accommodates fishing and boating access and an access road.*

Iron Canyon Reservoir

- Within five years of Commission approval of the recreation plan, reconstruct Hawkins Landing Campground to Forest Service standards and provide potable water and reconstruct or resurface the access road to allow all-season use. *This measure is modified to include details for the campground including an entrance gate with signing; surfaced loop road; parking spurs; site posts; picnic tables; animal resistant food boxes; fire rings; vault restrooms; animal resistant trash receptacles; and developed trail from the campground to the adjacent boat ramp and shoreline for pedestrian fishing access.*
- Within five years of Commission approval of the recreation plan, retain concrete ramp surface at Hawkins Landing Boat Launch and replace or repair the surfacing that connects to the concrete ramp. *This measure is modified to include specifications for reconstruction of boat ramp surface (length and width) to meet California Boating standards for one lane, and to specify a surfaced and striped parking lot above high water level for a minimum of 10 vehicles with a single-vault toilet, animal resistant trash receptacle, and an information sign.*
- Within five years of Commission approval of the recreation plan, reconstruct Deadlun Campground to Forest Service standards and increase capacity by about 10 sites to provide about 37 sites and provide potable water a shoreline access trail. *This measure is modified to include details for campsites and campground including specifications for parking spurs, site posts, picnic tables, animal resistant food lockers, fire rings, two 2-vault restrooms, and animal resistant trash receptacles.*
- Within five years of Commission approval of the recreation plan, construct a new boat launch at the east end of Iron Canyon dam that meets California Boating standards and provide vault restroom, picnic tables, potable water, and trash receptacles/removal. *This measure is modified to include specifications for the boat ramp to be operable at minimum operating pool, for snow removal*

for parking area and ramp when project operations require snow removal from Oak Mountain Road, and one lane ramp placement should include option for two lanes if needed during mid-license review, and details for the parking area capacity, number of picnic tables.

- Conduct a site evaluation to determine the location of three paved parking areas along FR 37N78, each with a capacity of up to three vehicle parking spaces and a pedestrian shoreline access trail. *Once three suitable locations are identified, design and construct these project facilities*. *This measure is modified to specify the evaluation would be completed within two years of license issuance.*
- Allow public use of at least one campground year-round. *This measure is modified to specify that a schedule for implementation would be included in the recreation plan.*

<u>Pit 7 Reservoir</u>

- *Conduct a site evaluation to determine the location* of a pedestrian shoreline access trail at the upper end of Pit 7 reservoir, downstream of Pit 6 powerhouse tailrace. *This measure is modified to include specifications for conducting the site evaluation within two years of license issuance, consultation with the Forest Service, and once a suitable location is found, constructing this facility within five years of Commission approval of the recreation plan. The facility would include a trailhead, parking for up to three vehicles, and hand-launch boating access.*

<u>Pit 7 afterbay</u>

- Within two years of Commission approval of the recreation plan, grade and maintain FR 35N66 from its intersection with FR 37N78 to the car-top boat launch. Provide a vault restroom near the car-top boat launch.
- Continue to prohibit public access to Pit 7 afterbay water surface and shoreline by maintaining fencing, signage, and patrols.
- If the Pit 7 afterbay powerhouse is constructed, provide a paved parking area for two to three vehicles at the end of the powerhouse access road or along Fenders Ferry Road and provide a vault restroom, trash receptacle/removal, and pedestrian access to the shoreline between the powerhouse and Fenders Ferry Bridge. *This measure is modified to include specifications for the restroom and to condition the day-use area on public safety and homeland security needs.*
- Within five years of Commission approval of the recreation plan, provide a day-use site at Fenders Flat with a capacity five sites, parking, vault restroom, tables, fire grills, and trash receptacles/removal and to coordinate with the Forest Service to develop and implement a plan to revegetate disturbed areas

and prevent vehicle access beyond the access road and parking area. *This measure is modified to include specifications for the parking area.*

Land Use and Aesthetic Resources

- Develop, file, and implement, within 1 year of license issuance, a road and transportation facilities management plan for all project roads.
- Develop, file, and implement, within 1 year of license issuance, a fire prevention and response plan.
- File copies of the existing Spill Prevention Control and Countermeasure Plan (SPCC) and Hazardous Materials Business Plan (HMBP) with the Commission and provide copies to the Forest Service within 30 days of license issuance and continue to implement these plans.
- Include all project roads and recreation sites within the project boundary and file a revised exhibit G with the Commission within 1 year of license issuance.
- Develop, file, and implement, within 1 year of license issuance, a visual quality management plan.

Additional Measures Identified by Staff

In addition to PG&E's proposed measures listed above (and modified as indicated), the staff alternative also includes the following additional measures identified by staff based on agency, tribal, and non-governmental organization specifications, recommendations, and our analysis.

Geology and Soils

- Within 12 months of license issuance, develop and implement a gravel and coarse sediment management plan in consultation with agencies and approved by the Forest Service. Augment gravel and coarse sediment periodically. Evaluate Star City Creek as a primary source of gravel, and evaluate other potential alternate local sites.

Aquatic Resources

- Implement a minimum flow release schedule for the McCloud dam reach, as follows:

Month	**Lower McCloud River Flows (cfs) by Water Year[a]**
May – June	200
July– February 14	175[1]

Month	Lower McCloud River Flows (cfs) by Water Year[a]	
February 15-29	0-75% RO[b]	No flow change
	76-89% RO[b]	No flow change
	90-99% RO[b]	Increase flow by 75 cfs
	100-119% RO[b]	Increase flow by 125 cfs
	≥120% RO[b]	Increase flow by 175 cfs
March 1-15	0-75% RO[b]	No flow change
	76-89% RO[b]	Increase flow by 50 cfs
	90-99% RO[b]	Increase flow by 50 cfs
	100-119% RO[b]	Increase flow by 100 cfs
	≥120% RO[b]	Increase flow by 150 cfs
March 16-31	0-75% RO[c]	No flow change
	76-89% RO[c]	No flow change
	90-99% RO[c]	No flow change
	100-119% RO[c]	Increase flow by 50 cfs
	≥120% RO[c]	Increase flow by 150 cfs
April 1-15	0-75% RO[c]	No flow change
	76-89% RO[c]	No flow change
	90-99% RO[c]	No flow change
	100-119% RO[c]	No flow change
	≥120% RO[c]	Increase flow by 50 cfs
April 16 – April 30	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 (if 0-99%RO) and by 75 cfs per week (if ≥ 100% RO) until flow is 200 cfs. Decrease flow by 50 cfs each Friday after May 1 until flow is 200 cfs. Maintain 200 cfs release at gage MC-7 through June 30.
	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)

[1] Mean daily flow at USGS Gage 11367800 (MC-1) at Ah-Di-Na should be at least 200 cfs.

- Implement a minimum flow release schedule for the Iron Canyon dam reach, as follows:

	Release from Iron Canyon Dam (cfs) by Water Year-type		
Month	**Wet**	**Above Normal**	**Below Normal, Dry, Critically Dry**
October	10	7	7
November	10	7	7
December	15	10	7
January	15	10	7
February	15	10	7
March	>20[b]	15	10
April	>20[b]	15	10
May	15	10	7
June	15	10	7
July	10	7	7
August	10	7	7
September	10	7	7

- Downramp all spill events controllable at McCloud dam by valve operation at a maximum rate of 150 cfs per 48 hour until the prescribed minimum instream flow value is reached and upramp operational controllable spills at McCloud dam at a maximum rate of 200 cfs per 24 hour period.
- Determine water year type based on the forecast of unimpaired runoff of the Sacramento River near Redding as provided by DWR Bulletin 120 or its successor.
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflow and measure and document all instream flow releases in publicly available formats.

- Develop and implement an aquatic biological monitoring plan within 12 months of license issuance and for Commission approval, after consultation with interested parties and approved by the Forest Service, for fish, benthic macroinvertebrates, special-status aquatic mollusks, other special-status species, and invasive aquatic species in the McCloud River and Iron Canyon Creek. Periodic sampling of fish, benthic macroinvertebrates, and special-status mollusks would occur once every three years for the first nine years, and then once every five years thereafter. The number of sites, site locations, sampling methods, and data protocols should be consistent with relicensing studies.

Terrestrial Resources and Threatened and Endangered Species

- Implement a vegetation and invasive weed management and monitoring plan, as specified by Forest Service condition 25, with the inclusion of the species-specific monitoring schedule outlined in PG&E alternative condition 25; best management practices (BMPs) to avoid/minimize effects on wetlands; and restoration of native vegetation in relevant areas disturbed as a result of project activities will also be included in this plan.
- Implement a TBMP (terrestrial biological management plan) as specified by Forest Service condition 26, with the inclusion of the species-specific monitoring schedule outlined in PG&E alternative condition 26. The Special-status Species section of the TBMP also should incorporate a foothill yellow-legged frog monitoring plan.
- Exclude the use of pesticides and herbicides on NFS land, unless prior written approval is received first from the Forest Service, as specified by Forest Service condition 15.

Recreation Resources

- Stock 60,000 pounds of trout annually at the project and develop (for Commission approval) and implement a fish stocking plan in consultation with California Fish and Game within two years of license issuance and evaluate and monitor the amount of fish to be stocked every 6 years.
- Construct, within two years of license issuance, a floating dock or pier and trail (away from Tarantula Gulch boat launch) at McCloud reservoir.
- Provide lighting at both the Tarantula Gulch and Iron Canyon boat launches.
- Conduct a site evaluation to determine the location of a pedestrian shoreline access trail at the lower end of Pit 7 reservoir, with paved parking. Once a suitable location is found, construct this facility within five years of Commission approval of the recreation plan.

Cultural Resources

- Implement the final HPMP prior to license issuance, as proposed by PG&E and specified by Forest Service condition 34. Include additional staff modifications, including inclusion of treatment measures for site CA-SHA-252 and National Register evaluations for all adversely effected sites.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

2.4.1 Issuing a Non-Power License

A non-power license is a temporary license that the Commission terminates when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider a non-power license a realistic alternative to relicensing in this circumstance.

2.4.2 Federal Government Takeover of the Project

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2.4.3 Project Retirement

Project retirement could be accomplished with or without removal of the dams. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions and cessation of power generation at the project, resulting in the following effects:

- Energy currently generated at the project by a renewable resource would be lost.
- There would be significant costs involved in retiring the powerhouse and appurtenant facilities.
- The environmental enhancements currently proposed by PG&E would be foregone.
- If the dam and control structures were removed, the original riverine habitat could not be reestablished because of the presence of Shasta dam and Shasta Lake, which inundates the Lower McCloud River and abuts the Pit 7 afterbay. Also, the presence of Shasta dam prevents unobstructed fish passage into areas upstream, including the McCloud-Pit Project.
- If the dam and control structures were removed, the existing recreational, residential, and commercial interests around the project would be compromised.

- The potential for environmental effects such as the release of sediments accumulated behind the dam to the river downstream and loss of lacustrine habitats and wetlands could occur.

The removal of the dam and control structures, however, would restore some riverine habitat, eliminate any fish entrainment mortality that may be occurring, provide recreational riverine boating, provide the potential for future unobstructed fish passage if Shasta dam were removed, and allow the Tribes to potentially re-establish some of their traditional uses of the river that occurred prior to impoundment.

Despite these potential benefits, we do not regard this alternative as reasonable in view of the many more potential losses.

The second project retirement alternative would involve retaining the dam and control structures and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This alternative would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward to assume regulatory control and no participant has advocated this alternative; therefore, we have no basis for recommending this action. Furthermore, because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be reasonable alternative.

For these reasons, we do consider dam removal a reasonable alternative to relicensing the project with appropriate protection, mitigation, and enhancement measures.

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3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.) and we first describe each resources affected environment, which includes historic and current conditions. The existing condition is the baseline against which environmental effects of the proposed action and alternatives are compared. Next, we describe the environmental effects of the proposed project, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Unless otherwise identified, the source of our information is the license application for the project (PG&E, 2009a). We provide citations for information obtained from other sources, including subsequent filings related to the project.

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The project is located along the western slope of the Cascade Range in the Central Valley of northern California, within Shasta County and the Shasta-Trinity National Forest.[9] The project area originates at McCloud reservoir and occupies the McCloud and Lower Pit River Basins to Shasta Lake. The project area is entirely contained within the Sacramento River Hydrologic Region of California and specifically includes the following: McCloud reservoir; McCloud River from McCloud reservoir downstream to the confluence with Squaw Valley Creek; Iron Canyon reservoir and Iron Canyon Creek from Iron Canyon dam downstream to the Pit River; the Pit River downstream of the James B. Black powerhouse to the Pit River arm of Shasta Lake immediately downstream of Pit 7 afterbay; and tributaries that flow into the project reservoirs. The maximum elevation of the project area is about 2,680 ft, the normal maximum water surface elevation of McCloud reservoir.

The area surrounding the project is primarily federal forest land with rural communities and one larger incorporated city (>80,000 residents) nearby. Land uses in and around the project area include recreational and commercial activities such as fishing, swimming, timber harvest, and wildlife management. Water uses such as municipal and domestic supply, power production, recreation, warm- and cold-water spawning, and wildlife habitat are also associated with the project area.

The Cascades are a chain of active and explosive volcanic cones that extend from British Columbia in the north to Mount Lassen, California. Mount Shasta, the headwater region of the McCloud River system associated with the project, is the second highest volcano within the Cascade Range. To the east of the Cascades, the geologic setting

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[9] A portion of the route of the proposed McCloud transmission line crosses about 5 miles of the southern portion of Siskiyou County.

transitions into one dominated by formations associated with the Modoc Plateau; the major drainage of the Modoc Plateau is the Pit River, which is meandering and low-gradient in its upper reaches until it enters the canyon topography upstream of Shasta Lake, including the Pit 6 and Pit 7 Developments. Rivers and streams of the project area are typically steep gradient and highly confined, resulting in minimal flood plain development.

The project vicinity has a temperate climate with warm, dry summers and cool winters. Moderate snowfall occurs above elevations of 5,000 ft, and precipitation falls predominantly as rain at lower elevations. The National Weather Service maintains a monitoring station (No. 045449) in the town of McCloud, which has documented July air temperatures from an average maximum high of 87.8 degrees Fahrenheit (°F) to an average minimum low of 47.6°F. Air temperatures in January range from an average maximum high of 45.7°F to an average minimum low of 23.6°F. Annual mean precipitation at McCloud is 50.57 in., most (78 percent) of which falls between November and March, and annual mean snowfall is 81.5 in.

The project area is characterized by a variety of vegetation types typical of mixed woodland and mid-elevation forest habitats found in the southeastern Klamath Mountains and west-slope southern Cascade regions. More than three-quarters of the land is occupied by Douglas-fir–Ponderosa pine, Douglas-fir, and mixed conifer forests. The remaining land supports a wide array of vegetation types where plant species diversity is high due to the complex topography of the project area. In general, the topographical features of the project area preclude extensive wetland habitat, although wetland-associated vegetation often exists adjacent to and within the active river channel, and additional wetlands occur in small patches along the reservoirs.

In addition to the McCloud-Pit Hydroelectric Project, which is the only hydroelectric project on the McCloud River, PG&E owns and operates other projects in the Pit River watershed: Pit 1 Project (FERC No. 2687); Pit 3, 4, and 5 Project (FERC No. 233); and Hat Creek Project (FERC No. 2661). Tributaries to the Pit River also have several smaller-scale hydroelectric projects. These other hydroelectric systems receive and regulate flows from most of the Pit River watershed upstream of the town of Big Bend.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing NEPA (50 CFR §1508.7), an action may cause cumulative effects if its impacts overlap in space and time with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on information in the license application, agency comments, public comments, other filings related to the project, and staff analysis, we identified water quality and fisheries as having the potential to be cumulatively affected by the continued operation and expansion of the McCloud-Pit Project, in combination with other past, present, and future activities that occur in the McCloud and Pit River watersheds. These cumulative effects are discussed in more detail in 3.3.2.3 *Cumulative Effects* (Aquatic Resources).

3.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the proposed action's effects on resources. Because the proposed action would affect resources differently, the geographic scope for each resource may vary. For most fisheries and water resources, the geographic scope would include all project reservoirs (McCloud, Iron Canyon, Pit 6, and Pit 7), Pit 7 afterbay, tributaries that flow into the reservoirs, and streams downstream of the project reservoirs, including the McCloud River from McCloud reservoir downstream to the confluence with Squaw Valley Creek, Iron Canyon Creek from Iron Canyon dam downstream to the Pit River, and the Pit River downstream of the James B. Black powerhouse to the Pit River arm of Shasta Lake, immediately downstream of the Pit 7 afterbay.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS will include past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope will look 30 to 50 years into the future, concentrating on the effect of reasonably foreseeable future actions on the resources. The historical discussion will be, by necessity, limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

This section outlines the proposed action and action alternatives with regard to: (1) geology and soils, (2) aquatic resources, (3) terrestrial resources, (4) threatened and endangered species, (5) recreation resources, (6) cultural resources, and (7) land use and aesthetic resources.

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

3.3.1.1.1 Geologic Setting

The McCloud-Pit Hydroelectric Project covers three major geologic terranes which affect surficial processes, erodibility, and drainage development: the Eastern Klamath belt, the Western Cascades terrane, and the High Cascades terrane. The majority of the upper basin of McCloud dam is located in the High Cascades and Western

Cascades terranes, and the lower basin occurs almost entirely in the Eastern Klamath belt. The entire Lower McCloud River and portions of the Iron Canyon Creek watershed and the Lower Pit River are located within the Eastern Klamath belt.

The landscape in the project vicinity reflects widespread regional uplift and fluvial incision resulting in highlands and deep canyons. The upper portion of McCloud reservoir is underlain by shale and greywacke sandstone. In the middle portion of McCloud reservoir, metavolcanic rocks are juxtaposed against outcrops of limestone and interbedded tuffaceous mudstone and sandstone. Erosion tendencies along riparian slopes in the Lower McCloud River vary according to the adjacent rock type. Mafic flows, tuffaceous mudstone, and minor amounts of limestone occur in the lower portion of the reservoir and downstream of McCloud dam, and exposed rocks are strongly jointed and moderately fractured, forming steep slopes that are generally erosion-resistant. Fractured and weathered metasedimentary and metavolcanic rocks, however, are relatively weak and prone to mass wasting in areas with steep slopes. Survey sites in and around Hawkins Creek are underlain by shale, siltstone, and metavolcanic rocks, with gentle to steep slopes covered with gravelly soils and typically supporting dense mixed conifer and oak woodland vegetation.

In the Lower McCloud River watershed, soils mantling steep slopes overlaying metasedimentary and metavolcanic rocks are typically thin and rocky, except in areas with convergent topography, where a thicker mantle of soil and colluvium is more susceptible to landslides and debris flow during intense storm events. Active and dormant landslide scars are susceptible to secondary erosion by rock fall and shallow debris slides. Intensely weathered, fine-grained, and highly erodible sedimentary rocks surrounding Iron Canyon reservoir and the upper portions of Pit 6 Powerhouse Road are particularly susceptible to erosion when disturbed, as are potentially unstable landforms on fractured metamorphic rocks in the Oak Mountain Road corridor and inner gorge of the Lower Pit River.

Soil conditions around the Lower Pit River include highly weathered upland surfaces which are in some places composed of saprolite. These soils are susceptible to erosion and have potential for high fine sediment yields if sparsely vegetated or denuded. Soils mantling the generally steep sided canyon slopes are thin and rocky. Debris flows commonly are triggered on steep canyon slopes with convergent topography and thick soil mantle during and following major storm events. These conditions are commonly found in the area of Iron Canyon reservoir and dam, as well as in the area of the James B. Black Development.

Seismicity

Available seismic data for the project area are classed as Critical Energy Infrastructure Information. The Commission's Dam Safety Program regulations (18 CFR part 12D) require PG&E to retain an independent consultant every five years to inspect, review data, and prepare project safety reports to be submitted to the Commission. The California Water Code requires seismic stability adequacy for all dams

under the jurisdiction of the California Department of Water Resources (California Water Resources), Division of Safety of Dams, which are in general satisfied by the same requirements of 18 CFR part 12D. The most recent part 12D safety reports for the McCloud, Iron Canyon, Pit 6, and Pit 7 dams were prepared in October 2006.

3.3.1.1.2 Reservoir Shorelines

McCloud Reservoir

In general, shorelines around McCloud reservoir are underlain by resistant bedrock that limits the degree to which the shoreline can be eroded as a result of fluctuations in the reservoir water level. McCloud reservoir shorelines can be classified into four types: (1) convex, bedrock controlled shorelines overlain by coarse rock debris with moderate to steep slopes and shallow soils; (2) shorelines with convex to uniform slope profiles in protected cove locations with low to moderate slopes and fine-grained sandy loam soils; (3) steep to very steep shorelines with shallow erosional scarps and loose underlying rocky colluviums and sandy loam soils that support stands of mixed conifer and shrubs; and (4) shorelines with active shallow soil erosion or rock slide activity with very steep slopes and little or no vegetative cover. Surveys of the McCloud reservoir shoreline revealed few erosion sites, all of which had relatively low impact potential (table 3-1). PG&E has mitigated moderate erosion due to drainage or surface runoff that has occurred at a few recreation areas associated with McCloud reservoir (Tarantula Gulch Recreation Area, Ash Camp and Ah-Di-Na Campgrounds, Star City Creek).

Table 3-1. Distribution of erosion inventory sites for the McCloud reservoir and Lower McCloud River study region. (Source: PG&E, 2009a)

	Number of Erosion Sites							
Rank[a]	**Roads**	**Proposed Infrastructure[b]**	**Mass Wasting**	**Spoils**	**Shoreline**	**Tributary**	**Recreation Use**	**Total**
High	5	6	--	--	--	--	3	14
Medium	5	17	3	4	--	--	10	39
Low	1	7	--	3	4	2	10	27
Total	11	30	3	7	4	2	23	80

[a] Rank is based on the potential for the site to cause future effects to project infrastructure or water resources of concern by direct sediment delivery, relative to all inventory sites. A percentile greater than 75 is considered High; a percentile between 25 and 75 is considered Medium, and a percentile less than 25 is considered Low.

[b] Proposed Infrastructure, defined in Study Region 1 by the proposed McCloud powerhouse and proposed McCloud transmission line, includes road-related erosion sites surveyed along FR 38N11 between McCloud dam and the town of McCloud, California.

Erosion Sites

Sites for erosion evaluation in the project area were selected based on their potential to affect aquatic resources of concern, project infrastructure, public and private access, and public health and safety. Sediment delivery to McCloud reservoir has occurred where shoreline slopes are characterized as type 4 and where stream crossings along FR 38N11 have gullied, resulting in sediment delivery below the high water shoreline. Multiple road-related erosion sites were identified along FR 38N11, in the proposed areas for future powerhouse and transmission line development. Additionally, the actively eroding slopes of the McCloud tunnel spoils, where they are composed of finer-grained material and located directly adjacent to Hawkins Creek, may increase delivery of fine sediment to Hawkins Creek. However, most of the Hawkins Creek channel is buffered from the spoil slopes by floodplain surfaces covered by dense riparian vegetation.

Sediment Delivery

Young volcanic rocks and unconsolidated surficial deposits in the Upper McCloud River Basin form large areas with little runoff or sediment delivery to the Upper McCloud River. However, debris flows originating from the unconsolidated inner gorge slopes of Mud Creek Canyon high on the southeast flank of Mount Shasta have historically delivered large quantities of fine sediment to the Upper McCloud River during summer months (Osterkamp et al., 1986), and sediment delivery from debris flows in Mud Creek constitutes a large fraction of the sediment currently stored in McCloud reservoir. McCloud dam and McCloud reservoir trap all coarse sediment (>2 millimeters [mm]) delivered from upstream source areas. Sediment delivery from tributaries draining steep topography surrounding McCloud reservoir constitutes the majority of the coarse sediment stored in the McCloud reservoir: about 937,400 tonnes (t) representing an average annual coarse sediment yield of about 140±30 t km^2 y^{-1}. Other direct sediment delivery to McCloud reservoir is attributed primarily to road-related erosion. Gully erosion extending from suspended culverts or shallow erosion associated with very steep, barren fill slopes are the two most common modes of erosion along FR 38N11, between McCloud dam and Tarantula Gulch. Although active erosion was identified at site-specific locations, the potential risk to the road infrastructure remains negligible.

Large Woody Debris

In the McCloud basin, LWD can play an important role in channel formation and as aquatic and riparian habitat for aquatic and wildlife resources. LWD is delivered to the system via areas of mass wasting and toppling of tree or large limbs as a result of bank undercutting and during storm events. LWD in tributaries of the upper McCloud basin is carried progressively downstream during periods of high water discharge. Prior to construction of McCloud dam, LWD from the upper basin would continue to be redistributed through the lower McCloud River during storm events. Presently, LWD from the upper basin is trapped and accumulates over time in McCloud reservoir. For the safety of recreational boaters and protection of dam structures, PG&E is required under

the existing license to regularly capture and remove LWD accumulated behind McCloud dam.

Iron Canyon Reservoir

Iron Canyon reservoir and dam are underlain by volcaniclastic and pyroclastic rocks, and argillite and tuffaceous sandstone, as well as weathered, clay-rich, and friable sedimentary rocks. Outcrops of weakly metamorphosed and moderately to strongly weathered, interbedded sedimentary rocks in this region express a wide range of rock resistance. Shoreline slopes are moderate (30 to 65 percent) to steep (>65 percent).

The highly weathered soils and saprolite in this area are easily eroded, particularly where sparsely vegetated, and are potential sources of sediment. Slopes around the northern and western portions of Iron Canyon reservoir range from gentle to moderate but become steep along the southern margin in areas adjacent to the dam. Gentle to steep slopes surrounding the reservoir and dam support mixed conifers, oak woodland, and riparian vegetation.

The two predominant soil types in shoreline areas are loose, gravelly sandy loam soils and cohesive, clay loam soils. Shoreline erosion of up to about 3 ft above the water line occurs at locations where tree stumps and roots have been exposed and is common around the reservoir perimeter, indicating shoreline lowering since completion of Iron Canyon dam in 1965. There are deeply incised gullies where stream channels enter the reservoir. Concentrated surface runoff from spur roads has caused lesser amounts of gully erosion below the high water shoreline. Slumping and shallow scarps were observed in relatively few shoreline areas, on moderately steep slopes and steep hillslopes above the high water line.

Erosion Sites

Surveys of the Iron Canyon reservoir shoreline revealed few erosion sites, all of which have low to medium impact potential (table 3-2). The Iron Canyon reservoir perimeter road has erosion sites associated with road drainage diversions, plugged or restricted ditch relief structures, and off-highway vehicle use. Concentrated surface runoff has resulted in rill erosion along steep, unpaved road surfaces. During erosion inventories, PG&E observed delivery of fine sediment to Iron Canyon reservoir and tributary stream channels at the majority of erosion sites surveyed along the perimeter road.

Two former borrow pits located northeast of Iron Canyon dam were evaluated during field surveys. The northernmost borrow pit showed extensive evidence of past and active gully erosion at numerous locations across the disturbed hillslope. It appears that significant headward erosion into brittle, clay-rich sediments has occurred since excavation of the borrow pit. Two deep gully channels incise up to 2,500 ft of slope extending to Iron Canyon reservoir. Thick accumulations of sediment were stored behind grade control structures installed along these gully channels, and some of the grade

control structures near the gully headwalls have failed. The Forest Service has implemented measures to control severe gully erosion at this site.

Large Woody Debris

In the Iron Canyon basin, LWD plays an important role in channel formation and as habitat for fish and aquatic resources. LWD is delivered to the system via areas of mass wasting and toppling of tree or large limbs as a result of bank undercutting and during storm events. LWD in tributaries to Iron Canyon reservoir is carried progressively downstream during periods of high water discharge. Prior to construction of Iron Canyon dam, LWD would continue to be redistributed down Iron Canyon Creek to the Pit River during storm events. Presently, LWD from tributaries to Iron Canyon reservoir is trapped and accumulates over time in the reservoir. For the safety of recreational boaters and protection of dam structures, PG&E has instituted a program to periodically capture and remove LWD from Iron Canyon reservoir.

Table 3-2. Distribution of erosion inventory sites for the Iron Canyon reservoir and dam study region. (Source: PG&E, 2009a)

	Number of Erosion Sites							
Rank[a]	**Roads**	**Proposed Infrastructure**	**Mass Wasting**	**Spoils**	**Shoreline**	**Tributary**	**Recreation Use**	**Total**
High	7	--	--	1	--	--	--	8
Medium	12	--	2	7	3	6	4	34
Low	3	--	--	3	2	11	2	21
Total	22	0	2	11	5	17	6	63

[a] Rank is based on the potential for the site to cause future effects to project infrastructure or water resources of concern by direct sediment delivery, relative to all inventory sites. A percentile greater than 75 is considered High; a percentile between 25 and 75 is considered Medium, and a percentile less than 25 is considered Low.

Sediment Delivery

Sources of fine sediment to Iron Canyon reservoir include road erosion into tributaries to Iron Canyon reservoir, active erosion from the borrow pits northeast of Iron Canyon dam, and concentrated road runoff along the Iron Canyon dam access road. Additionally, the reservoir shoreline, with erosion ranging from localized to extensive, is a major contributor of fine sand, silt, and clay to the reservoir. Channel banks along tributaries above the high water shoreline are protected mostly by dense riparian vegetation or bedrock outcrops, but actively eroding channel banks in reaches below the high water shoreline with bedrock channel beds have a high potential to deliver sediment to the reservoir. Finally, rill erosion and soil disturbance related to unrestricted OHV use is a widespread source of direct fine sediment delivery to Iron Canyon reservoir.

3.3.1.1.3 Project Reaches

Lower McCloud River

Sediment Delivery

In contrast to the Upper McCloud River Basin, the Lower McCloud River Basin is comprised almost entirely of steep slopes and a dense, deeply incised channel network that promotes a more peaked response to storm events and higher rates of coarse sediment delivery by mass wasting. Cumulative sediment supply to the Lower McCloud River under regulated conditions ranges from 1,450 t y^{-1} at the Hawkins Creek confluence to 7,050 t y^{-1} at the Squaw Valley Creek confluence. Under unimpaired conditions, the Lower McCloud River was likely supply limited from McCloud dam to at least Bald Mountain Creek. Large alluvial bedforms such as point bars and island bars occur infrequently and are relatively immobile due to their coarse-grained composition. LWD does not influence channel morphology or sediment storage in the Lower McCloud River. The number and distribution of erosion sites in this area is provided in table 3-1.

At McCloud dam, a tight meander bend located directly across from the bottom of the spillway lies within sheared metavolcanic and sedimentary bedrock and is subject to erosion during large spillway releases. Future large spillway releases have the potential to further erode rock in the meander bend and associated low saddle as well as in the embankment supporting the road. Rock fall and shallow landslides have produced dry ravel (loose rock particles) along steep cut slopes, and deposited rock and debris into the inboard ditch associated with FR 38N11 as it traverses relatively steep terrain immediately downstream of McCloud dam. Mass wasting associated with sites in this area indicates a potential to affect road access and deliver sediment to the McCloud River. Sediment produced by episodic erosion during large spillway releases and chronic secondary erosion of the retreating cliff face across from McCloud dam is delivered directly to the Lower McCloud River, indicating a high potential for future mass wasting in the vicinity.

The Lower McCloud River is a mixed bedrock-alluvial channel with high transport capacity relative to sediment supply and generally low volumes of active

sediment storage. Channel reach morphology in the Lower McCloud River broadly transitions from predominantly step pool upstream of Ah-Di-Na to alternating plane bed and pool riffle downstream of Ah-Di-Na, reflecting an overall decrease in slope and confinement and an increase in mobile sediment supply. The resistant bedrock and boulder channel boundaries in the Lower McCloud River render channel geometry less sensitive to changes in hydrologic and sediment supply regimes. Large, immobile grains within the Lower McCloud River reduce the stress available for transporting finer mobile sediment and create velocity shadows that induce deposition of finer material, forming one of the primary storage elements of mobile coarse sediment within the active channel. Similarity in the size of coarse sediment supplied by major tributaries and the size of mobile deposits in the mainstem Lower McCloud River emphasizes the importance of coarse sediment inputs from major tributaries in supplying the mobile sediment fraction, including spawning gravel size classes, to the McCloud River downstream of McCloud dam.

Bed mobility and transport capacity in the Lower McCloud River are primarily controlled by differences in channel slope which generally follow a downstream decreasing continuum. Bed mobilization occurs at an estimated 1,030 cfs in the vicinity of Ah-Di-Na and at 2,060 cfs between Claiborne Creek and Squaw Valley Creek. Initial mobilization of more mobile sediment patches in most locations occurs at flows >620 cfs. Annual average bedload transport capacity peaks in the vicinity of Ah-Di-Na and declines downstream, reaching a minimum between Claiborne Creek and Squaw Valley Creek. The presence of suspended sediment in the Lower McCloud River, including sediment delivery from Mud Creek, is discussed in section 3.3.2.1.2, *Water Quality*.

Large Woody Debris

Because LWD from the upper McCloud basin is trapped and removed from behind McCloud dam, the quantity of LWD is reduced in the lower McCloud River. LWD inventories show that there is very little LWD stored in the lower McCloud River channel between McCloud dam and Shasta Lake. Below Squaw Valley Creek, the lower McCloud River is subject to higher flow variation and debris inputs from multiple tributaries, so the effect of McCloud dam on the quantity and distribution of LWD is diminished.

Iron Canyon Creek

Sediment Delivery

Accelerated sediment delivery in Iron Canyon Creek is related to erosion of the access road to the Iron Creek gage and related spur roads, rilling of the native hillslopes adjacent to the east and west dam abutments, and entrainment of fine sediment stored in Iron Canyon reservoir in the vicinity of the valve intake. The consequent accelerated delivery of fine sediment to Iron Canyon Creek and the absence of flow releases that frequently mobilize sediment have resulted in increased fine sediment storage in the bed and banks of the relatively low-gradient channel reach immediately downstream of Iron

Canyon dam. Geomorphic monitoring demonstrates that annual valve releases would effectively reduce fine sediment accumulation in the reach immediately downstream of Iron Canyon dam.

Increases in suspended sediment concentrations in Iron Canyon Creek and the Pit River due to interbasin transfer between the McCloud River Basin and the Iron Canyon Creek and Pit River Basins during episodic mass-wasting events is minimal and discussed in more detail in section 3.3.2.1.2, *Water Quality*.

Large Woody Debris

Based on observations that LWD recruitment in Iron Canyon Creek is comparable to regional creeks and environments. The quantity of LWD is consistently distributed longitudinally along the stream channel between Iron Canyon dam and Pit River. Experimental flow releases at Iron Canyon dam indicated that LWD was mobilized when flows exceeded the bankfull discharge.

Lower Pit River

Project areas characterized in the Lower Pit River include those in the vicinity of Oak Mountain Road, Pit 6 Powerhouse Road, Pit 7 Powerhouse Road, and the Proposed Pit 7 afterbay powerhouse and transmission line. The topography in the Oak Mountain Road (FR 37N34) corridor north of the Pit 6 reservoir is moderately steep to steep, with dormant landslides and debris basins on very steep, southeast-facing slopes from the ridgeline to the Pit River (Forest Service, 2005). In the Lower Pit River, gentle to moderate slopes are underlain by resistant volcanic rocks which are relatively stable, with localized debris basins on steeper slopes leading to the Pit River. Shallow debris slides coalesce and areas of active rock-fall occur along the steep inner gorge slopes of Pit River Canyon.

PG&E reported 54 observed erosion sites along the Oak Mountain Road corridor, about 59 percent of which were identified as road-related (table 3-3). Sites along this road and associated spur roads have a moderate to high potential to deliver sediment to Iron Canyon reservoir, tributaries to Iron Canyon Creek, or the Pit River. Additionally, concentrated surface runoff and road-related erosion along spur roads to the Willow Creek siphon have potential to deliver sediment to Willow Springs Creek and interrupt access to project facilities.

Erosion is also evident in a few locations along the edge of the Iron Canyon tunnel spoils (table 3-3), which are near the ridgeline of a tributary to Iron Canyon Creek west of the penstock pipe and downstream of the Iron Canyon tunnel portal. PG&E attributes two existing shallow debris slides to the settling of the spoils. Downslope, two gully channels are scoured to bedrock and have coalesced, delivering sediment directly into an Iron Canyon Creek tributary.

PG&E mitigated the effects of a 1997 storm-related large debris flow that destroyed stream crossing structures. The debris flow scar from this storm remains a major potential sediment source. Other debris flow-related mitigation includes the repair

of the James B. Black penstock pipe that ruptured after a 1978 bedrock landslide, and associated bedrock stabilization. PG&E's subsequent creation of a Penstock Safety Program ensures routine evaluation and review of penstock alignment and adjacent slopes.

PG&E identified additional erosion sites further downstream in the Lower Pit River (table 3-4). Along Pit 6 Powerhouse Road, there is evidence of past and active erosion in several areas. Concentrated surface runoff from culvert outlets and diverted road drainage has caused gully erosion and shallow slope failure of soils and engineered road fill. Debris slide scars along steep inner gorge slopes exposed unconsolidated fluvial gravels overlying metasedimentary bedrock.

Table 3-3. Distribution of erosion inventory sites for the Oak Mountain Road Study Region. (Source: PG&E, 2009a)

	Number of Erosion Sites							
Rank[a]	**Roads**	**Proposed Infrastructure**	**Mass Wasting**	**Spoils**	**Shoreline**	**Tributary**	**Recreation Use**	**Total**
High	17	--	10	1	--	--	--	28
Medium	14	--	6	2	1	2	--	25
Low	1	--	--	--	--	--	--	1
Total	32	0	16	3	1	2	0	54

[a] Rank is based on the potential for the site to cause future effects to project infrastructure or water resources of concern by direct sediment delivery, relative to all inventory sites. A percentile greater than 75 is considered High; a percentile between 25 and 75 is considered Medium, and a percentile less than 25 is considered Low.

Table 3-4. Distribution of erosion sites in the Lower Pit River Study Region. (Source: PG&E, 2009a)

	Number of Erosion Sites							
Rank[a]	**Roads**	**Proposed Infrastructure**	**Mass Wasting**	**Spoils**	**Shoreline**	**Tributary**	**Recreation Use**	**Total**
High	6	--	--	--	--	--	--	6
Medium	17	1	--	1	--	--	--	19
Low	3	1	--	2	--	--	1	7
Total	26	2	0	3	0	0	1	32

[a] Rank is based on the potential for the site to cause future effects to project infrastructure or water resources of concern by direct sediment delivery, relative to all inventory sites. A percentile greater than 75 is considered High; a percentile between 25 and 75 is considered Medium, and a percentile less than 25 is considered Low.

The access road to the Pit 7 powerhouse traverses moderately steep, well-vegetated slopes. Aggraded ditch relief structures, suspended culvert outfalls, diverted road runoff, and fluvial erosion along channel bank toe slopes has caused surface and gully erosion at the outboard road edge at several sites. Thinly bedded metasedimentary bedrock along the access road is relatively resistant to erosion and shows only a few localized shallow slide scars at steep to near vertical road cut banks.

Proposed Infrastructure

PG&E evaluated slope conditions in the vicinity of the proposed location for the Pit 7 afterbay powerhouse and transmission line. This area is characterized by moderate to steep (40–65 percent) slopes underlain by massive to fractured volcaniclastic bedrock and overlain by shallow, rocky soils that support mature conifers and understory shrubs. PG&E observed old shallow landslide scars in this area but no active erosion. A narrow and benched ridgeline along the northern divide of this second drainage provides potentially suitable sites for the new powerhouse. Bedrock outcrops at the terminus of this ridge form a nearly vertical slope above the west abutment of the Pit 7 afterbay dam.

As planned, the proposed transmission line has an initial trajectory of south 10° east leading from the proposed Pit 7 afterbay powerhouse to FR 35N23. The proposed alignment traverses an active gully and steep, inner gorge slopes between the east abutment of Pit 7 afterbay dam and FR 35N23. An alternative alignment for the transmission line would traverse more gentle slopes (<50 percent) underlain at shallow depths by bedrock.

Sediment Delivery

Active erosion along the steep inner gorge portion of Pit 6 Powerhouse Road has caused delivery of unconsolidated sediment and spoils material to the Pit River. Active gully incision from a non-project road, FR 34N17, has caused multiple gully channels to form on lower gradient toe slopes located within the project area with a high potential for direct delivery of eroded sediment to the Lower Pit River.

3.3.1.2 Environmental Effects

Continued operation of the McCloud-Pit Project could affect geology and soils in the watershed by affecting streamflow, sediment trapping and transport, and geomorphic characteristics of the stream channel. PG&E proposes infrastructure additions that may affect geology and soils in the watershed, and the proposed license measures focus on minimizing issues that may result from the installation of the proposed infrastructure as well as address operation and management issues that have been observed during project operation in the current term of the license. Observed issues include trapping of LWD; erosion from bare surfaces, rockfalls, road-related surfaces, tunnel spoils, and borrow pits; reservoir sedimentation; and project effects on sediment supply and transport.

Continued operation of the project may influence the rate of erosion in the watershed and the trapping of sediment in project reservoirs. Project operations may also

limit LWD retention and associated sediment storage in the Lower McCloud River. Therefore, PG&E proposes to develop an erosion and sediment monitoring and control plan and an LWD management plan. Additionally, the Forest Service, NMFS, and FWS have recommended that PG&E develop a plan for gravel and coarse sediment management, not included in the final license application.

Large Woody Debris

LWD can provide habitat structure in streams and affect sediment storage and channel morphometry through its affect on the distribution of flows and water velocity within the stream channel and sediment mobilization and transport. LWD can provide cover and holding habitat for fish, serve as substrate for growth of epibenthic algae and invertebrates, and affect sediment deposition and scouring. Loss of LWD could result in reduced complexity of aquatic habitat and reduced carrying capacity for aquatic biota.

In Iron Canyon Creek, LWD is abundant and project operations appear to have little or no effect on LWD supply, based on observations that LWD recruitment is comparable to regional creeks and environments. The volume of LWD in Iron Canyon Creek is consistently distributed longitudinally in the stream channel, which may indicate that LWD mobilization happens on a regular basis despite flow regulation.

In the Lower McCloud River, the large channel width, high stream power, and normally low LWD loads due to project operations result in limited opportunity for LWD retention and associated long-term sediment storage within the bank full channel perimeter. LWD from the upper watershed accumulates in McCloud reservoir during high flow events, and under the current license, PG&E generally removes LWD to protect the McCloud dam structure. This action, as well as the dam itself, reduces the supply of LWD and impedes the transport of LWD from the upper reaches of the McCloud River to the lower reaches of the river below McCloud dam.

Within one year after license issuance, PG&E proposes to prepare an LWD management plan in consultation with the Forest Service. The plan would provide an operating procedure to facilitate the placing of woody debris downstream of McCloud dam to replace LWD removed from the system by operation and maintenance of the McCloud dam. The plan will specify size criteria, placement and storage sites, volume and frequency of placement, and monitoring procedures.

Forest Service condition 21 supports PG&E's proposal to prepare an LWD management plan approved by the Forest Service within one year of license issuance. The condition specifies that monitoring procedures included in the plan should assess the effectiveness of LWD mobilization and dispersal in the Lower McCloud River.

Forest Service condition 19 specifies that LWD removed from reservoirs as part of recreation development, management, and monitoring may be re-introduced to the Lower McCloud River as directed in the LWD management plan. This condition is discussed further in section 3.3.5, *Recreation Resources*.

NMFS also submitted comments on the proposed action, specifically stating that the LWD management plan should ensure that LWD inputs will not be prevented from migrating downstream, in order to maintain habitat benefits to both resident biota and anadromous listed salmonids.

Our Analysis

LWD contributes to productive aquatic ecosystems, and is an important component in the formation of complex aquatic habitat units and channel maintenance. LWD provides aquatic habitat along the margins and in the active portion of the river channel, riparian habitat on surfaces above the low-flow channel, and organic matter which supports the aquatic food web.

PG&E conducted inventories and aerial footage reviews of the Lower McCloud River that indicated little LWD storage between McCloud dam and Shasta Lake and few, if any, channel forming LWD elements. Although the frequency of smaller flood events is diminished by project operations, larger floods capable of mobilizing and redistributing LWD are uncontrolled and continue to occur on a regular basis. These floods, combined with placement of accumulated LWD from McCloud reservoir in downstream reaches, would increase the abundance of LWD in these reaches and provide habitat benefiting aquatic and riparian organisms in areas where LWD is retained within the active stream channel and adjacent riparian areas.

NMFS recommended that any LWD management plan should ensure that LWD inputs will not be prevented from migrating downstream. Presumably, the rate of LWD inputs from the upper watershed remains similar to that experienced during pre-project hydrologic conditions; however, the current hydrograph below the dam is significantly different from pre-project conditions. Therefore, the carrying capacity of the lower watershed is not likely able to accommodate the volume of LWD material generated by the upper watershed.

The Forest Service recommended that monitoring procedures in the plan specifically address the effectiveness of LWD mobilization and dispersal. Existing survey information documents the amount and distribution of LWD in the lower McCloud River; however, there is an absence of data that indicates how effective the proposed minimum and periodic spill flows will be at mobilizing and distributing LWD. The Forest Service's recommended monitoring program would provide information necessary to assess whether the locations and quantity of LWD placement are appropriate to achieve the objectives.

Erosion and Sediment Control

Surface erosion, increased overland flow, and mass wasting associated with project construction and maintenance could release fine sediment into project waterways; fine sediment can adversely affect environmental resources increasing turbidity and degrading coarse substrate used for spawning. PG&E proposes construction which could

lead to stream sedimentation, increased turbidity, and geomorphic effects if proper erosion and sediment control measures are not implemented and maintained.

Reduction of seasonal high flow events as a result of project operations may contribute to the accumulation of fine sediment in spawning gravels, which could adversely affect trout spawning and incubation success and contribute to the encroachment of riparian vegetation into the stream channel. Sediment that originates from upstream watershed surface erosion, rockfalls, and mass wasting is generally transported downstream in the channel reaches and retained in reservoirs behind structures. An inventory by PG&E identified 56 erosion sites in the project vicinity that were ranked in the 75th percentile or above, indicating high potential of these sites to adversely affect project infrastructure or sediment delivery to streams.

In order to manage existing erosion and minimize future erosion and sediment delivery to stream channels, PG&E proposes to prepare an erosion and sediment monitoring and control plan within one year after license issuance. PG&E would develop the plan in consultation with the Forest Service and other appropriate agencies. The plan would guide management of erosion and sediment control during the term of the new license and would include the following elements:

- Methods for ongoing inventory of project-related erosion and sedimentation;
- A schedule for periodic monitoring;
- An inventory of erosion sites (e.g., map and database) identified by periodic monitoring;
- Criteria for treating erosion sites;
- Protocols for emergency erosion and sediment control; and
- A process and schedule for reporting monitoring results, including periodic plan review and revision.

Inventory of project-related erosion and sedimentation would include project roads, facilities, infrastructure, reservoir shorelines, recreational use areas, and areas of mass wasting that are project-related or affected by project roads and facilities. Initial priority would be placed on the 56 sites ranked as having high erosion potential. Sites would be monitored for five years to assess erosion activity and associated causes. Annual monitoring reports would include a Forest Service-compatible database of erosion sites and detailed site-specific erosion and sediment control measures where necessary and appropriate. Botanical resources affected by project-related erosion would be revegetated according to the Vegetation Management Plan, as discussed in section 3.3.3, *Terrestrial Resources*.

Forest Service condition 22 specifies that, within one year after license issuance, PG&E should file with the Commission its erosion and sediment control management and monitoring plan developed in consultation with the Forest Service, California Water

Board, California Fish and Game, and other interested parties. The condition specifies that the plan should be approved by the Forest Service and should provide direction for managing erosion and controlling sediment during the term of the new license. Furthermore, the Forest Service states that during planning, and before any new construction or non-routine maintenance projects with the potential for causing erosion or stream sedimentation on or affecting Forest Service lands, PG&E should develop site-specific erosion control plans that will be approved by the Forest Service. The plans would include measures to control erosion, stream sedimentation, dust, and soil mass movement.

Ground-disturbing activities have the potential to disturb soil integrity. Forest Service condition 18 specifies that if PG&E proposes additional future ground-disturbing activities, PG&E should consult with the Forest Service to determine the scope of work and potential for project-related effects, and whether additional information would be required to proceed with the planned activity. This condition and the licensee alternative are discussed further in section 3.3.7, *Land Use and Aesthetic Resources*.

NMFS filed a 10(j) recommendation, with concurrence from FWS, stating that as soon as listed salmonids are documented as within the McCloud River and affected by the project, PG&E should implement flow regimes and non-flow-related measures necessary to mitigate impacts of the project's facilities and operations on sediment movement and deposition, river geometry, and channel characteristics. According to the 10(j) recommendation, these actions would include mitigation of impacts on stream competence, capacity, floodplain conductivity, bank stability, and extent, duration, and repetition of high flow events. This recommendation is discussed further in section 3.3.2, *Aquatic Resources*.

In addition to formal 10(j) recommendations, NMFS also submitted comments on the proposed action, specifically stating that the erosion and sediment monitoring and control plan should consider the habitat and biological criteria needs of listed salmonids, particularly because sediment could have adverse effects on spawning substrate and water quality that are important for listed salmonids. The extent that plan would monitor or reduce sediment inputs from the project may be beneficial to most aquatic biota, including listed salmonids. The seasonal timing of these actions could affect listed salmonids as well as the sediment/erosional inputs and resulting turbidity.

Although no measures are proposed to address reservoir sedimentation and the few areas of surface erosion (including mass wasting and rockfalls), studies, environmental site reviews, and agency and stakeholder discussions concluded that these issues do not present significant risk during the term of the proposed license.

California Fish and Game recommends and Forest Service condition 19 specifies that Iron Canyon dam safety valve testing should occur only between March 5 and 15 when the highest instream flows are released, in order to minimize impacts to the reproductive success of breeding aquatic organisms, and that these flows should be kept

to the minimum level allowable (possibly in the range of 150 cfs) to minimize channel damage.

Our Analysis

PG&E's proposal for management and control of erosion and sedimentation would provide for periodic monitoring, inventory, and prioritization of potential erosion sites, identification of criteria and procedures for controlling/mitigating erosion sites, development of emergency response protocols to manage erosion and sedimentation, and establish annual mechanisms for reporting and agency review of procedures and actions. This proposal would provide mitigation for existing erosion sites and prevention of erosion and sedimentation associated with project infrastructure and future project actions. It also assures consultation with Forest Service and other appropriate agencies in developing the plan and periodic annual review by these agencies of the plan and actions taken. The proposal will provide controls necessary to protect water quality, aquatic and riparian habitat from the effects of erosion and sedimentation.

Designing and implementing an appropriate soil erosion control and revegetation plan for construction activities, as specified by Forest Service condition 22, would prevent the release of disturbed sediment into waterways, and therefore would prevent effects on water quality, aquatic habitat, and public health and safety. Proper revegetation and post-construction monitoring would ensure that disturbed areas are restored with native species, and that gullying or other forms of erosion do not occur as a result of construction disturbance.

NMFS and FWS 10(j) recommendation included general measures to affect sediment movement and deposition, substrate quality, and channel characteristics to support listed anadromous salmonids. No specific measures or procedures are recommended. The Keswick and Shasta dams on the Sacramento River downstream of the McCloud dam are existing barriers to upstream passage of anadromous salmonids including Chinook salmon and steelhead. None of the listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River until upstream migration of listed species is implemented through Lake Shasta. Therefore, the general recommendations by NMFS would provide no benefit for listed species at this time.

Gravel and Coarse Sediment

McCloud dam and reservoir trap coarse sediment (>2 mm) delivered from upstream sources, limiting available gravel and coarse sediment that could support and enhance aquatic habitat downstream of the dam. Reduction in sediment supply to the Lower McCloud River due to sediment trapping in McCloud reservoir decreases with distance downstream of McCloud dam as a result of sediment input from tributaries; the effect ranges from a 94 percent reduction at the Hawkins Creek confluence to a 78 percent reduction at the Squaw Valley Creek confluence. In response to project operations, the reach from about 5 to 8 kilometers downstream of McCloud dam is the

most likely to exhibit degraded habitat through coarsening of the bed surface in addition to reduction in the frequency and quantity of mobile sediment deposits.

Coarsening of the river bed surface may result in coarse sediment habitat that is no longer considered optimal for salmonid spawning. As flows below the dam continue to move coarse sediment downstream, no sediment is supplied to the reach to replenish it. This causes gradual lowering of the bed as the smaller particles are moved downstream, leaving only the largest boulders which are only moved by infrequent floods. This process traps fine particles and locks the bed in a pavement-like state called "armoring," making it harder for salmonids to dig spawning redds, which typically consist of loose gravel that can be easily excavated by the fish. Surface and subsurface substrate sampling indicate that armoring is a significant problem below McCloud dam (NMFS, 2010), particularly between the dam and major downstream tributaries. Project operations could result in long-term minor to moderate adverse impacts on aquatic habitat.

Forest Service condition 23 specifies that PG&E should develop and implement a gravel and coarse sediment management plan within one year of license issuance, in consultation with the Forest Service, California Fish and Game, the California Water Board, and other interested parties, and with approval of the Commission and the Forest Service. The plan should require the annual addition of 150 to 600 tons (depending on monitoring results) of gravel and coarse sediment (8-128 mm) to the Lower McCloud River, with inputs specifically within the reach between the McCloud dam spillway and the Hawkins Creek confluence. The Forest Service specifies that PG&E consider using sorted gravel and coarse sediment from the Star City Creek inlet in McCloud reservoir as the source of material for the plan. The plan should also include a monitoring component for the Lower McCloud River between the McCloud dam and Bald Mountain Creek confluence that is integrated into the biological monitoring plan, to evaluate the biological population trends of trout and macroinvertebrates that are affected by gravel and coarse sediment, long-term changes in channel morphology, and the fate of introduced gravels and coarse sediment over the course of the license term.

PG&E alternative condition 23 proposes to revise the time to develop the gravel and coarse sediment management plan to two years, to allow for receipt of license articles from the Commission and collaborative plan development, and that gravel and coarse sediment introductions occur periodically rather than annually. The licensee proposes that the source of the coarse sediment would be the delta deposit at the head of the Star City Creek arm of McCloud reservoir, where the coarse sediment will be excavated "in the dry" and not dredged. Coarse sediment augmentation would occur as far upstream in the specified Lower McCloud River reach (between the spillway and the Hawkins Creek confluence) as operationally feasible and cost effective. The licensee proposes that the monitoring component of the plan cover the Lower McCloud River between McCloud dam and Ladybug Creek rather than Bald Mountain Creek. The licensee also proposes that implementation would be contingent on receipt of section 401 water quality certifications, a streambed alteration agreement from California Fish and Game, and a

section 404 permit from the U.S. Army Corps of Engineers with terms and conditions that do not substantively alter the cost or specifications of the action proposed. If this is not the case, or if for any reason the sediment currently stored in the Star City Creek delta is considered to be of insufficient quantity or quality, the licensee proposes that it then would be exempt from Forest Service condition 23.

California Fish and Game recommendations that PG&E prepare a gravel and sediment management plan requiring the annual addition of 150 tons of gravel and sediment to the McCloud River, between the dam spillway and the confluence with Hawkins Creek. California Fish and Game recommends that PG&E consider using the Star City Creek inlet as a material source. As part of the long-term monitoring component of this plan, California Fish and Game's recommendation incorporates amphibians as an indicator species for assessing ecosystem health.

Forest Service condition 24 specifies that PG&E should prepare a reservoir dredging plan in consultation with the Forest Service and approved by the Commission and the Forest Service, if required for the purposes of increasing gravel and sediment supply or for removing sediment from reservoirs to accomplish project management objectives. The plan should be filed not less than 90 days prior to any proposed or scheduled reservoir dredging operations and should include details regarding the following: dredging location, amount, and timing; dredged material amount, composition, and size; stockpile site identification; equipment, road access, and material storage/staging needs; conditions to minimize related ecological impacts; and public notification.

PG&E alternative condition 24 proposes that PG&E does not anticipate a need for dredging during the license term, as PG&E alternative condition 24 for the gravel and coarse sediment management plan would eliminate the need for dredging within McCloud reservoir as a gravel source to support downstream gravel augmentation.

NMFS, with concurrence from FWS, recommends that, as soon as listed salmonids are documented as within the McCloud River and affected by the project, PG&E should design and implement a listed salmonid gravel substrate augmentation plan, in consultation with the U.S. Bureau of Reclamation, NMFS, FWS, California Fish and Game, and the Commission, and with the approval of the Commission and NMFS.

Our Analysis

The development and implementation of a gravel and coarse sediment management plan, and monitoring and adaptive management of gravel and coarse sediment augmentation as specified by Forest Service condition 23 would help mitigate project effects on aquatic habitat. Gravel and coarse sediment augmentation below McCloud dam would likely mimic patterns of sediment deposition created below downstream tributary confluences in the Lower McCloud River. Gravel introduction below McCloud dam would have the effect of contributing the gravel and sediment equivalent of an additional tributary to the most supply limited reach of the Lower

McCloud River. Increasing the availability of gravel in the affected reach could benefit aquatic resources by increasing the availability of salmonid spawning habitat. Increasing the amount of gravel deposits could also increase the amount of invertebrate habitat that is available within the stream substrate, and enhancing invertebrate production could increase the biomass of fish species that can be supported.

Recommendations regarding the amount and timing of gravel augmentation covered a broad range from California Fish and Game's 150 annually to the Forest Service's recommendation to provide 150-600 tons of gravel and coarse sediment annually. This range reflects the uncertainty as to how much and how quickly sediment would be mobilized and distributed through the downstream reach. PG&E's alternative gravel and coarse sediment augmentation program is similar to the Forest Service, but recommends placement of material periodically based on need given that spill flows capable of mobilizing larger sediment material occur at a frequency of about 4 out of 10 years at McCloud dam. As opposed to a fixed annual augmentation schedule, PG&E's proposed periodic augmentation monitoring plan and adaptive management plan would provide a more flexible mechanism for determining the volume and frequency of sediment introduction necessary to maintain aquatic habitat.

PG&E proposes to use the Star City Creek delta as the source of gravel and sediment, but does not propose to explore an alternate source of material if Star City Creek proves to be inadequate for any reason. Similarly, Forest Service recommended PG&E use delta deposits at one of the McCloud reservoir tributaries, such as Star City Creek, as a source of gravel and sediment. The Forest Service further recommended that PG&E should prepare a reservoir dredging plan, if required, for the purposes of increasing gravel and sediment supply. While dredging would allow for the collection of locally suitable source material, the technique is often costly, and may pose additional environmental risks, including, but not limited to, the release of mercury. Use of sediment deposits at the mouth of the Star City Creek tributary, located adjacent to the McCloud reservoir, would provide material with a natural size range typical of the regional sources. However, an evaluation of other potential local source locations would identify the necessary volumetric, physical, and chemical characteristics, as well as the logistics for collection of transport, would be prudent to ensure the suitability of source material for augmentation. The proposed monitoring plan would provide procedures to determine how the introduced gravel and coarse sediment are distributed downstream and the potential benefit to aquatic resources, while the adaptive management approach would provide a mechanism modifying the gravel and sediment augmentation program based on the observations from the monitoring program.

In their alternative 4(e), PG&E recommended that monitoring for the gravel and coarse sediment program focus on the measurement of changes to the physical characteristics of the substrate through the reach targeted for augmentation. Forest Service recommended that the monitoring plan be integrated with the biological monitoring plan. Unlike PG&E's recommendation, the Forest Service's specification would allow for the evaluation of the gravel augmentation program on the physical

habitat as well as the associated changes to the biological resources. Integration of the two monitoring programs provides an effective and efficient means for analyzing the success and potential benefits of the program to aquatic resources.

Forest Service specified that the geographic scope of monitoring encompass the reach from the McCloud dam to Bald Mountain Creek. PG&E proposed that monitoring extend to Ladybug Creek, about a mile and a half upstream of Bald Mountain Creek. PG&E suggested this as the downstream limit to monitoring because pre-licensing studies indicated a suitable mix of gravel substrate for spawning below Ladybug Creek. Three of the Habitat Criteria Mapping (HCM) study sites (HCM-02, HCM-03, and HCM-04) are located between Ladybug Creek and Bald Mountain Creek. The reach between Ladybug Creek and Bald Mountain Creek could provide a good baseline for evaluating the success of the program given the pre-licensing data for the three HCM study sites and the fact that good quality spawning substrate exists in this reach.

California Fish and Game's recommendation is generally consistent with the Forest Service and PG&E's alternative. Relative to the monitoring plan California Fish and Game specifically recommended the use of amphibians as indicators of success of the gravel and coarse sediment augmentation program. We note that while FYLF is the only amphibian in the area likely to benefit from gravel augmentation, it is not found in the lower McCloud River because water temperatures are generally too cold to support the species. Within the proposed coarse sediment and gravel augmentation reach, fish, particularly salmonids, and invertebrates are more likely to benefit from augmentation than amphibians. Monitoring focused on fish and invertebrates would provide data that is more indicative of a biological response to gravel and coarse sediment augmentation. PG&E provides a rationale for completion of the gravel and coarse sediment management and monitoring plans 2 years following issuance of the new license rather than one year proposed by Forest Service. However, one year is typically adequate for consultation, completion of the plan, and securing all approvals and permits.

The recommendations by NMFS and FWS are made relative to augmentation of gravel substrate for listed salmonids when they are documented in the lower McCloud River and affected by the project. The Keswick and Shasta dams on the Sacramento River downstream of the McCloud dam are existing barriers to upstream passage of anadromous salmonids including Chinook salmon and steelhead. None of the listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River if and until upstream migration of listed species is implemented through Lake Shasta. Therefore, management of gravel spawning substrate recommended by NMFS and FWS would provide no benefit for listed species at this time. The proposed monitoring program would provide a mechanism for adapting the augmentation program to benefit listed anadromous species if and when they become present in the project area.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

3.3.2.1.1 Water Quantity

Water Storage and Hydrology

The McCloud-Pit Hydroelectric Project includes two major storage reservoirs, two regulating reservoirs, one afterbay, two tunnels, and three powerhouses and associated transmission facilities. Key characteristics of the five project basins, including inflow, surface area, length, storage capacity, releases, and drainage area are described below.

McCloud reservoir has a maximum surface area of 520 acres, is 5 miles long, and has a maximum storage capacity of about 31,197 ac-ft. The reservoir shoreline is 14 miles long. The McCloud River watershed above McCloud reservoir includes the highest altitude within the project vicinity and thus has the largest amount of snowmelt influence of the four reservoirs. As a result, McCloud reservoir receives a large component of base flow from springs (about 700 cfs) that discharge groundwater from the aquifer to the east of Mount Shasta into the McCloud River and its tributaries. Another noteworthy contribution comes from glacial melt from Konwakiton Glacier, one of several glaciers located on Mount Shasta's southeastern slopes just above Mud Creek. A number of small tributaries flow directly into McCloud reservoir, including Huckleberry Creek, which also carries most of the flow diverted from Mud Creek. Water is normally released from McCloud reservoir to Iron Canyon reservoir via McCloud tunnel and to the Lower McCloud River via the McCloud dam spillway and a low-level outlet tunnel.

Iron Canyon reservoir has a surface area of 506 acres, is 1 mile long, and has a maximum storage capacity of about 24,241 ac-ft. The reservoir shoreline is 11 miles long. The majority of the water in Iron Canyon reservoir originates in the McCloud River watershed and is diverted via McCloud tunnel. Iron Canyon reservoir is also the confluence point of five small streams: Gap Creek, Little Gap Creek, Cedar Salt Log Creek, Deadlun Creek, and McGill Creek. Water is normally released from Iron Canyon reservoir to Pit 6 reservoir through the James B. Black powerhouse on the Pit River via Iron Canyon tunnel, an associated pipeline, and a steel penstock. The minimum and maximum recorded daily flows through James B. Black powerhouse are 0 and 2,280 cfs, respectively, and the historical mean and median daily discharges are 900 and 863 cfs, respectively (U.S. Geological Survey [USGS] gage 11363910/MC-11). Iron Canyon reservoir also releases to Pit 6 reservoir via a low-level slide gate to Iron Canyon Creek.

Pit 6 reservoir has a surface area of 265 acres, is 10 miles long, and has a maximum storage capacity of about 15,619 ac-ft. The reservoir shoreline is 5 miles long. The watershed contributing to Pit 6 reservoir begins on the Pit River at Pit 5 dam and includes the mainstem Pit River and its tributaries, including Iron Canyon Creek downstream of Iron Canyon dam. The watershed of one major tributary in this area, Kosh Creek, constitutes almost half of the Pit 6 reservoir watershed. Water is normally

released from Pit 6 reservoir through the Pit 6 powerhouse to the Pit River and Pit 7 reservoir. The minimum and maximum recorded daily flows through Pit 6 powerhouse are 0 and 8,650 cfs, respectively, and the historical mean and median daily discharges are 4,193 and 3,800 cfs, respectively (USGS gage 11364150/PH-63).

Pit 7 reservoir has a surface area of 468 acres, is 8 miles long, and has a maximum storage capacity of about 34,142 ac-ft. The reservoir shoreline is 16 miles long. The two primary tributaries to the Pit River in the watershed contributing inflow to Pit 7 reservoir are Roaring Creek and Hatchet Creek. Water is normally released from Pit 7 reservoir through the Pit 7 powerhouse to the Pit River and Pit 7 afterbay before continuing to Shasta Lake. The minimum and maximum recorded daily flows through Pit 7 powerhouse are 0 and 9,080 cfs, respectively, and the historical mean and median daily discharges are 4,231 and 3,760 cfs, respectively (USGS gage 11364800/PH-64).

Pit 7 afterbay has a surface area of about 69 acres at normal "maximum" surface elevation of 1,067 ft, which is the maximum water surface of Shasta Lake. The afterbay is located immediately downstream from the Pit 7 powerhouse and has no storage capacity. Flows from Pit 7 reservoir are regulated with the V-notch weir in the Pit 7 afterbay dam. Changes in water flow from the Pit 7 dam and powerhouse are attenuated by the afterbay.

Table 3-5 shows physical characteristics of each reservoir and the Pit 7 afterbay, and figure 3-1 shows historic trends in storage for each reservoir. Table 3-6 provides minimum required flow releases to Lower McCloud River and Iron Canyon Creek, and tables 3-7 through 3-18 provide regulated and estimated unimpaired flow statistics for each of the main project reaches. We provide a discussion of instream flow requirements for aquatic species in section 3.3.2.1.3, *Aquatic Biota*.

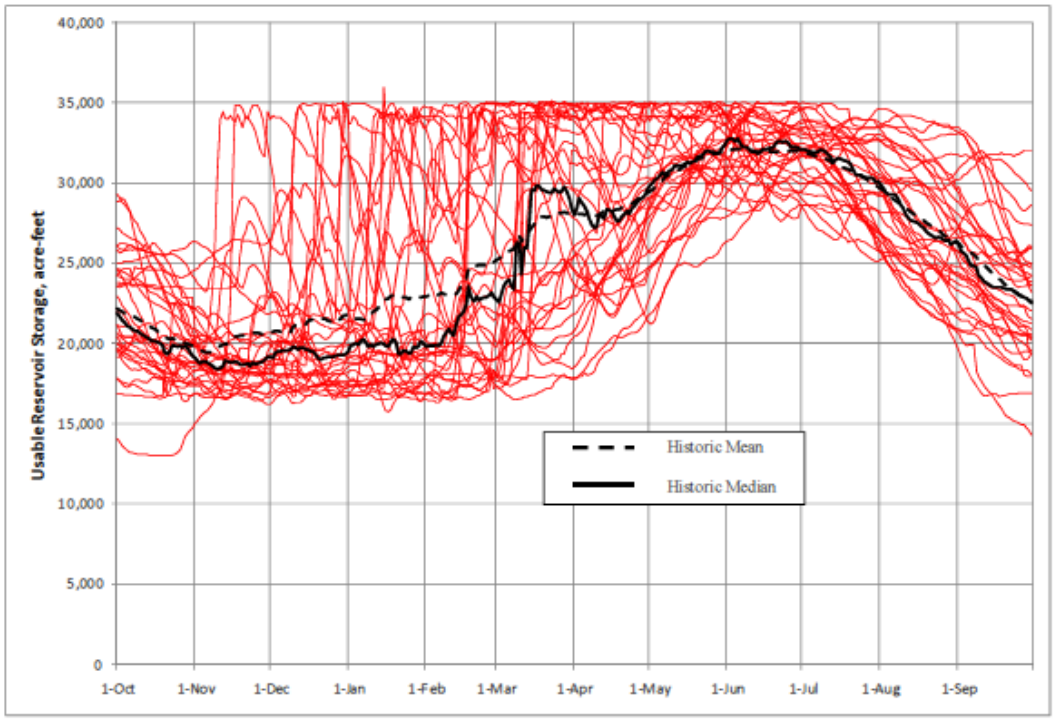
Table 3-5. Reservoir and afterbay characteristics. (Source: Staff, based on specifications provided in PG&E, 2009a)

	Elevation (ft)		Storage capacity (ac-ft)
Basin	**Normal Maximum**	**Normal Minimum**	**Gross**
McCloud reservoir	2,680	2,635	31,197
Iron Canyon reservoir	2,664	2,593[a]	24,241
Pit 6 reservoir	1,425	1,385	15,619
Pit 7 reservoir	1,270	1,235	34,142
Pit 7 afterbay	1,067[b]	1,036c	0

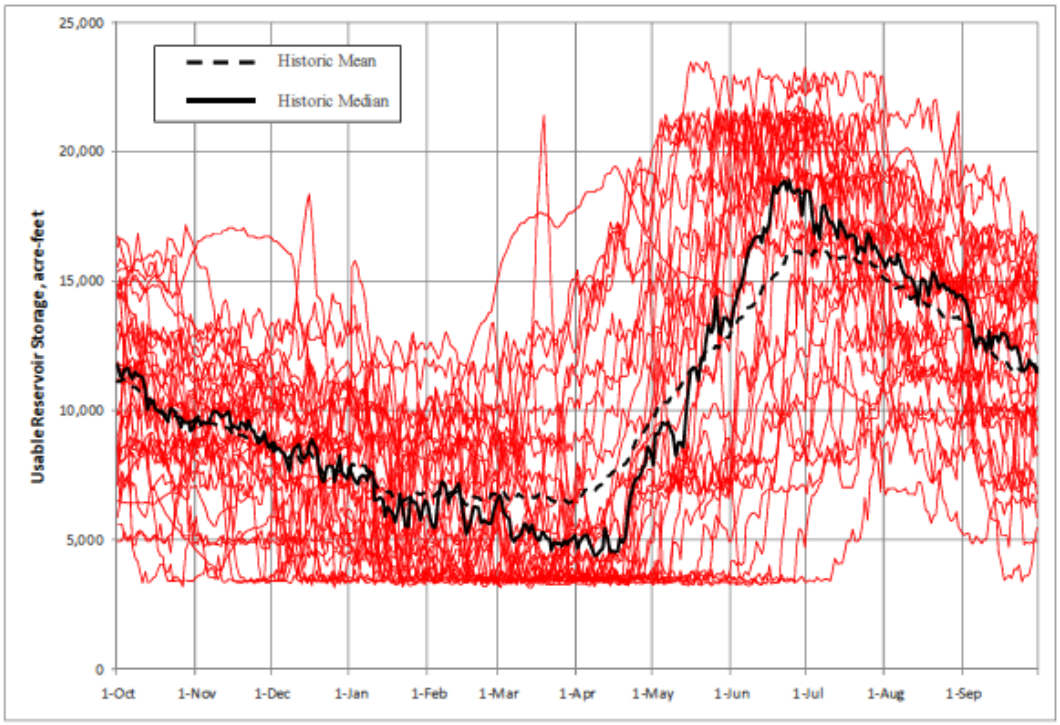
[a] 2,615 ft during summer recreation season.

[b] Shasta Lake at full pond.

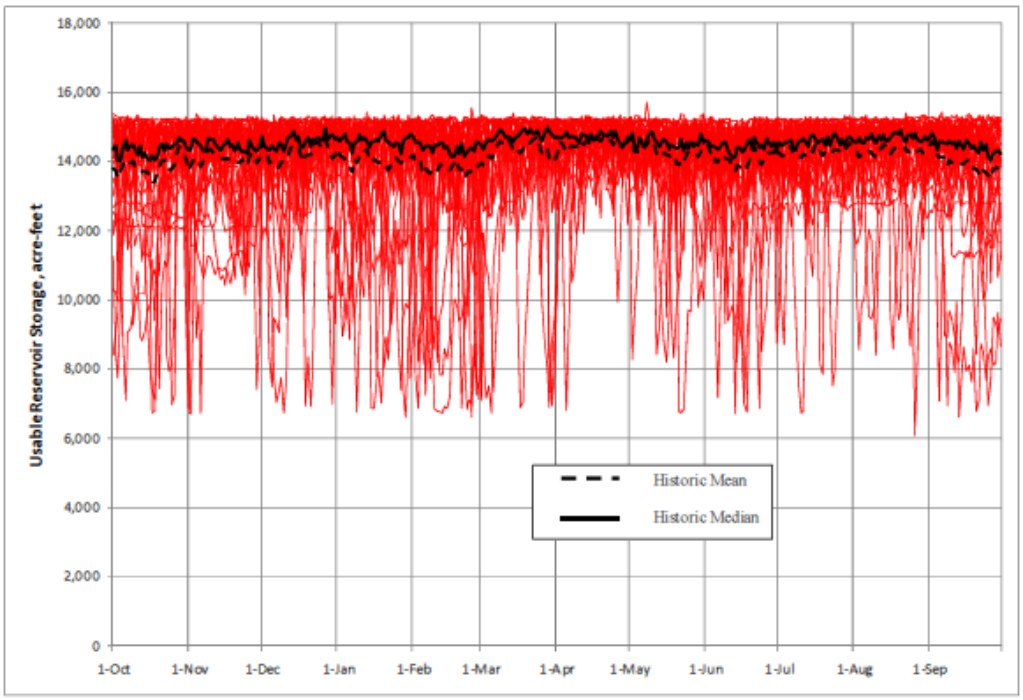
[c] Elevation of afterbay weir v-notch invert.



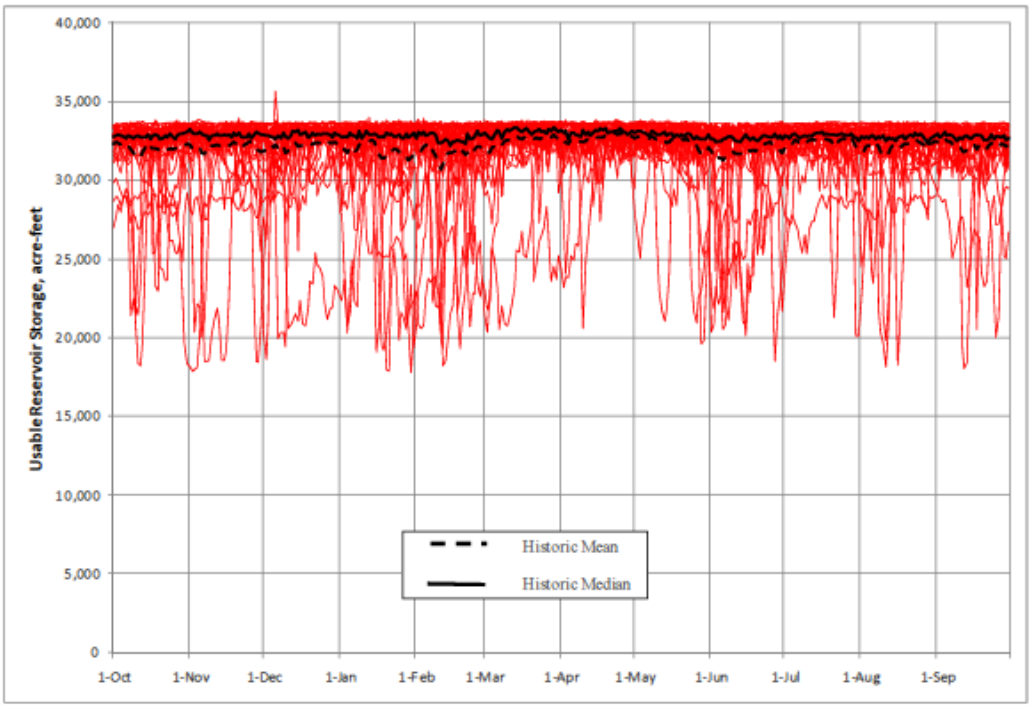
a) McCloud Reservoir



b) Iron Canyon Reservoir



c) Pit 6 Reservoir



d) Pit 7 Reservoir

Figure 3-1. Historic median and mean daily reservoir storage for McCloud-Pit Hydroelectric Project reservoirs, water years 1974[a] through 2006. (Source: PG&E 2009a)

[a] Pit 7 reservoir data represent water years 1975 through 2006.

Table 3-6. Current required releases to Lower McCloud River and Iron Canyon Creek. (Source: Adapted by staff, from PG&E, 2009a)

Reservoir	**Gage Location (USGS/PG&E No.)**	**Date**	**Required Minimum Flow (cfs)**	
McCloud	McCloud Dam (11367760/MC-7)		**All Years**	
		May 1–Nov 30	50	
		Dec 1–Apr 30	40	
			Normal Year	**Dry Year**
	Ah-Di-Na (11367800/MC-1)	Jan 1–Feb 28	160	160
		Mar 1–Apr 30	170	170
		May 1–May 15	170	160
		May 16–Aug 31	200	160
		Sep 1–Dec 15	210	180
		Dec 15–Dec 31	170	170
Iron Canyon	Iron Canyon Dam (11363930/MC-10)		**All Years**	
		Year-round	3	
Pit 6	N/A	N/A	N/A	
Pit 7	Downstream of Pit 7 Dam (11365000/PH-47)	When Shasta Lake elevation <1,055 ft.	150	
Pit 7 Afterbay	N/A	N/A	N/A	

Table 3-7. Mean, minimum, and maximum unimpaired flows in the McCloud River above McCloud reservoir for water years 1974–2006 (USGS gage 11367500/MC-3); all flows are unimpaired at this location. (Source: PG&E 2009)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	NA	NA	NA	941	532	11,900
February	NA	NA	NA	990	541	6,490
March	NA	NA	NA	1,133	577	8,330
April	NA	NA	NA	1,117	647	3,930
May	NA	NA	NA	1,097	576	3,190
June	NA	NA	NA	935	566	2,250
July	NA	NA	NA	831	559	1,390
August	NA	NA	NA	795	552	1,130
September	NA	NA	NA	775	546	1,080
October	NA	NA	NA	757	546	1,140
November	NA	NA	NA	801	541	4,170
December	NA	NA	NA	854	537	9,700

Table 3-8. Mean, minimum, and maximum regulated flows in the McCloud tunnel for water years 1974–2006 (USGS gage 11367720/MC-8); all flows are regulated at this location. (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	879	271	1,620	NA	NA	NA
February	934	0	1,470	NA	NA	NA
March	1,051	0	1,580	NA	NA	NA
April	1,053	337	1,590	NA	NA	NA
May	957	266	1,460	NA	NA	NA
June	841	0	1,430	NA	NA	NA
July	769	321	1,420	NA	NA	NA
August	726	16	1,210	NA	NA	NA
September	689	296	1,320	NA	NA	NA
October	652	159	1,220	NA	NA	NA
November	668	180	1,420	NA	NA	NA
December	775	237	1,540	NA	NA	NA

Table 3-9. Mean, minimum, and maximum regulated and unimpaired flows in the McCloud River at the McCloud dam for water years 1974–2006 (USGS gage 11367760/MC-7, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	228	40	17,646	1,198	589	16,544
February	201	39	5,546	1,283	594	8,792
March	250	39	8,690	1,437	703	11,646
April	206	40	3,529	1,325	714	5,497
May	247	44	2,100	1,248	637	4,108
June	206	58	1,680	1,043	618	2,646
July	175	131	346	915	607	1,571
August	179	121	223	869	598	1,248
September	192	116	228	846	590	1186
October	193	45	251	829	592	1,557
November	200	47	4,630	917	585	6,546
December	163	39	3,025	1,035	585	13,096

Table 3-10. Mean, minimum, and maximum regulated and unimpaired flows in the McCloud River at Ah-Di-Na for water years 1974–2006 (USGS gage 11367800/MC-1, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	384	153	25,200	1344	596	19,207
February	408	147	9,110	1452	604	10,081
March	484	143	11,800	1614	738	13,556
April	362	149	5,690	1,441	732	6,399
May	350	146	3,620	1,319	653	4,593
June	248	157	1,405	1,084	628	2,880
July	205	148	343	939	610	1,716
August	204	150	278	885	602	1,295
September	217	162	265	861	594	1,222
October	217	178	447	847	598	1,808
November	257	178	5,690	966	589	8,005
December	284	163	17,000	1,129	589	14,992

Table 3-11. Mean, minimum, and maximum regulated and unimpaired flows in the McCloud River above Shasta Lake for water years 1974–2006 (USGS gage 11368000/MC-5, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	1,376	208	44,999	2,336	644	39,007
February	1,564	217	18,700	2,609	675	21,662
March	1,647	226	26,000	2,776	831	27,756
April	1,034	209	12,400	2,113	807	13,109
May	730	212	7,220	1,699	756	8,192
June	452	194	2,266	1,294	689	4,103
July	329	191	945	1,063	637	2,419
August	289	187	485	971	619	1,507
September	294	191	549	938	605	1,371
October	311	196	2,310	941	617	3,671
November	561	216	15,900	1,270	614	18,855
December	908	202	31,100	1,753	617	29,092

Table 3-12. Mean, minimum, and maximum regulated and unimpaired flows in Iron Canyon Creek at Iron Canyon dam for water years 1974–2006 (USGS gage 11363930/MC-10, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	3.9[a]	0.4[a]	11.0[a]	67	3	1,341
February	13.8[a]	2.0[a]	538.0[a]	78	3	931
March	9.8[a]	2.7[a]	501.0[a]	79	4	961
April	3.8[a]	2.6[a]	6.4[a]	45	3	454
May	3.9[a]	2.5[a]	7.4[a]	26	4	244
June	3.9	2.6	7	14	2	92
July	3.9	2.7	7	8.4	2	48
August	3.9	0.4	7.6	5.8	1.2	18
September	3.9	2.7	7.8	5.2	0.7	24
October	3.9[a]	2.7[a]	8.1[a]	6	0.8	126
November	3.9[a]	2.7[a]	9.1[a]	21	2	735
December	3.8[a]	0.4[a]	15.0[a]	42	2	955

[a] Regulated data set is incomplete (0.25 percent missing data).

Table 3-13. Mean, minimum, and maximum regulated and unimpaired flows in the Pit River below the Pit 5 dam for water years 1974–2006 (USGS gage 11363000/PH-27, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	1,014	46	30,200	4,255	2,076	32,529
February	1,252	47	36,500	4,812	1,884	36,882
March	1,586	50	15,700	5,347	2,220	20,517
April	1,004	45	12,000	4,440	2,037	17,020
May	805	67	17,500	3,930	1,812	20,328
June	274	107	5,460	2,946	1,724	9,533
July	145	78	322	2,411	1,620	4,220
August	155	72	1,940	2,305	1,618	3,438
September	143	89	3,160	2,358	1,627	3,783
October	149	88	2,770	2,525	1,655	3,745
November	240	48	7,450	2,941	1,865	12,110
December	459	39	15,200	3,409	2,035	19,721

Table 3-14. Mean, minimum, and maximum regulated and unimpaired flows at the Pit 5 powerhouse for water years 1974–2006 (USGS gage 11362700/PH-69); all flows are regulated at this location. (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	2,955	196	4,184	NA	NA	NA
February	3,179	0	4,330	NA	NA	NA
March	3,500	1,020	4,250	NA	NA	NA
April	3,233	114	4,330	NA	NA	NA
May	3,002	0	4,240	NA	NA	NA
June	2,517	0	4,140	NA	NA	NA
July	2,120	0	3,989	NA	NA	NA
August	2,032	0	4,000	NA	NA	NA
September	2,124	0	4,060	NA	NA	NA
October	2,286	0	4,058	NA	NA	NA
November	2,535	0	4,138	NA	NA	NA
December	2,699	0	4,520	NA	NA	NA

Table 3-15. Mean, minimum, and maximum regulated and unimpaired flows in the Pit River at the Pit 7 dam for water years 1974–2006 (USGS gage 11365000/PH-47, synthesized unimpaired hydrology data). (Source: PG&E 2009a)

	Regulated Flow (cfs)			**Unimpaired Flow (cfs)**		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	6,216	466	43,500	5,533	2,144	52,183
February	7,017	376	49,000	6,302	1,985	42,933
March	7,765	740	32,800	6,844	2,702	33,957
April	6,428	291	32,400	5,305	2,254	25,088
May	5,419	533	22,200	4,419	2,005	22,173
June	3,876	145	10,800	3,217	1,825	10,219
July	3,216	30	8,240	2,571	1,677	4,679
August	3,024	62	6,940	2,415	1,667	3,569
September	3,080	71	7,980	2,458	1,669	3,968
October	3,325	140	14,500	2,647	1,727	5,798
November	4,046	356	20,000	3,333	1,932	22,384
December	4,752	257	32,600	4,212	2,115	37,874

Table 3-16. Mean, minimum, and maximum regulated and unimpaired at the James B. Black powerhouse for water years 1974–2006 (USGS gage 11363910/MC-11); all flows are regulated at this location. (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	973	0	1,950	NA	NA	NA
February	1,025	0	1,920	NA	NA	NA
March	1,142	0	2,020	NA	NA	NA
April	1,080	0	1,970	NA	NA	NA
May	972	0	2,060	NA	NA	NA
June	856	0	1,910	NA	NA	NA
July	835	0	1,970	NA	NA	NA
August	808	0	2,280	NA	NA	NA
September	779	0	1,970	NA	NA	NA
October	732	0	2,000	NA	NA	NA
November	744	0	2,010	NA	NA	NA
December	860	0	2,000	NA	NA	NA

Table 3-17. Mean, minimum, and maximum regulated and unimpaired at the Pit 6 powerhouse for water years 1974–2006 (USGS gage 11364150/PH-63); all flows are regulated at this location. (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	4,804	606	8,520	NA	NA	NA
February	5,236	48	8,090	NA	NA	NA
March	5,940	1,090	8,080	NA	NA	NA
April	5,477	279	8,200	NA	NA	NA
May	4,778	0	7,900	NA	NA	NA
June	3,755	56	7,680	NA	NA	NA
July	3,221	0	6,430	NA	NA	NA
August	3,061	0	6,680	NA	NA	NA
September	3,087	0	6,330	NA	NA	NA
October	3,194	0	6,380	NA	NA	NA
November	3,611	0	8,020	NA	NA	NA
December	4,207	0	8,650	NA	NA	NA

Table 3-18. Mean, minimum, and maximum regulated and unimpaired at the Pit 7 powerhouse for water years 1974–2006 (USGS gage 11364480/PH-64); all flows are regulated at this location. (Source: PG&E 2009a)

	Regulated Flow (cfs)			Unimpaired Flow (cfs)		
Month	**Mean**	**Minimum**	**Maximum**	**Mean**	**Minimum**	**Maximum**
January	5,068	136	9,240	NA	NA	NA
February	5,546	0	9,030	NA	NA	NA
March	6,228	772	9,080	NA	NA	NA
April	5,741	70	8,980	NA	NA	NA
May	4,999	330	8,990	NA	NA	NA
June	3,760	20	8,660	NA	NA	NA
July	3,155	0	8,240	NA	NA	NA
August	2,941	0	6,940	NA	NA	NA
September	3,022	0	6,620	NA	NA	NA
October	3,172	0	8,090	NA	NA	NA
November	3,605	0	9,050	NA	NA	NA
December	4,342	0	9,035	NA	NA	NA

Consumptive Use

The primary consumptive uses of water in the Lower McCloud and Pit Rivers within the project area are for recreation and wildlife/aquatic habitat. The majority of recreational use of project waters (primarily boating, fishing, and camping) occurs at McCloud and Iron Canyon reservoirs, with limited recreational use at Pit 6 and Pit 7 reservoirs. Lower McCloud River is used for fishing below McCloud reservoir.

3.3.2.1.2 Water Quality

The Central Valley Regional Water Quality Control Board (Central Valley Regional Water Board) defines water quality criteria for the Sacramento River and its tributaries and formally designates existing and potential beneficial uses and water quality objectives. The McCloud River is designated in the Central Valley Regional Water Board *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (basin plan; Central Valley Regional Water Board, 2007) for municipal and domestic water supply, contact and non-contact recreation, power production, cold freshwater habitat, coldwater spawning, and wildlife habitat. The Pit River in the project area is designated for all of the beneficial uses designated for the McCloud River, as well as for water supply for irrigation and stock watering, warm freshwater habitat, and warmwater spawning. Basin plan objectives that are applicable to project-affected waters are described in table 3-19.

The McCloud River is not listed under section 303d of the CWA as an impaired water body. However, the Pit River is listed for nutrients, organic enrichment/low dissolved oxygen (DO), and water temperature, with agriculture and grazing cited as the probable sources of impairment; the river is targeted as low priority for the development of total maximum daily load (TMDL) standards, with proposed TMDL completion in 2013 (California Water Board, 2006).

Table 3-19. Water quality objectives to support designated beneficial uses in the project area. (Source: PG&E, 2009a)

Water Quality Objective	**Description**
Bacteria	Fecal coliform concentration: less than a geometric average of 200 per 100 milliliters (ml) water on five samples collected in any 30-day period and less than 400 per 100 ml on 10 percent of all samples taken in a 30-day period. *Escherichia coli* concentrations: less than a geometric average of 126 per 100 ml of water on five samples collected in any 30-day period and less than 235 per 100 ml on 10 percent of all samples taken in a 30-day period. Basin plan criteria for fecal coliform will be replaced with criteria for *E. coli* following approval of the amendment (Central Valley Regional Water Board, 2002) by the State Board, Office of Administrative Law and U.S. Environmental Protection Agency (EPA).
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Although certain trace element levels have been applied to particular water bodies, no portion of the project affected area is cited within the basin plan. In addition, waters designated for municipal or domestic use must comply with portions of title 22 of the California Code of Regulation.
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
Dissolved Oxygen	Monthly median of the average daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. Minimum level of 7 milligrams per liter (mg/l). When natural conditions lower DO below this level, the concentrations shall be maintained at or above 95 percent of saturation.
Floating Material	Water shall be free of floating material in amounts that cause nuisance or adversely affect beneficial uses.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

Water Quality Objective	Description
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses.
pH	The pH of surface waters will remain between 6.5 to 8.5, and cause changes of less than 0.5 in receiving water bodies.
Radioactivity	Radionuclides shall not be present in concentrations or accumulate in the food web to an extent that is harmful to human, plant, animal or aquatic life.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
Tastes and Odor	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes and odors to domestic or municipal water supplies, fish flesh, or other edible products of aquatic origin, or substances that cause nuisance or otherwise adversely affect beneficial uses.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
Turbidity	In terms of changes in turbidity (nephelometric turbidity units [NTU]) in the receiving water body: where natural turbidity is 0 to 5 NTU, increases shall not exceed 1 NTU; where 5 to 50 NTU, increases shall not exceed 20 percent; where 50 to 100 NTU, increases shall not exceed 10 NTU; and where natural turbidity is greater than 100 NTU, increase shall not exceed 10 percent.

Water Quality Objective	Description
Water Temperature	The natural receiving water temperature of interstate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in water temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 2.8 degrees Celsius (ºC) above natural receiving-water temperature.

Water Quality Standards

Water quality in the project area was determined to be generally in accordance with basin plan objectives, with only one potential exceedance of basin plan criteria for pH, which PG&E considered to be insignificant, and no exceedances for other parameters. Monitoring results and the observed exceedance are summarized below.

Chemical Constituents

Sampling has demonstrated low levels of chemical constituents regulated under title 22 of the California Code of Regulations. Although limited data are available on metals in the McCloud and Pit Rivers, samples collected in 1985-1986 indicated generally low metals concentrations near or below laboratory reporting limits. Levels of minerals in samples collected in the project area and surrounding watershed in 2007 did not exceed the applicable maximum contaminant levels.

Although little data exist on anthropogenic pollutants such as oil and grease, pesticides, and herbicides in project-affected waters, pesticide screening samples collected upstream of Shasta Lake in the Pit and Lower McCloud Rivers in 1999 and 2000, respectively, contained low pesticide levels.

Dissolved Oxygen

Generally, measured DO levels in project-affected waters remained above the 7 mg/l basin plan standard at all times. During one sampling event, DO saturation near the bottom of McCloud reservoir dropped below 85 percent, and in one case, it dropped below 75 percent. However, DO concentrations did not violate basin plan criteria for beneficial uses, and PG&E could not establish exceedance based upon a monthly average, as required by the basin plan criterion. During a short period in late June 2004, PG&E reported DO concentrations near 3 mg/l in the McCloud River, downstream of McCloud dam that quickly rose to 10 mg/l. PG&E attributed the anomalous DO measurements to an equipment malfunction.

Toxicity

Ammonia levels measured for this study were well below toxicity thresholds. A limited amount of rainbow trout tissue sampling for mercury was conducted in the Pit and McCloud Rivers, with mercury concentrations of about 0.05 milligram per kilogram (mg/kg).

Measurements were taken in summer, 2007, at the sediment-water interface of McCloud and Iron Canyon reservoirs to assess oxidation-reduction potential (a measure of anoxia sometimes used to indicate conditions suitable for mercury methylation); data were above the range typically associated with methylation. No mining activities occur within 1 mile from project boundaries, limiting potential sources and input of metals to the project-affected portion of the system.

Water Temperature

McCloud Reservoir—The water temperatures and water quality conditions in McCloud reservoir support a coldwater trout fishery. Although project operations influence seasonal water quality conditions in McCloud reservoir and water temperatures in the Lower McCloud River are affected by releases from McCloud reservoir, measurements of water temperature in the reservoir (<20°C) were well within the tolerance range of salmonids and generally met basin plan criteria.

Temperatures in McCloud reservoir reflect the large volume of cool water entering the reservoir from the spring-fed Upper McCloud River and the relatively short residence time of water in the reservoir. Daily average surface water temperatures at upstream reservoir stations in McCloud reservoir ranged from 6.9ºC in May to 16ºC in August, while downstream reservoir stations were somewhat warmer. For example, daily average surface water temperatures at the most downstream reservoir station ranged from about 12.0ºC in May to 20ºC in August, cooling to less than 10ºC in October. Overall, water temperature changes from upstream of McCloud reservoir to downstream do not differ by more than 1.6ºC at any time and are comparable to the normal heating expected along the pre-project river length. Despite surface water warming, hypolimnetic release temperatures below McCloud dam are cold because of the steep thermocline and large hypolimnion.

Reservoir temperature profiles in summer from 2006–2008 were characterized by a relatively shallow (0–3 meters [m]) epilimnion, a 3-6 m thermocline (metalimnion) characterized by sharply reduced temperatures with depth, and a deep (40-52 m) thermally stable hypolimnion that extends beneath the thermocline to the reservoir bottom. The stratification period typically extends from early June to late September in the project area. A coldwater pool, operationally defined as all depths exhibiting water temperatures less than 10.0ºC, ranged in thickness from 137.8 ft (42 m) in August to 167.3 ft (51 m) in June, 2008.

Minimum flow releases from McCloud dam to the Lower McCloud River are withdrawn from a low-level gate near the bottom of the reservoir. During 2007-2008,

daily average temperatures from the bottom of the reservoir ranged from 7.0ºC in May to 10.1ºC in August. Water temperatures at the elevation of the intake for McCloud tunnel (elevation 2,556 ft), which leads to Iron Canyon reservoir, never exceeded 10.3ºC.

McCloud River—River temperatures below McCloud dam as observed during 2008 monitoring efforts increased during spring and summer spill events, due to water releases from the warmer epilimnion of the reservoir. Although these temperature increases were conferred downstream, the effects of the spills diminished with tributary flow augmentation from upstream to downstream, and water temperatures near Shasta Lake did not exceed 19ºC.

Under current minimum flows, water temperatures in the Lower McCloud River remain below 18.8°C for the entire 24-mile-long reach year-round. Temperatures vary seasonally, increasing from June to mid-July, remaining warmest in mid-summer, and declining from mid- to late August through September. Hourly temperature averages never exceeded 20ºC, except at the most downstream site above Shasta Lake. During the 2006-2008 monitoring period, daily average water temperatures recorded in tributaries to the Lower McCloud River ranged from 6 to 19.7ºC from May through October and were both slightly warmer and more variable than daily average temperatures in the mainstem McCloud River. As expected, tributary temperatures varied with ambient air temperature and the coldest tributary measured, Ladybug Creek, was generally 3-4ºC cooler than the lower elevation Claiborne and Squaw Valley Creeks.

Iron Canyon Reservoir— Water temperatures in Iron Canyon reservoir are influenced by water delivered from the McCloud reservoir hypolimnion, some surface water warming and entrainment within Iron Canyon reservoir, and the relatively short residence time. The water temperatures and water quality conditions in the reservoir include a well-developed thermocline and a deep thermally stable hypolimnion, which supports a coldwater trout fishery. The temperature of flows from the bottom of the dam was similar to the temperature of the McCloud River upstream of McCloud reservoir (which reflects cold groundwater input).

The summer (June to September) temperature differences between monitoring stations above the reservoir and below the Iron Canyon dam are small: a 0.14ºC decrease per mile was observed under hot meteorological conditions (water temperatures exceeded 13.1ºC above the reservoir and 12.7ºC below the dam no more than 10 percent of the time), whereas a 0.03ºC increase was observed under normal temperature conditions (water temperatures exceeded 12.0ºC above the reservoir, 12.1ºC below the dam, and 15.0ºC above the Pit River confluence no more than 50 percent of the time).

The thermal structure of Iron Canyon reservoir was characterized by a warmer epilimnion underlain by a thermocline extending to about 4 to 10 m deep throughout the spring to late summer. Surface water temperatures ranged from 12.3 to 22.5ºC in July 2006–2008. In the hypolimnion strata, water temperatures near the bottom of the reservoir ranged from 11.0 to 12.3ºC in July 2006–2008. Although project operations

influence water quality conditions in Iron Canyon reservoir, water quality measurements were well within the tolerance range of salmonids (<20°C) and met basin plan criteria.

Iron Canyon Creek—Water is discharged from the Iron Canyon reservoir hypolimnion to Iron Canyon Creek at an elevation of 2,565 ft and the James B. Black powerhouse intake at an elevation of 2,556 ft. Under current operating conditions, cold hypolimnetic (deep) releases of water from Iron Canyon reservoir and low residence times tend to reduce the temperature variability immediately below the dam, and result in downstream Iron Canyon Creek temperatures that are virtually identical to temperatures above the reservoir. Water temperatures in Iron Canyon Creek below the dam from June through September of 2006-2008 exhibited daily average temperatures from 10 to 17ºC.

Although the upstream site below the dam exhibited very small diel and seasonal fluctuations due to reservoir releases of thermally isolated hypolimnetic water, water temperatures downstream of Iron Canyon dam do not change significantly with change in stream flow, largely due to the abundance of shade along the stream channel. Stations located downstream exhibited patterns that more closely reflect ambient meteorological conditions, increasing temperatures from May to July and declining from late August to early October. Downstream from the monitoring station below the dam to the station above the confluence with the Pit River, water temperature increased an average of about 0.64ºC per mile under normal meteorological thermal conditions.

Pit 6 and Pit 7 Reservoirs—Water diverted from the McCloud River enters the Pit River watershed at James B. Black powerhouse, having traversed through two tunnels and Iron Canyon reservoir. Daily average temperatures at surface water monitoring sites in the Pit River reservoirs were comparatively warmer than those observed in the McCloud River Basin. The thermal structures of Pit 6 and Pit 7 reservoirs were similar during the 2007-2008 monitoring period and reflected the large flow volume and short residence time of water in the reservoirs. Water temperature and water quality conditions in the Pit 6 and Pit 7 reservoirs support a transitional-zone fish assemblage including native tule perch, hardhead, Sacramento pikeminnow, and Sacramento sucker, which is similar to other Pit reservoirs upstream of the project area. Pit 7 reservoir also supports small populations of largemouth and smallmouth bass, tui chub, and rainbow trout.

Unlike the Lower McCloud River and Iron Canyon Creek watersheds, temperatures in the Pit River watershed did not exhibit increasing variability with distance downstream. The differences on average (normal condition) between monitoring stations above the reservoir and James B. Black powerhouse represented a sharp decline in temperature: 5.6ºC within less than 0.1 mile. After mixing with flow from the upstream Pit 3, 4, and 5 Project, temperatures increase an average of about 0.1ºC per mile, which reflects the limited stratification and low residence time of water in Pit 6 and 7 reservoirs. Ambient daily average temperatures at stations above the project area ranged from 12 to 22ºC from June through September.

Pit River—Daily average temperatures below the interbasin transfer entering through James B. Black powerhouse were cooler, with temperatures downstream of the

Pit 6 powerhouse less than 19°C. Below Pit 7 reservoir, the river water temperature reaches a maximum of 18 to 20ºC during the middle to late summer with a diel variation of 2 to 7ºC during the spring, summer, and early fall. There is a steady decline in water temperatures in the fall and winter, with minimum water temperatures at all sites near 4ºC. Samples collected in 2007 showed that the water temperature in the Pit River watershed was well within the tolerance range of salmonids, native minnows, and suckers and met basin plan criteria.

pH

Analysis of historical and recent data indicates that measured pH values throughout the project area and surrounding watershed occasionally approach or exceed the basin plan water quality objectives, which specify an acceptable pH range of 6.5-8.5. Monitoring efforts in 2007 and 2008 revealed two potential exceedances: a pH of 8.9 was measured in the metalimnion of McCloud reservoir in June 2007, and a pH of 9.1 was measured in McCloud River downstream of Squaw Valley Creek in May 2008. However, historical data show that comparable pH levels occur naturally in the system, and lower pH measurements were typically recorded in the vicinity of these elevated readings, which indicate that the exceedance was a natural episodic event and not likely representative of conditions in the river as a whole.

Biostimulatory Substances

Although biostimulatory substances are of general concern in the Pit River (California Water Board, 2006), levels of all nutrients measured throughout the project area were low, and chlorophyll-*a* levels were below the method detection limit of 0.05 mg/l at every site sampled. Although *in situ* DO data suggested some localized algal growth at intermediate depths in both McCloud and Iron Canyon reservoirs in the summer, such growth is typical in lakes in the region.

Coliform Bacteria

The state water quality criteria for the protection of waters used for water contact recreation are based on the collection of a minimum of five fecal coliform samples within a 30-day period. Although there is no basin plan criterion for total coliform, the levels found in project-affected waters in summer, 2007, were slightly in excess of the 230 most probable number per 100 ml criterion in the U.S. EPA (2003) guidelines for water contact recreation. Heavier recreational use associated with the 2008 Labor Day weekend in Iron Canyon reservoir and its tributaries did not appear to significantly alter fecal coliform concentrations. Overall, historical and recent sampling in project-affected waters, including recreational areas in McCloud and Iron Canyon reservoirs, resulted in generally low concentrations of total coliform, fecal coliform, and *E. coli*.

Sediment Transport and Supply

Mud Creek, a tributary upstream of McCloud dam, adversely affects water clarity in the Lower McCloud River by periodically delivering large amounts of fine volcanic sediment from the Konwakiton glacier on Mount Shasta directly into McCloud reservoir.

Project operations affect the volume, rate, and timing of sediment transport downstream. The increased turbidity in McCloud reservoir and the Lower McCloud River associated with these natural occurring events continues to be a fishery and aesthetic concern. Increased turbidity is known to alter fish feeding behavior (Barrett et al., 1992; Tippets and Moyle, 1978), as well as impair angling conditions (see section 3.3.5, *Recreation Resources*). PG&E conducted an extensive suspended sediment monitoring program in the project area during 2007 and 2008, and results of that monitoring are discussed below.

Turbidity Upstream of McCloud Reservoir

Mud Creek stream flow is routed by an upstream landowner to Huckleberry Creek, which flows into the head of McCloud reservoir. Suspended sediment levels entering McCloud reservoir are largely a function of conditions in the Mud Creek drainage.

Under base-flow conditions, synoptic sampling of total suspended solids (TSS) at the mouth of Mud Creek / Huckleberry Creek ranged from 13 to 141 mg/l (2 to 113 NTU). However, because sampling was not continuous and spring-fed Huckleberry Creek mixes with Mud Creek before it reaches McCloud reservoir, these data can under-represent suspended sediment and turbidity levels in Mud Creek. Synoptic sampling of TSS in Mud Creek above the Highway 89 bridge during non-event periods ranged from 54 to 1,260 mg/l (15 to 840 NTU), whereas continuous data from this site showed turbidity exceeding 1,600 NTU on a regular basis.

The maximum continuous turbidity monitoring in Mud Creek during high flow events was beyond the instrument maximum range of 1,602 NTU, and PG&E assumed actual levels to be significantly greater than this maximum value. TSS sampling in Mud Creek that occurred during these events showed concentrations of up to 9,360 mg/l.

Turbidity in McCloud Reservoir

There is sustained transport of sand and coarser material from Mud Creek into McCloud reservoir during all periods of active transport. Project operations influence the capture and re-sorting of coarse sediments stored in a McCloud reservoir deltaic deposit downstream of the mouth of Huckleberry Creek, the capture and settling of finer sediments stored in the distal portions of the reservoir, and sediment transport through the reservoir to downstream reaches.

Depending on the elevation of the reservoir, bed materials collected from the active channel in Mud Creek are deposited either at the confluence of Mud Creek / Huckleberry Creek with the McCloud River or moved rapidly downstream to areas exhibiting reservoir-like properties and deposited in a submerged delta. The leading edge of this deltaic deposit terminates about 2.5 miles downstream of the Mud Creek / Huckleberry Creek confluence and 2.5 miles upstream of the dam. As reservoir levels are drawn down, this deltaic material is re-suspended and transported by incoming flows

to the next depositional zone, forming a wedge-shaped deposit that gradually moves downstream.

During a Mud Creek event, the highest density sediment plume enters McCloud reservoir and travels rapidly along the reservoir bottom to the low level outlet located near McCloud dam. As the event pulse moves through the reservoir, a process of diffusion takes place where turbidity spreads and disperses into the greater reservoir water column, reducing its density and spreading into the upper hypolimnion and metalimnion in areas with neutral density that can suspend the plume at mid-depths. Depending on the size of the event and associated turbulent mixing and upward current induced by surface winds, the mid-depth, lower density plume can, at times, reach the surface layer and become visible. The stratification of turbidity in McCloud reservoir within the water column allows reservoir fish to use other portions of the water column as refugia. Depending on the size of the event pulse, the plume arrives at the dam anywhere from 1 to 3 days after entering the reservoir.

Turbidity Downstream of McCloud Reservoir

Project operations can also alter sediment transport characteristics from McCloud reservoir and into the Lower McCloud River as well as the introduction of sediments into the Iron Canyon and Pit River watersheds through interbasin transfer.

Under base-flow conditions, suspended sediment values ranged from <2.0 to 4 mg/l TSS (0.5 to 3.6 NTU) in the Lower McCloud River. These base-flow conditions are generally significantly lower than reported above for Mud Creek / Huckleberry Creek. Although the absolute concentration of the event pulse is diluted by the reservoir receiving waters, wave action and scour during reservoir drawdown can re-mobilize sediments stored in the reservoir, and turbidity downstream of McCloud reservoir during Mud Creek events is significantly higher than under base-flow conditions. Continuous turbidity monitoring over five events in August-October 2007, and August-September 2008, showed downstream turbidity levels in the Lower McCloud River ranging from 65 to 300 NTU below McCloud reservoir, 12 to 155 NTU above Claiborne Creek, and 5 to 72 NTU above Shasta Lake. TSS sampling that occurred during these events showed TSS concentrations of up to 167 mg/l below McCloud reservoir (nearly two orders of magnitude less than the peak reported in Mud Creek). Depending on the size of the Mud Creek wasting event, the post-event “cleansing” period can last anywhere from a few days to more than a week. Turbidity levels typically spike on the day the event pulse reaches the dam outlet and then decline significantly over the next several days (typically 4-8 days).

In the Iron Canyon watershed, turbidity levels within the interbasin transfer from the McCloud River watershed during Mud Creek events were slightly above those found during base-flow conditions due to a number of factors: dilution, dispersion, and diffusion due to the large volume of the two upstream reservoirs, as well as the elevation of the discharge intake/outlet structures relative to the elevations of turbidity plumes associated with a particular event. Continuous data at Iron Canyon dam measured

maximum daily average turbidity during two August-September, 2008, Mud Creek events of 5.5 NTU, representing a change of 4.2 NTU above pre-event levels.

Under base-flow conditions in the Pit River watershed, turbidity ranges were 0.8 to 2.1 NTU (3 to 6 mg/l TSS) upstream of James B. Black powerhouse, 1.5 to 4.1 NTU (2 to 3 mg/l TSS) below Pit 6 powerhouse, and 1.1 to 6.8 NTU (2 to 5 mg/l TSS) below Pit 7 powerhouse. These baseline turbidity data indicate that conditions in the Pit River upstream of the James B. Black powerhouse (above the interbasin transfer) were similar to those measured downstream of the Pit 5 powerhouse (downstream of all diversion inputs) during non-event periods.

During periods when mass wasting is occurring upstream on Mount Shasta, some signal of Mud Creek turbidity reaching the Iron Canyon Creek sites was apparent, with turbidity increases of up to 4 NTU above pre-event levels in August and September, 2008. However, the large volume of flow coming from the Pit 3, 4, and 5 project, as well as settling that occurs in Pit 6 and Pit 7 reservoirs, attenuates any potential effects of turbidity in the Pit River system. Only one of the two major turbidly events occurring in 2008 was measured by the continuous recording sensor in the Lower Pit River; the maximum turbidity at this site during the August 2008 Mud Creek event was measured as 2.6 NTU, about 1 NTU above pre-event levels.

The increases in suspended sediment concentrations and turbidity in Iron Canyon Creek and the Pit River, resulting from interbasin transfer between the McCloud River basin and the Iron Canyon Creek and Pit River basins during episodic mass-wasting events, caused temporary exceedances of basin plan criteria. However, as stated above, the suspended sediment levels in the Pit River watershed resulting from water transfers from McCloud reservoir during Mud Creek events were minimal (<4.5 NTU) and would not deleteriously affect fish populations in Pit 6 reservoir or in downstream impoundments.

3.3.2.1.3 Aquatic Biota

The project area supports both stream and reservoir fisheries. Project stream reaches include a rainbow and brown trout fishery in the Lower McCloud River and Iron Canyon Creek. The project reservoirs—Pit 6 and 7 reservoirs and Pit 7 afterbay—also support native minnow, sucker, and tule perch populations. In this section we describe the aquatic habitats and aquatic biota within project-area waters.

Important and Special Status Fish Species

Rainbow and brown trout support important recreational fisheries in the project area. The McCloud River historically had the only bull trout (*Salvelinus confluentus*) population in the state of California until it was extirpated in 1975. The river also supported Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), and occasional coho salmon (*Oncorhynchus kisutch*). The Pit 6 reservoir supports a population of hardhead, a California species of concern and a Forest Service sensitive species.

Coastal rainbow trout are the trout species native to most west-side watersheds, and were historically found below an elevation of 4,900 ft, but have been introduced throughout the western Sierra Nevada including most of the project area. Rainbow trout spawn in the spring, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Females excavate a nest, or "redd," in the gravel and, after spawning, cover the eggs with gravel. After hatching, the fry remain in the gravels until their yolk sacs are absorbed. The fry then venture into open water, feeding on plankton and aquatic macroinvertebrates. As they mature, they begin to feed on aquatic and terrestrial insects, and large trout also feed on fish and crayfish.

Brown trout are an introduced species in California, and occur mainly in low- to mid-elevation ranges. Brown trout spawn in the fall, although the specific spawning time is influenced by factors such as the genetic strain of the fish, water temperature, and period of daylight. Spawning usually occurs in gravel riffles or gravel pockets of small streams. Despite differences in timing, the spawning and rearing characteristics of brown trout are similar to rainbow trout. Brown trout can be found in tributaries, rivers, lakes, and reservoirs. Adults generally remain near the bottom of pools, while juveniles can be found in riffles as well as in pools. Brown trout prefer temperatures below 20°C, and have high growth rates at water temperatures between 12 and 20°C (Moyle, 2002). Brown trout compete with other trout species for resources.

Hardhead are a large, native minnow generally found in undisturbed areas of larger low- to middle-elevation streams (elevation between 30 and 4,760 ft in the Sacramento and San Joaquin watersheds). Its range extends from the Kern River in the south to the Pit River in the north. Hardhead inhabit areas that have clear, deep pools with sandy, gravel/boulder substrates and slow water velocities (less than 0.05 ft per second). Hardhead co-occur with Sacramento pikeminnow and usually with Sacramento suckers, and tend to be absent from streams where introduced species, especially centrarchids, predominate. Hardhead have been identified in the Pit 6 and Pit 7 reservoirs during fish population surveys conducted in October 2007.

Prior to the completion of Shasta dam in 1942, Chinook salmon and other anadromous fishes were able to travel up the McCloud River as far as the 20-ft-high Lower Falls. Chinook salmon have been extirpated from the McCloud and Pit Rivers. In addition, the extirpation of Chinook populations had further impacts by affecting other species in the system, notably bull trout (originally identified as Dolly Varden) that feed on early life stages of Chinook (California Fish and Game, 1990). In 1950, Keswick dam was completed downstream of Shasta dam, further blocking anadromous fish passage 9 miles downstream of Shasta dam (Yoshiyama et al., 2001).

After the completion of McCloud dam in 1965, bull trout were present and spawning access remained available within the Upper McCloud River (above McCloud dam) and its tributaries, where both fry and juvenile rearing habitat are present. The

construction of McCloud dam, which blocked access to downstream adult holding habitat, also created new adult habitat within the reservoir where cold, deep water was abundant. However, following the construction of McCloud dam, the McCloud reservoir was extensively stocked with rainbow trout, brown trout, and brook trout, and was heavily promoted as a fishing destination. The brook trout did not survive or grow well, and California Fish and Game ceased stocking brook trout but continued stocking brown and rainbow trout. Bull trout harvest increased after McCloud reservoir opened to fishing in 1966, and fish were present above McCloud dam up until around 1971 (California Fish and Game, 1990). Although issues with the population were identified, angling restrictions for bull trout were not adopted until 1976 (California Fish and Game, 1990) when they had already been extirpated from the system. Given the loss of Chinook salmon as a food source, over-harvesting by anglers, and the introduction of non-native salmonids that most likely led to competition and hybridization between the species yielding sterile offspring, the extirpation of bull trout within the Upper McCloud River appears to be the cumulative effect of an array of stressors on the population to which construction of the McCloud dam may have been but one contributing factor. Attempts to reintroduce the species by California Fish and Game in the early 1990s were unsuccessful and the effort was subsequently abandoned.

Following construction of the McCloud dam and other management objectives, the fish community residing in the Lower McCloud River currently includes Sacramento pikeminnow, riffle sculpin, Sacramento sucker, rainbow trout, and brown trout, with additional fishes (e.g., smallmouth and spotted bass) likely entering the lower-most section of the river from Shasta Lake periodically or on a seasonal basis.

Currently, the upper portion of the Lower McCloud River is managed as a California Fish and Game wild trout stream, and is therefore no longer stocked; however, California Fish and Game continues to stock sport fish in Shasta Lake. It is expected that a portion of the trout that California Fish and Game releases in Shasta Lake migrate upstream into portions of the Lower McCloud River. Monitoring conducted at a fish counting weir near Ladybug Creek indicated that brown trout appear highly migratory in comparison to rainbow trout within the Lower McCloud River (Moyle, unpublished; California Fish and Game, 1994). In addition, California Fish and Game released 127,252 Chinook salmon in Shasta Lake as part of an ongoing mark/recapture study funded by the licensee in 2005-2006 (letter from Jason F.R. Vann, License Coordinator, PG&E, October 31, 2008). However, no Chinook salmon were observed during the fall, 2007, McCloud River fish surveys.

Benthic Macroinvertebrates

The licensee conducted benthic macroinvertebrate sampling in the project-affected reaches of the Lower McCloud River and Iron Canyon Creek in August and September, 2007, and November, 2008. During the 2007 sampling, the licensee also collected reference samples from Squaw Valley Creek, a tributary of the McCloud River and Clear Creek, a tributary to Iron Canyon reservoir. In addition, the licensee acquired historical

(1999–2008) benthic macroinvertebrate data for The Nature Conservancy's McCloud River Preserve for comparison purposes. From the 14 benthic samples collected by the licensee in 2007 and 2008, a total of 6,970 organisms comprising 95 distinct taxa were collected. Insects comprised a majority of the benthic community including 13 mayfly taxa, 19 stonefly taxa, 18 caddisfly taxa, and 9 beetle taxa. Other invertebrates included oligochaetes, clams, and gastropods.

A multimetric index (MMI) based on five metrics described by Rehn et al. (2007) was formulated for each sample taken within the project area. MMI values of Iron Canyon Creek were within or slightly below the range of MMI values of reference sites. MMI values from the McCloud River sites were lower when compared to MMI values of reference sites; however, MMI values generated from historical data collected over a 10-year period (1999–2008) on the McCloud River Preserve were consistently closer to those of the reference sites and notably higher than those collected from the other Lower McCloud River sites. Overall, the physical habitat data and benthic macroinvertebrate samples collected over 10 years within the project area generally indicated good aquatic habitat conditions and water quality.

Aquatic Mollusks

An aquatic mollusk survey was conducted in the summer and fall, 2007, to inventory all mollusk species in the project vicinity including Forest Service special status (FSSS) aquatic mollusk species. In total, three species of freshwater mussels, four species of Sphaeriacian clams, and nine species of aquatic snails were found during the 2007 survey. The FSSS freshwater mussel species *Anodonta californiensis/nuttalliana* was found in lentic habitat in the Pit 6 and Pit 7 reservoirs, and the FSSS aquatic snail species *Fluminicola seminalis* was found in the Lower McCloud River at the confluence of Chatterdown Creek. No FSSS aquatic mollusks were found in the proposed McCloud or Pit 7 afterbay construction area surveys.

Reservoir Fish

In total, 20 different species have been documented in project reservoirs (table 3-20). During fish surveys conducted in the fall of 2007 and 2008, a total of 15 species were observed, including four species (bluegill, brook trout, channel catfish, and spotted bass) that had not been previously documented. Five species (bigeye marbled sculpin, common carp, green sunfish, pit roach, and speckled dace) that were historically observed in project reservoirs were not observed in the 2007 and 2008 surveys.

Table 3-20. Fish species documented in the McCloud-Pit Project reservoirs.

Species	McCloud Reservoir[a]	Iron Canyon Reservoir[a]	Pit 6 Reservoir	Pit 7 Reservoir	Pit 7 Afterbay[a]
bluegill				○	
bigeye marbled sculpin			●		
brook trout	○				
brown trout	○	○		●	
channel catfish			○		
common carp			●		
green sunfish			●		
hardhead			●○	●○	○
largemouth bass			●	●○	
Pit roach			●		
Pit sculpin			●		○
rainbow trout	○	○	●	●○	○
riffle sculpin			●○		
Sacramento pikeminnow			●○	○	
Sacramento sucker			●○	●○	○
smallmouth bass			●	●○	○
speckled dace			●		
spotted bass					○
tui chub				○	
tule perch			●○	●○	

[a] No historical data available.

○ Species documented during 2007 and 2008 surveys.

● Species documented historically.

McCloud Reservoir

Fish species that occur in McCloud reservoir include naturally spawned rainbow and brown trout and annually stocked hatchery raised rainbow trout. Brown trout, brook trout, and rainbow trout were captured in the reservoir during the 2007 surveys. Rainbow trout and brown trout were the more abundant species, representing more than 99 percent of the total catch during gill net surveys. Both species were distributed evenly around the reservoir and were captured in both shallow and deeper waters. Only one brook trout was collected in the reservoir. During electrofishing surveys, brown trout and rainbow trout were the only species collected. With the exception of brook trout, both juveniles and adults of trout species were captured. No records of historic fish sampling in McCloud reservoir were found for comparison to this study.

Iron Canyon Reservoir

Rainbow trout and brown trout were captured in the reservoir during the 2007 surveys. Rainbow and brown trout comprised 76 and 24 percent of the total catch, respectively, during gill net surveys. Twenty-three fish consisting of rainbow trout and brown trout were captured by electrofishing in the reservoir. About 8 percent of the rainbow trout captured during fish surveys in Iron Canyon reservoir were identified as hatchery-origin fish. Both juveniles and adults of rainbow and brown trout were captured. No records of historic fish sampling in Iron Canyon reservoir were found for comparison to this study.

Pit 6 Reservoir

Water temperature and water quality conditions in the Pit 6 reservoir support a transitional-zone fish assemblage including native tule perch, hardhead, Sacramento pikeminnow, and Sacramento sucker. During gill net surveys in 2007, tule perch and hardhead represented 54 and 36 percent, respectively, of the total catch. Other species collected in gill net surveys included Sacramento pikeminnow, Sacramento sucker, and channel catfish. A total of two fish (one hardhead and one riffle sculpin) were captured during electrofishing surveys. Six age classes of hardhead were identified in the reservoir. Small sample sizes for Sacramento pikeminnow and Sacramento sucker precluded definitive identification of age groups. Other fish historically documented in the reservoir, but not captured in 2007, include rainbow trout, largemouth bass, smallmouth bass, common carp, Pit roach (*Hesperoleucus mitriulus*), speckled dace *(Rhinichtyhs osculus*), Pit sculpin (*Cottus pitensis*), and bigeye marbled sculpin (California Fish and Game, 2001; PG&E, 2001). Additionally, channel catfish were captured in 2007, but not reported in previous years.

Pit 7 Reservoir

Fish species that occur in the Pit 7 reservoir include tule perch, hardhead, Sacramento sucker, Sacramento pikeminnow, smallmouth bass, largemouth bass, rainbow trout, tui chub, and bluegill. During gill net surveys in 2007, tule perch was the most abundant species, representing 47 percent of the fish captured, followed by

hardhead. During electrofishing surveys, Sacramento sucker was the most abundant species, representing 42 percent of the fish captured. Three fish species captured in 2007 (bluegill, Sacramento pikeminnow, and tui chub) were not reported in previous years.

Pit 7 Afterbay

The reservoir fish assemblage in Pit 7 afterbay includes hardhead, Sacramento sucker, rainbow trout, spotted bass, smallmouth bass, and Pit sculpin. During gill net surveys in 2007, hardhead was the most abundant species, representing 86 percent of the fish captured, followed by Sacramento sucker. All other fish species represented less than 1 percent of the total fish captured. During the 2007 electrofishing surveys, hardhead was the dominant species captured followed by Sacramento sucker, rainbow trout, spotted bass, smallmouth bass, and Pit sculpin. Hardhead were primarily in the upstream portion of the impoundment (below Pit 7 dam), which has a more riverine character, while warmwater species (smallmouth and spotted bass) were primarily in the downstream, lacustrine portion of the impoundment near the Pit 7 afterbay dam. Additionally, more than 1,000 juvenile hardhead were observed within the upstream riverine portion of the impoundment during electrofishing in Pit 7 afterbay.

Stream Fish Populations

PG&E conducted fish surveys at eight sites on the mainstem Lower McCloud River in fall, 2007, and three sites on Iron Canyon Creek in 2007 and 2008. A total of six species of fish were observed in the Lower McCloud River and Iron Canyon Creek during these surveys.

Lower McCloud River

The Lower McCloud River travels about 24 miles over an elevation range of 1,425 ft (1.1 percent average gradient) from 2,500 ft at McCloud dam to 1,075 ft at Shasta Lake (non-project). Groundwater springs provide a continuous source of cold water to the upper McCloud River. Flow in the Lower McCloud River is regulated by releases from McCloud dam, but receives significant groundwater discharge from springs and tributaries; water temperatures supporting the coldwater fishery averaged 9.0°C below McCloud dam and 14.6°C above Shasta Lake between May and October 2008. This cold water supports a viable trout fishery throughout the entire 24-mile-long reach. The Lower McCloud River also supports a Sacramento sucker / pikeminnow assemblage just above Shasta Lake; these species are typically associated with foothill elevations and transitional zone water temperatures and probably enter the lower river from Lake Shasta.

The current license establishes minimum instream flows below McCloud dam for the protection of aquatic resources and the high quality coldwater fishery. Flow in the Lower McCloud River ranges from a minimum monthly mean of 204 cfs in August to a maximum monthly mean of 484 cfs in March (as measured at gage MC-1). The Lower McCloud River hydrograph indicates a relatively stable base-flow regime with relatively minimal annual variance outside of high flow events driven by snow melt or prolonged moderately intense rainfall. The limited base-flow variability in the Lower McCloud

River at gage MC-1 under regulated conditions is affected by minimum flow releases from McCloud dam for aquatic resources. Variability in the flow regime increases with distance downstream, due to significant tributary inflow at various locations. The licensee, as required by the current license (article 31), provides minimum instream flow releases with compliance determined at two locations: McCloud dam and the Lower McCloud River at Ah-Di-Na. At McCloud dam, required minimum flows are 50 cfs from May 1 through November 30, and 40 cfs from December 1 through April 30; actual flow releases are usually much higher in order to meet downstream requirements at the Ah-Di-Na gage. For the Lower McCloud River at Ah-Di-Na (gage MC-1), there are dual minimum flow requirements for dry and normal years: dry year minimum instream flow requirements range from 160 to 180 cfs, depending on the month. During normal years, the minimum instream flow requirement at Ah-Di-Na ranges from 160 to 210 cfs, depending on the month.

Mud Creek, a tributary upstream of McCloud dam, can adversely affect water clarity in the reservoir and Lower McCloud River by periodically discharging large amounts of sediment composed of fine volcanic material released naturally from the Konwakiton glacier on Mount Shasta. Discharge of this suspended material from Mud Creek continues to be a fisheries and aesthetic concern affecting turbidity in the Lower McCloud River.

The dominant substrate in the Lower McCloud River is coarse-grained boulder/cobble with many large boulders and bedrock outcrops. Total spawnable gravel quantity increases gradually from McCloud dam downstream to near Ah-Di-Na Campground. Below Ah-Di-Na, overall spawnable gravel quantity increases down to Ladybug Creek. The quality of spawnable gravel improves from McCloud dam to Ladybug Creek; gravel quality upstream of Hawkins Creek was “fair” to “poor,” whereas gravel quality below Hawkins Creek was “good” on average. The number of brown trout redds observed also increased downstream to just below Ah-Di-Na Campground. Below Ah-Di-Na, the frequency of redds observed was low, although the abundance of spawnable gravel continued to increase. Overall, the majority of gravel patches were less than 100 square feet in size and ranged from “poor” to “excellent” in quality.

LWD in the river channel can provide a significant source of cover for juvenile and adult fish. A review of existing LWD inventories shows that there is very little LWD stored in the Lower McCloud River channel between McCloud dam and Shasta Lake. LWD transported from the upper watershed is trapped at McCloud reservoir and not distributed downstream to the Lower McCloud River.

Fishes observed in the Lower McCloud River in 2007 included rainbow trout, brown trout, riffle sculpin, unidentified sculpin species, Sacramento sucker, Sacramento pikeminnow, and unidentified minnow species. Rainbow trout and brown trout were observed in similar relative abundance at all sites. Rainbow trout were numerically dominant overall with the exception of the downstream-most site, which included a higher percentage of sculpin. Trout and sculpin species were distributed throughout the

Lower McCloud River. Sacramento suckers were only observed at the sites immediately upstream and downstream of Tuna Falls. Minnow species (including Sacramento pikeminnow) were observed only at the downstream-most site. During 1984-1987, surveys at a fish weir installed about 1 mile upstream of Shasta Lake on the Lower McCloud River documented brown trout, rainbow trout, Sacramento sucker, Sacramento pikeminnow, smallmouth bass, Chinook salmon, and kokanee. Observation from an upstream fish weir installed on the Lower McCloud River near Ladybug Creek during the same period documented brown trout and rainbow trout.

Iron Canyon Creek

Iron Canyon Creek travels 4.6 miles over an elevation range of 1,041 ft (4.3 percent average gradient), from 2,470 ft at Iron Canyon dam to 1,430 ft at the confluence with Pit 6 reservoir. Iron Canyon Creek receives water from Iron Canyon reservoir, which receives water diverted from McCloud reservoir and from a few small tributary streams. Minimum stream flow in Iron Canyon Creek is maintained by a year-round minimum release of 3 cfs from Iron Canyon reservoir. Accretion from small tributary streams increases flow in Iron Canyon Creek by 2 to 3 cfs under low flow conditions. During non-runoff periods in 2007, moderate accretion sources increased flows at the mouth of Iron Canyon Creek by 2 to 4 cfs over the minimum release flow. Once a year, typically in the late fall or early winter, high flows are released down Iron Canyon Creek for a short period (usually under 30 minutes) during a valve exercise. Flow releases during this exercise vary depending on reservoir water levels, but were about 280 cfs in 2008, and are high enough to mobilize some LWD and transport fine sediments downstream.

Mean daily water temperatures at the mouth of Iron Canyon Creek ranged between 8.4°C and 17.3°C from May through October 2007. Temperatures immediately downstream of Iron Canyon dam exhibit minimal daily and monthly fluctuations, reflecting reservoir releases of cold hypolimnetic water. Pools make up 25 percent of the stream channel, with flatwater and riffle habitat accounting for the remaining 37 and 38 percent, respectively. The stream channel has an abundance of riparian shade and ample vegetative, structural, and LWD cover for fish. Excluding the lower and upper 0.5 mile, spawning substrate is evenly distributed longitudinally along the stream channel. Iron Canyon Creek supports a self-sustaining trout population.

During 2007 and 2008 surveys, three fish species were observed in Iron Canyon Creek including rainbow trout, Pit sculpin, and brown trout. Rainbow trout were observed at all sites and were numerically dominant overall, whereas brown trout were observed at the lower and upper sites and Pit sculpin were observed at the two lower sites.

3.3.2.2 Environmental Effects

Minimum Flows

Reduced flow and limited seasonal variation in flow associated with project operations at McCloud and Iron Canyon reservoirs and diversion of water to the project powerhouses affect habitat for aquatic biota and recreational opportunities in downstream reaches. Therefore, minimum instream flow requirements for the reaches in Lower McCloud River below McCloud dam, Iron Canyon Creek below Iron Canyon dam, and the Pit River below Pit 7 dam are established to meet both aquatic biota and recreational needs. Minimum flow levels may also substantially influence other resources including foothill yellow-legged frog breeding (see section 3.3.3, *Terrestrial Resources*), wading conditions for anglers and boating opportunities (see section 3.3.5, *Recreation Resources*), and project generation (see section 4.2, *Comparison of Alternatives*). Flows that support optimal conditions can differ significantly among these various resources and users. Therefore, the regulated flow regime under the proposed action seeks to balance these various objectives. Resource agencies and several other non-government stakeholders provided recommendations regarding minimum flows in each reach.

Flow Recommendation

In its final license application, PG&E proposed a minimum flow regime for each of these reaches that varies by month and water year type in order to more closely reflect a natural hydrograph for the system and support aquatic resources and other users. Additionally, PG&E alternative condition 19 proposes modifications to instream flows. In all cases, the proposed flows (tables 3-21 through 3-24) are equal to or greater than the flows that are required in the current project license (table 3-6).

Forest Service condition 19 specifies seasonal flow regimes for each of these reaches: lower McCloud River (tables-3-21), Iron Canyon Creek (table 3-22), and Pit 7 (table 3-23). Additionally, California Fish and Game and NMFS filed a 10(j) recommendation for the Lower McCloud River below McCloud dam (table 3-21). California Fisheries and Water Unlimited, and the California Salmon and Steelhead Association, support the existing daily flow requirements for the Lower McCloud River below McCloud dam. The McCloud River Club states that any significant increase in flows on the lower McCloud River during the early fishing season could harm trout populations and the ability of anglers to safely fish during the spring season (see section 3.3.5, *Recreation Resources*) and cite the state classification and reputation of this reach as a world class wild trout fishery under existing conditions.

Trout Unlimited, California Trout, and McCloud River Club alternative condition 19 recommends modifications to instream flows when flows are increasing between mid-March and mid-April (table 3-24). By recommending the minimum flows increase at a lower rate in relatively normal water years and decrease at a higher rate in wetter years, the Trout Unlimited, California Trout, and McCloud River Club alternative would increase the number of available angling days in late April and May. Trout Unlimited,

California Trout, and the McCloud River Club support the Forest Service's proposed minimum baseflow of 200 cfs at Ah-Di-Na (MC-1) but suggest that summer base flows at Ah-Di-Na should be the higher of (1) 200 cfs, or (2) the historic average summer base flows during normal years under the existing license (about 210 to 220 cfs).

McCloud RiverKeepers filed alternative condition 19 flows that proposed minimum flow releases at McCloud dam (MC-7) of 100 cfs year-round and a second compliance point at MC-7 with minimum flows ranging from 160 to 210 cfs (table 3-25). McCloud RiverKeepers' basis for their proposed flows is that they allow the project to produce more power than the Forest Service condition 19 flows and keep similar minimum flows as those under the current license will support existing fish populations.

NMFS filed a 10(j) recommendation that, as soon as listed salmonids are documented as within the McCloud River and affected by the project, PG&E should consider and implement NMFS's instream flow release ranges from McCloud dam during July-September to meet the thermal summer spawning requirements for winter-run Chinook salmon. Additionally, in its comments on the proposed action, NMFS recommended establishing a higher base flow downstream of McCloud dam so that winter/spring spill and its cessation would not result in appreciable differences in habitat conditions.

In addition to formal 10(j) recommendations, NMFS also submitted comments on the proposed action, specifically stating that release volumes (and instream flows) downstream of McCloud dam should be within a range acceptable for meeting the physical habitat and biological criteria requirements of listed salmonids. According to the NMFS comment, in the event of a turbine shutdown, a continuous flow bypass would be required to maintain suitable ranges of flow releases beneficial to listed salmonids.

American Whitewater recommended the following flows at McCloud dam: peak flows of 600 cfs during April and ramping down through May in wet and above normal years; at least 400 cfs during the month of April in below normal water years; and flows of 300 cfs ramping down to 200 cfs base flows by the opening day of trout season in dry and critically dry years.

Flow Compliance

PG&E and the resource agencies also propose ways to comply with the minimum flows that differ. PG&E proposes that the minimum flow requirements be met on the basis of the seven-day running average of mean daily flow. PG&E proposes the following: (1) individual mean daily flows may be less than the required minimum stream flow; (2) the instantaneous 15-minute stream flow should be at least 90 percent of the required minimum stream flow; and (3) the seven-day running average of the daily mean be equivalent to or greater than the required minimum flow.

California Fish and Game recommends and Forest Service condition 19 specifies that compliance be based on two measurements of flow: instantaneous and mean daily average. Instantaneous measurement of instream flows for the Lower McCloud River

and Iron Canyon Creek should occur at time intervals not to exceed 15 minute; mean daily flow would be calculated from all instantaneous readings between midnight of one day and midnight of the next. California Fish and Game and the Forest Service specify that the instantaneous flow should be at least 80 percent of the specified mean daily flow for minimum flows less than or equal to 10 cfs, and at least 90 percent of the specified mean daily flow for minimum flows greater than 10 cfs. California Fish and Game and the Forest Service specify that, should the mean daily flow be less than the required mean daily flow, while the instantaneous flows are higher than the 80-90 percent required, PG&E should begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release. Credit for such additional releases would not exceed 20 percent of the instantaneous flow amount, when used to attain the equivalent of the under-released volume.

California Fish and Game and Forest Service specify that compliance with minimum instream flows at Pit 7 (table 3-23) should be based on instantaneous flow measurements.

Table 3-21. Minimum flows proposed, specified, or recommended for gage MC-7 below McCloud dam (USGS gage 11367760) by PG&E, the Forest Service, California Fish and Game, and NMFS. (Source: Staff)

Release from McCloud Dam (cfs) by Water Year[a]											
All Water Years									Normal	Dry	Critically Dry
Month	**PG&E Final License Application (FLA)**	**PG&E Alt 4(e)**		**FS (revised 3/1/2010)**		**DFG & FS (original 1/29/2010)**		**NMFS[e]**			
October	150	175[f]		175[f]		200					
November	150	175[f]		175[f]		200					
December	Min. 200, Target 220	175[f]		175[f]		200					
January	Min. 200, Target 220	175[f]		175[f]		200					
February 1-14	Min. 200, Target 220	175[f]		175[f]		200					
February 15-29	Min. 200, Target 220	0-75% RO[b]	No flow change	0-75% RO[b]	No flow change	0-75% RO[b]	No flow change				
		76-89% RO[b]	No flow change	76-89% RO[b]	No flow change	76-89% RO[b]	No flow change				
		90-99% RO[b]	Increase flow by 75 cfs	90-99% RO[b]	Increase flow by 75 cfs	90-99% RO[b]	Increase flow by 50 cfs				
		100-119% RO[b]	Increase flow by 125 cfs	100-119% RO[b]	Increase flow by 125 cfs	100-119% RO[b]	Increase flow by 100 cfs				
		≥120% RO[b]	Increase flow by 175 cfs	≥120% RO[b]	Increase flow by 175 cfs	≥120% RO[b]	Increase flow by 150 cfs				

Release from McCloud Dam (cfs) by Water Year[a]										
All Water Years								Normal	Dry	Critically Dry
Month	**PG&E Final License Application (FLA)**	**PG&E Alt 4(e)**		**FS (revised 3/1/2010)**		**DFG & FS (original 1/29/2010)**		**NMFS[e]**		
March 1-15	Min. 200, Target 220	0-75% RO[b]	No flow change	0-75% RO[b]	No flow change	0-75% RO[b]	No flow change			
		76-89% RO[b]	Increase flow by 50 cfs	76-89% RO[b]	Increase flow by 50 cfs	76-89% RO[b]	Increase flow by 50 cfs			
		90-99% RO[b]	Increase flow by 50 cfs	90-99% RO[b]	Increase flow by 50 cfs	90-99% RO[b]	Increase flow by 50 cfs			
		100-119% RO[b]	Increase flow by 100 cfs	100-119% RO[b]	Increase flow by 100 cfs	100-119% RO[b]	Increase flow by 100 cfs			
		≥120% RO[b]	Increase flow by 150 cfs	≥120% RO[b]	Increase flow by 150 cfs	≥120% RO[b]	Increase flow by 150 cfs			
March 16-31	Min. 200, Target 220	0-75% RO[c]	No flow change	0-75% RO[c]	No flow change	0-75% RO[c]	No flow change			
		76-89% RO[c]	No flow change	76-89% RO[c]	No flow change	76-89% RO[c]	No flow change			
		90-99% RO[c]	Increase flow by 50 cfs	90-99% RO[c]	Increase flow by 50 cfs	90-99% RO[c]	Increase flow by 50 cfs			
		100-119% RO[c]	Increase flow by 100 cfs	100-119% RO[c]	Increase flow by 100 cfs	100-119% RO[c]	Increase flow by 100 cfs			
		≥120% RO[c]	Increase flow by 150 cfs	≥120% RO[c]	Increase flow by 150 cfs	≥120% RO[c]	Increase flow by 150 cfs			

Release from McCloud Dam (cfs) by Water Year[a]											
All Water Years								Normal	Dry	Critically Dry
Month	**PG&E Final License Application (FLA)**	**PG&E Alt 4(e)**		**FS (revised 3/1/2010)**		**DFG & FS (original 1/29/2010)**		**NMFS[e]**		
April 1-15	Min. 200, Target 220	0-75% RO[c]	No flow change	0-75% RO[c]	No flow change	0-75% RO[c]	No flow change			
		76-89% RO[c]	No flow change	76-89% RO[c]	No flow change	76-89% RO[c]	No flow change			
		90-99% RO[c]	No flow change	90-99% RO[c]	No flow change	90-99% RO[c]	No flow change			
		100-119% RO[c]	Increase flow by 50 cfs	100-119% RO[c]	Increase flow by 50 cfs	100-119% RO[c]	Increase flow by 50 cfs			
		≥120% RO[c]	Increase flow by 50 cfs	≥120% RO[c]	Increase flow by 50 cfs	≥120% RO[c]	Increase flow by 50 cfs			
April 16-last Fri/Sat	Min. 200, Target 220	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 until flow is 200 cfs & maintain 200 cfs release at MC-7 through June 30	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 until flow is 200 cfs & maintain 200 cfs release at MC-7 through June 30	0-89% RO[d]	Decrease flow by 50 cfs (maintain min. 200 cfs)			
Last Fri/Sat in April-April 30	Min. 200, Target 220	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)	≥90% RO[d]	No flow change			
						Decrease flow 50 cfs each Friday to 200 cfs				
May	150	200		200		200				
June	150	200		200		200				

Release from McCloud Dam (cfs) by Water Year[a]							
All Water Years					Normal	Dry	Critically Dry
Month	**PG&E Final License Application (FLA)**	**PG&E Alt 4(e)**	**FS (revised 3/1/2010)**	**DFG & FS (original 1/29/2010)**	**NMFS[e]**		
July	150	175[f]	175[f]	200	400-600	400-600	~600
August	150	175[f]	175[f]	200	300-400	300-400	~400
September	150	175[f]	175[f]	200	150-300	150-300	~400

Notes:

[a] Using most recent California Water Resources Sacramento Valley Water Year Type Index forecast.

[b] February 1 McCloud runoff (RO) percentage from DWR Bulletin 120.

[c] March 1 McCloud runoff (RO) percentage from DWR Bulletin 120.

[d] April 1 McCloud runoff (RO) percentage from DWR Bulletin 120.

[e] Flows recommended when listed salmonids are present in McCloud River.

[f] Mean daily flow at USGS gage 11367800 (MC-1) at Ah-Di-Na should be at least 200 cfs.

Shaded values are consistent with flows specified in Forest Service condition 19 (revised 3/1/2010).

The release requirement for the current license is 50 cfs from May 1 to Nov 30 and 40 cfs from Dec 1 to Apr 30 in all years.

Table 3-22. Minimum flows proposed, specified, or recommended for gage MC-10 below Iron Canyon dam (USGS gage 11363930). (Source: Staff)

Release from Iron Canyon Dam (cfs) by Water Year[a]												
	Wet				Above Normal				Below Normal, Dry, Critically Dry			
Month	**PG&E FLA**	**PG&E Alt 4(e)[c]**	**FS**	**DFG**	**PG&E FLA**	**PG&E Alt 4(e)[d]**	**FS**	**DFG**	**PG&E FLA**	**PG&E Alt 4(e)[e]**	**FS**	**DFG**
October	10	10	10		7	7	7		5	7	7	
November	10	10	10		7	7	7		5	7	7	
December	15	15[f]	15	same	10	10[f]	10	same	7	7[f]	7	same
January	15	15	15		10	10	10		7	7	7	
February	15	15[g]	15	as	10	10[g]	10	as	7	7[g]	7	as
March	20	>20[b,g]	>20[b]		15	15[g]	15		10	10[g]	10	
April	20	>20[b,g]	>20[b]	FS	15	15[g]	15	FS	10	10[g]	10	FS
May	15	15[g]	15		10	10[g]	10		7	7[g]	7	
June	15	15	15		10	10	10		7	7	7	
July	10	10	10		7	7	7		5	7	7	
August	10	10	10		7	7	7		5	7	7	
September	10	10	10		7	7	7		5	7	7	

Notes:

[a] Using most recent California Water Resources Sacramento Valley Water Year Type Index forecast.

[b] In March and April of wet water years, the flow control valve on Iron Canyon dam should be fully opened. Mean daily flow should be at least 20 cfs during this period.

[c] Defined as less than 100% of average April-July forecasted runoff in Bulletin 120 for McCloud River at Shasta Lake.

[d] Defined as 100-119% of average April-July forecasted runoff in Bulletin 120 for McCloud River at Shasta Lake.

[e] Defined as 120% or greater of average April-July forecasted runoff in Bulletin 120 for McCloud River at Shasta Lake.

[f] Flow changes during December would be performed as soon as weather and site accessibility permit.

[g] Flow changes during these months would be made once, within five business days of the actual publication date of that month's DWR Bulletin 120, or as soon as permitted by weather and site accessibility.

Shaded values are consistent with flows specified in Forest Service condition 19.

The release requirement for the current license is 3 cfs year-round. The previous month's flows would continue through the first several days of the months where forecasts are used to determine flows, until the new flow has been determined and the flow change made.

Table 3-23. Minimum flows proposed, specified, or recommended for gage PH-47 below Pit 7 dam (USGS gage 11365000). (Source: Staff)

Release from Pit 7 Dam (cfs)			
PG&E FLA	**Alt 4(e)**	**Forest Service**	**California Fish and Game**
150 (when Shasta Lake elevation <1,055 ft.)	NA	150 (year-round instantaneous flow)	Same as Forest Service

Notes: Shaded values are consistent with flows specified in Forest Service condition 19.

The release requirement for the current license is 150 cfs whenever the elevation of Shasta Lake is below 1,055 ft.

Table 3-24. Minimum flows proposed by the Forest Service, California Trout, Trout Unlimited, and McCloud River Club for gage MC-7 below McCloud dam (USGS gage 11367760). Specified flow increases are relative to flows specified in table 3-21 for the same date interval. Variations from Forest Service condition 19 are indicated in bold. (Source: Staff)

Release from McCloud Dam (cfs) by Water Year[a]

Month	**FS (revised 3/1/2010)**		**Trout Unlimited, California Trout, and McCloud River Club alt 4(e)**	
March 16-31	100-119% RO[b]	Increase flow by 100 cfs	100-119% RO[b]	Increase flow by **50 cfs**
	≥120% RO[b]	Increase flow by 150 cfs	≥120% RO[b]	Increase flow by 150 cfs
April 1-15	100-119% RO[b]	Increase flow by 50 cfs	100-119% RO[b]	**No flow change**
	≥120% RO[b]	Increase flow by 50 cfs	≥120% RO[b]	Increase flow by 50 cfs
April 16-last Fri/Sat	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 until flow is 200 cfs & maintain 200 cfs release at MC-7 through June 30	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 **(if 0-99%RO[d]) and by 75 cfs per week (if ≥100%RO[c])** until flow is 200 cfs. **Decrease flow by 50 cfs each Friday after May 1 until flow is 200 cfs[d].** Maintain 200 cfs release at MC-7 through June 30
Last Fri/Sat in April-April 30	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)

[a] Using most recent California Water Resources Sacramento Valley Water Year Type Index forecast.
[b] March 1 McCloud runoff (RO) percentage from DWR Bulletin 120.
[c] April 1 McCloud runoff (RO) percentage from DWR Bulletin 120.
[d] Matches Forest Service original condition 19.

Table 3-25. Minimum flows (cfs) proposed by the McCloud RiverKeepers for gage MC-7 below McCloud dam (USGS gage 11367760) and for gage MC-1 at Ah-Di-Na (USGS gage 11367800) compared to revised Forest Service condition 19 and PG&E alternative condition 19. (Source: Staff)

	McCloud dam (MC-7)		**Ah-Di-Na (MC-1)**		
Month	**Forest Service**	**RiverKeepers**	**Forest Service**	**Normal year**	**Dry Year**
January	175	100	200	160	160
February	175-350	100	200	160	160
March	175-650	100	200	170	170
April	175-700	100	200	170	170
May 1-15	175-550	100	200	170	160
May 16-31	175-400	100	200	200	160
June	175-200	100	200	200	160
July	175	100	200	200	160
August	175	100	200	200	160
September	175	100	200	210	180
October	175	100	200	210	180
November	175	100	200	210	180
December 1-15	175	100	200	210	180
December 16-31	175	100	200	170	170

Our Analysis

To develop the flows proposed in their license application, PG&E used three flow studies (HCM, Individual Base Modeling [IBM], and Physical Habitat Simulation Modeling [PHABSIM]) as well as macroinvertebrate, fisheries, and riparian vegetation studies to determine appropriate flows for aquatic and terrestrial biota. The HCM method was used to estimate total available habitat area in the Lower McCloud River for each trout life stage in order to evaluate the effects of varying stream flow on rainbow and brown trout habitat. Evaluation of both rainbow and brown trout was also included in an IBM based on two subreaches of the Lower McCloud River, which assessed key population responses, such as persistence, abundance, biomass, and size distributions under relevant hydrologic and thermal regimes. Instream flow incremental methodology (IFIM) and PHABSIM modeling were used to evaluate flow conditions and habitat criteria for each life stage of rainbow trout in Iron Canyon Creek downstream of Iron Canyon dam. In response to comments from resource agencies on the final license application, PG&E also performed PHABSIM model runs for the lower McCloud River for comparison with HCM and IBM results.

PG&E used the HCM to estimate suitable habitat for trout below McCloud dam under flows of about 200, 300, 400, 600, 800, and 1000 cfs (as measured at the Ah-Di-Na gage) at sites upstream of Squaw Valley Creek and at flows of about 300, 400, 600, 800, and 1000 cfs at sites downstream of Squaw Valley Creek. PG&E, in cooperation with interested relicensing participants, developed habitat criteria for rainbow and brown trout based on a review of existing literature. The developed habitat criteria included water depth and velocity criteria for fry, juvenile, adult, and spawning life stages. The results of PG&E's HCM study shows that the lowest study flows likely provide the most suitable habitat for rainbow and brown trout in comparison to the other measured flows.

The Forest Service reviewed the results of the HCM to evaluate its value in determining minimum flows for McCloud dam. The Forest Service determined that in the upper reach of the study area, maximum trout habitat would occur at flows between 190 and 250 cfs. In the lower reach the Forest Service suggested that maximum trout habitat would occur at flows between 250 and 450 cfs. However, the Forest Service also concluded that the HCM analysis could not be used to accurately determine flows that would provide maximum habitat.

PG&E also analyzed instream flows in the Lower McCloud River using IBM to evaluate the responses of rainbow trout and brown trout to various flow regimes and water quality conditions. PG&E evaluated five flow regimes in the model: unimpaired, historic (1990-2006), constant year round, constant summer varying only in winter, and constant winter flows varying only in summer. Results of the unimpaired and historic flow evaluation predicted that trout abundance was higher under project flows compared to pre-project unimpaired flows. The results of the year-round flow evaluation predicted that increasing flow above about 200 cfs at Ah-Di-Na (MC-1) would not increase trout abundance and would decrease the relative abundance of rainbow versus brown trout.

For varying summer flows, the model predicted that increasing summer flow above about 200 cfs would decrease relative abundance of rainbow trout. The varying winter flow evaluation produced variable results between sample sites: at the upper site near MC-1, the model predicted little change to trout abundance under simulated flows and at the lower site near MC-5, increasing flows above 200 cfs produced a decline in trout abundance. An increase in brown trout abundance was predicted as flows increased from 100 to 300 cfs. The results of the study suggest that more controlled flows at the McCloud dam may result in more stable habitat conditions for resident trout populations; however, PG&E noted that higher pre-project unimpaired flow regime may have been more suitable for extirpated species including listed salmonids and bull trout compared to resident trout.

PG&E used the PHABSIM model to compare spawning habitat in Iron Canyon Creek under the existing minimum flows to that under unimpaired flows. Compared to unimpaired conditions, the model results show the higher flows of the existing minimum flow regime at the top of the reach provide lower spawning weighted usable area (WUA) and the lower flows in the lower reach result in higher spawning WUA. The Forest Service evaluated the PHABSIM model results and noted that flows need to exceed 8 cfs before the entire channel and its margins are filled to some extent and flows in the range of 16 to 20 cfs provide some depth of flow in side channel areas. Furthermore, the Forest Service indicated base flow in the range of 7 to 10 cfs would be suitable for juveniles in the summer/fall period (July through October), and a spawning period flow in the range of 20 to 40 cfs is appropriate for March and April. Studies indicated that a self-sustaining rainbow trout population currently inhabits the waters of Iron Canyon Creek. Increasing the minimum instream flow from a year-round 3 cfs, to a seasonally variable flow, with a minimum of 7cfs will provide more usable habitat for all life stages of rainbow trout, while introducing a late winter-spring peak flow that mimics natural hydrologic conditions will provide more suitable habitat for spawning trout. Additionally, providing seasonally variable flow conditions will increase habitat heterogeneity, an important factor in providing for overall aquatic species diversity, and therefore, ecosystem health. The minimum mean daily flows specified by the Forest Service for lower McCloud River, Iron Canyon Creek, and Pit 7 afterbay, shown in tables 3-21 through 3-23, are the same as PG&E alternative condition 19 flows during all months; however, PG&E recommended that flow changes during February through May at Iron Canyon dam should be made within five business days of the actual publication date of that month's DWR Bulletin 120 because of potential seasonal access issues to the site. Similarly, PG&E recommended that flow changes in December be conducted as soon as weather and site accessibility permit.

Flows recommended by California Fish and Game (see tables 3-21through 3-23) are the same as those specified by Forest Service condition 19. California Fish and Game recommended flows differ from the revised Forest Service condition 19 flows for the reach below McCloud dam for the following time periods: February 15-29, April 16-30, and May through February 14. Following review of the modeling studies conducted by

PG&E, California Fish and Game determined that a base flow of 200 cfs below McCloud dam as measured at USGS gage no. 1136770 should be implemented (compared to 175 cfs proposed by PG&E and the Forest Service), with flow augmentation from February 14 to June 30 (3-WQ2). The flows recommended by California Fish and Game for Iron Canyon dam and Pit 7 afterbay are the same as the Forest Service recommended flows.

As previously stated, during pre-license application consultation the resource agencies proposed several methods (HCM, IBM, PHABSIM) to analyze the relationship between flow and quality and quantity of aquatic habitat available to target species and life stages in the lower McCloud River. Despite differences among methods, the predicted optimum flow for peak available habitat demonstrated consistency. PHABSIM modeling runs first using all study transects (TM-74) and second using a subset of transects (TM-75) provided nearly identical estimates of flows for peak habitat for each life stage evaluated, demonstrating the robustness of the model. Similarly results of IBM and HCM generally indicated that flows at the lower end of the range studied (175-200 cfs) provide greatest abundance or highest habitat values, respectively. The various flow recommendations from licensing participants are all designed to create a seasonal hydrograph that is more typical of natural patterns for the lower McCloud River with increasing flows during late winter and early spring followed by decreasing flows through late spring to base flow through the summer and fall. Differences among flow recommendations among participants relate to base flow and where it is measured and the rate of increase and decrease during late winter through late spring.

All recommendations concur that compliance should be measured at McCloud dam (gage MC-7) in order to ensure the desired minimum base flow and seasonal flow variation in the upper reach between the dam and Ah-Di-Na which is not created under the current license conditions where minimum flow compliance is set at gage MC-1 at Ah-Di-Na. Under the current license flow augmentation from Hawkins Creek provide the seasonal flow structure downstream of Ah-Di-Na. Revised Forest Service condition 19 specifies and PG&E alternative condition 19 proposes a second compliance location at MC-1 to assure that minimum base flow downstream of this point is 200 cfs even during periods when flows from Hawkins Creek are very low. The Forest Service/PG&E proposal for base flow would provide minimum flow at McCloud dam (175 cfs) that are more than three times those under the current license (50 cfs). The difference in available habitat (HCM or PHABSIM) or abundance of 1-year and older fish (IBM) between 175 and 200 cfs is generally less than 10 percent; area available at 175 cfs are generally within 10 percent of peak area for fry, juveniles, and adults. Peak area for trout spawning was predicted by PHABSIM and HCM at between 300 cfs and 400 cfs; spawning habitat area at 175-200 cfs was predicted at less than 50 percent of peak. It should be noted that rainbow trout spawn during spring when most of the recommendations augment minimum flow to reflect a more typical natural seasonal hydrograph.

Forest Service, PG&E, California Fish and Game recommend increasing flow twice a month beginning in mid-February depending on the relative rate of runoff in a given year as determined in DWR Bulletin 120. The flow increase recommended by

Forest Service, PG&E, and California Fish and Game (table 3-21) for a given runoff condition (0-75 percent, 76-89 percent, 90-99 percent, 100-119 percent, and greater than120 percent) is the same between March 1 and April 15; the first increase implemented on February 15 is 25 cfs higher in the Forest Service/PG&E condition than in the California Fish and Game recommendation when the runoff factor is 90 percent or higher. Forest Service/PG&E begin to decrease flow at weekly intervals beginning on 16 April (as long as the flow is greater than 200 cfs) until flows at MC-7 reach 200 cfs or until 1 May when flows are set at 200 cfs at McCloud dam. On July 1, flow is decreased to base flow conditions, 175 cfs at McCloud dam and 200 cfs at MC-1. On April 16. if the runoff factor is less than 90 percent California Fish and Game recommends the same flow decrease as Forest Service/PG&E; however, if the runoff factor is greater than 90 percent, California Fish and Game recommends maintaining the existing flow until the last Friday in April then decreasing to 200 cfs at McCloud dam. California Fish and Game's recommendation would increase flows more slowly during the first two weeks at the beginning of the late winter-spring flow augmentation, but maintain higher flows than Forest Service/PG&E during normal to wet years for a 2 week period at the end of April. The Forest Service/PG&E recommendation could benefit rainbow trout spawning for the two weeks during the early in the season, while the California Fish and Game recommendation could benefit late spawning rainbow trout during the last two weeks of the flow augmentation program. The difference in the actual benefit from these two flow scenarios to the trout population would probably vary from year to year depending on a range of additional factors that can influence the onset, duration, and success of spawning.

Although California Fish and Game recommend minimum flows at 200 cfs during May through February 14 measured at one compliance point near the McCloud dam, the Forest Service recommended minimum flows of 175 cfs during the same period as measured at McCloud dam and 200 cfs as measured downstream of McCloud dam at USGS gage no. 11367800 (MC-1/ Ah-Di-Na). California Fish and Game did not provide quantitative evidence that an increase of 25 cfs at McCloud dam would provide a substantial improvement in fish habitat. Various modeling exercises performed by PG&E indicate that this 25 cfs increase would have a minimal effect on available aquatic habitat. The Forest Service indicated that the lower 175 cfs release from McCloud dam allows discharge from Hawkins Creek near Ah-Di-Na to exercise greater natural control on fluctuations in the seasonal hydrograph downstream of Ah-Di-Na. California Fish and Game did note that higher base flows from McCloud may provide better conditions for recreation and reduce the potential for excessive harvest during low flows; such effects on recreational fishing are discussed in section 3.3.5, *Recreation Resources.*

California Trout, Trout Unlimited, and McCloud River Club (California Trout) submitted recommendations (table 3-24) for the late winter-spring flow augmentation that differ slightly from Forest Service/PG&E and California Fish and Game. During the second half of March, if the runoff factor is less than 120 percent (wet years), their flow recommendation would increase flows 50 cfs, half of that recommended by Forest

Service/PG&E/California Fish and Game; during the first half of April if runoff is less than 102 percent they recommend no flow increase compared to 50 cfs increase recommended by Forest Service/PG&E/California Fish and Game. When flows begin decreasing on 16 April, if the runoff factor is greater than 100 percent, California Trout recommends decreasing flow by 75 cfs per week, 25 cfs higher than Forest Service condition 19. The overall effect of the California Trout recommendation compared to the Forest Service recommendation is to increase flows at a slower rate at the beginning of the season during normal to dry years and decrease flows at a faster rate at the end of the season during normal to wet years. These slight changes in the rate of increase and decrease in spring flows are not likely to have a significant effect on available habitat for various trout life stages, but could result in lower instream flows and associated more wadeable conditions during the early trout fishing season.

California Trout, Trout Unlimited, and the McCloud River Club indicated that their alternative flows would likely meet the needs of all life stages of rainbow and brown trout and provide optimum fishing conditions in the Lower McCloud River. Under these alternative flows, during the period March 16 to May 21 when the McCloud River runoff factor is 100 to 119 percent, the number of days when flows greater than 300 cfs would occur is about 60 days per year rather than about 95 days per year under the Forest Service condition 19 flows. During periods when runoff is equal to or greater than 120 percent, the number of days that flows would be greater than 300 cfs would be about 94 and the number days flows would be greater than 600 cfs would be 37, compared to 116 and 45 days, respectively, under Forest Service revised condition 19. All other seasonal flows for each runoff scenario would be the about same. The alternative flows proposed by California Trout may provide more days with optimum wading-condition flows (less than 300 cfs) for fishing (see discussion in section 3.3.5, *Recreation Resources*); however, there is no substantial evidence that these flows would provide additional benefit to resident fish populations.

The McCloud RiverKeepers recommended that minimum flows be established at 100 cfs year-round at McCloud dam and flows varying by month ranging from 160 to 210 cfs at MC-1 (table 3-25) with augmentation from Hawkins Creek. McCloud RiverKeepers based this recommendation on the quality trout population and recreational fishery that exists at lower flows under current license conditions and the significant decrease in flow available for power generation under the other relicensing recommendations for flows. While this recommendation would increase minimum flows compared to the current license, it would not create a more natural seasonally varying flow regime supported by the other recommendations. Seasonal variation in flow typical of most streams in lower mountain and foothill landscapes can benefit aquatic habitat and a balanced aquatic ecosystem with a diverse seasonal forage base and robust age structure among species at the top of the food chain. PG&E did not perform a flow-habitat study of the Pit 7 afterbay downstream of Pit 7 dam. However, PG&E proposed, California Fish and Game recommended, and the Forest Service specified a minimum instream flow of 150 cfs in the Pit 7 afterbay, downstream of Pit 7 dam. This minimum instream flow

proposal reflects current operating procedures. The Pit 7 afterbay is operated run-of-river, therefore flow-habitat is largely influenced by natural seasonal variability. The afterbay supports a diverse warmwater fish assemblage which exhibits a recurrent exchange with populations in the Pit River arm of Lake Shasta. Maintaining the 150 cfs minimum flow downstream of Pit 7 dam would ensure adequate flow to maintain habitat for aquatic organisms even during critically dry periods. Furthermore, the 150 cfs minimum flow would ensure continuity with the Pit River arm of Lake Shasta when Lake Shasta's water surface elevation is below 1,055 ft msl.

Ramping Rates

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates (Bradford et al., 1995; Hunter, 1992; Huntington, 2004), and may also cause adverse effects on amphibians including the early life stages foothill yellow-legged frogs. Under the existing license, there are no ramping rate requirements downstream of any project impoundments and no ramping is required when changing between seasonal required minimum flow rates. However, occasional upramping is conducted at the project prior to uncontrolled spill events in order to minimize effects to downstream aquatic habitat and to ensure public safety.

PG&E does not propose to implement any ramping except prior to the start of an uncontrolled spill event at McCloud dam, during which PG&E would make a good faith effort to ramp up water flows at a target rate of no more than 100 cfs per hour. These ramp rates are consistent with current practice, although the existing project license does not require ramping requirements downstream of any project impoundment. No ramping is proposed when making seasonally required changes to minimum flow rates.

California Fish and Game recommends and Forest Service condition 19 specifies that PG&E ramp down all McCloud dam spill events once the spill reaches 1,000 cfs, at which point the control valve could be used to control the discharge. Downramping would proceed at a 150-cfs decrease every 48 hours until the prescribed minimum instream flow value for that time period is reached. Additionally, operational controllable spills would be upramped in increments not to exceed 200 cfs in a 24-hour period. Upramping and downramping related to testing of the flow valve at Iron Canyon dam should occur in 20-cfs increments, assuming a 200-cfs maximum. Ramping increments would be spaced at least 15 minutes apart for upramping and 30 minutes apart for downramping. In addition, valve safety compliance testing at Iron Canyon dam should only occur between March 5 and March 15.

PG&E alternative condition 19 proposes the same ramping rates specified by the Forest Service and recommended by California Fish and Game for McCloud dam and Iron Canyon dam. PG&E alternative condition 19, however, proposes an extension of the window available to perform valve safety testing for dam compliance at Iron Canyon dam to between March 1 and March 31, to allow for potential road access issues resulting from inclement weather conditions. NMFS filed a 10(j) recommendation that PG&E

should modify ramping to minimize impacts on listed salmonids, as soon as listed salmonids are documented as within the McCloud River and affected by the project.

American Whitewater and Friends of the River alternative condition 19 recommends modified downramping and ramping rates. The American Whitewater and Friends of the River recommend downramping all spill events based on stage rather than flow at McCloud dam; that is, at a rate of 0.2 ft every 48 hours, as measured at MC-7, until the prescribed minimum flow is reached. Upramping during operational controllable spills would be conducted at a rate not to exceed 1.0 ft every 24 hours, as measured at MC-7.

Our Analysis

PG&E did not conduct any analyses of the potential for fish stranding to occur in the project reaches. There is, however, some potential for fish to be stranded at times when flows are reduced following spill events or valve test flow releases. In these cases, implementing the ramping rates recommended by the Forest Service and California Fish and Game would help to limit the potential for stranding of fish and macroinvertebrates. Additionally, implementing ramping rates would decrease the potential to disrupt salmonid fry and foothill yellow-legged frogs, inhabiting shallow edge water habitats, which are particularly vulnerable to water velocity changes during up-ramping.

Expansion of the valve testing window from March 1 to March 31 would provide flexibility, given that late winter weather conditions can make access to Iron Canyon dam difficult and road conditions unsafe during March. The timing, frequency, and magnitude of natural peak spring runoff events can be highly variable depending of storms and snowmelt; therefore shifting the valve test 1-2 weeks earlier or later to accommodate safety and access is not likely to have adverse effects on aquatic resources.

The potential for stranding of fish and other aquatic organisms during rapid changes in flow is a function of changes in water depth rather than directly of flow rate. However the relationship between flow and water depth (stage-discharge) varies along the stream channel depending on the complexity and configuration of the channel cross-section and in particular the dimensions of the floodplain. USGS gage locations are typically selected specifically for uniform cross-sections with minimal complexity to provide an accurate and reliable stage discharge relationship to estimate flow from water surface elevation (not depth) for a wide range of flows. However, the gage location may not be indicative of the stage discharge relationship throughout much of the reach that it represents. The recommendation by American Whitewater to adjust the ramping rate based on stage (water level) rather than flows was based on the shape of the stage and discharge curves from the Ah-Di-Na gage. American Whitewater does not provide evidence that using stage measurements at the Ah-Di-Na gage as a guide for ramping would be any more appropriate for protection of aquatic resources than the use of flow measurements.

Flow Monitoring and Determination of Water Year Type

PG&E proposes to monitor compliance with minimum flows using existing USGS flow gages in each reach. For McCloud dam, minimum flows would be measured at two compliance points including USGS flow gage no. 11367760 (MC-7) or directly at McCloud dam and USGS flow gage no. 11367800 (Ah-Di-Na or MC-1); for Iron Canyon dam, minimum flows would be measured at USGS gage no. 11363930 (MC-10), and for Pit 7 dam, minimum flows would be measured at USGS gage no. 11365000 (PH-47).

Forest Service condition 19 specifies that PG&E operate and maintain existing gages, under USGS supervision, that are needed to determine the river stage and minimum streamflow on the Lower McCloud River below McCloud dam, Pit River below Pit 7 dam, and Iron Canyon Creek below Iron Canyon dam. Forest Service condition 19 also specifies the following: that any modification of these gage facilities that may be necessary to measure the new minimum streamflow releases be completed within 3 years of issuance of the new license; that flows be documented in publicly available and readily accessible formats; that flow data at gage MC-1 be real-time data and posted on the California Data Exchange Center (CDEC) or its successor website; and that flow data be subject to quality assurance / quality control (QA/QC) review by PG&E before it is made available to USGS for review and publication on the internet. Forest Service condition 19 further specifies that flow values (generally 15-minute recordings) used to construct the 24-hour average flows be made available to the resource agencies upon request.

California Fish and Game filed a 10(j) recommendation that PG&E have only one McCloud dam compliance point at the upper gage nearest the dam (MC-7/USGS 11367760), instead of at the Ah-Di-Na gage (MC-1/USGS 11367800) below the confluence with Hawkins Creek. NMFS filed a concurring 10(j) recommendation, specifically stating that PG&E should move the McCloud dam compliance point either to McCloud dam or gage MC-7. This would allow accretion from Hawkins Creek 1 mile downstream to provide seasonal variability to the Lower McCloud River flow regime. The California Sportfishing Protection Alliance also supports moving the flow compliance point to just downstream of McCloud dam. Forest Service condition 19 specifies that flows shall be measured for compliance at both the Ah-Di-Na gage and either at gage MC-7 or directly at McCloud dam.

Forest Service condition 19 specifies the methodology that would be followed to determine the water year type that would guide the implementation of minimum flows. Forest Service condition 19 specifies that PG&E use the forecast of unimpaired runoff of the Sacramento River near Redding that is provided by the DWR Bulletin 120 report. Each month between January and April, PG&E would determine the water year type based on the Bulletin 120 water year forecast and would manage release rates in the minimum flow table for the month based on that forecast. The May forecast would be used to establish the final water year type for the remaining months of the water year. PG&E would implement minimum instream flows triggered by the water year within

two business days of the actual publication date of Bulletin 120. PG&E alternately proposed that for Iron Canyon dam between February and May, given potential weather-related access difficulties, compliance with flow changes be implemented within five business days.

Our Analysis

The continued use of two compliance points for minimum flows at McCloud dam would ensure that adequate flows are provided in reaches directly below the dam and in the lower reaches that receive flow input from other tributaries to the Lower McCloud River.

Funding the continued O&M of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in a new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the license.

Funding the operation of the gages also would help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license. Flow data, following a QA/QC review, should be available to the public and accessible, including postings on the internet. Public availability of flow data would provide recreational and other water users with useful information on the conditions of project reaches and reservoirs. Specifying the methodology for determining water year type would be an essential requirement for determining compliance with minimum flows under the new license, because it would aid the licensee in implementing the appropriate minimum flow release schedule and other measures that are dependent on water year.

PG&E and Forest Service/ California Fish and Game have proposed different methods to measure compliance with the proposed minimum flow releases, although the two approaches appear to accomplish essentially the same goal by requiring compensation for under release of minimum flows. Flow would be measured instantaneously at 15-minute intervals and the instantaneous measurements would be averaged over a 24-hour period for a mean daily flow. PG&E proposed that all instantaneous measurements be within 90 percent of the target minimum flow (e.g., for a target minimum flow of 175 cfs at McCloud dam all measurements should be greater than 157.5 cfs). Forest Service/California Fish and Game provide more flexibility at Iron Canyon dam where target minimum flows for much of the year are less than 10 cfs, requiring minimum flows be no less than 80 percent of the target when the target is less than 10 cfs, and no less than 90 percent of the target when the target is greater than 10 cfs. PG&E has proposed that compliance with the target minimum flow be determined on the basis of the seven consecutive day running average of the daily means. Individual daily means would not need to meet the target minimum flow as long as the

7-day average does and the instantaneous measurements meet the 80/90 percent criteria; thus, if individual days failed to achieve the daily mean minimum flow, the under-release could be averaged out by over-releases on other days within each successive 7-day window (averaging period). California Fish and Game and the Forest Service recommend that individual daily mean flows must meet the target minimum flow; the failure to comply with the minimum flow on a given date must be corrected by releasing an appropriate additional volume within seven days of identifying the under-release. The proposals to measure compliance with minimum instream flows by PG&E and Forest Service/California Fish and Game generally accomplish the same objective by requiring compensation for dates where there is an under release of flow; however, the proposals differ in the methodology used to calculate/document the compensation for under release of minimum instream flows**.**

Water Quality Monitoring

PG&E proposes to prepare a water quality monitoring plan within 1 year after license issuance. PG&E would prepare the plan in consultation with the California Water Board, Forest Service, California Fish and Game, and other interested parties. The plan would include monitoring methodologies, survey rationale, and water quality standards, as appropriate, for temperature, turbidity, and bacteria (total or fecal coliform), as well as a process and schedule for reporting survey and monitoring results.

Forest Service condition 20 specifies content for the water quality and temperature monitoring plan for the project. Under the plan, the following would occur: periodic monitoring of all project reservoirs once every five years for contaminants; periodic monitoring of DO at McCloud, Pit 6, and Pit 7 reservoirs; annual monitoring (May-September) for 10 years, of potential water temperature effects to beneficial uses including recreation, aquatic habitats, and target species, as a result of modified instream flows and reservoir operations, with potential additional monitoring if temperatures above 20°C occur in reservoirs or downstream reaches; continuous turbidity monitoring in the Lower McCloud River (at MC-7 or MC-1) during the fishing season, as well as in Iron Canyon Creek (at MC-10) for at least five years after license issuance to ensure PG&E's repairs reduce sedimentation into the creek below the dam; and implementation of BMPs to satisfy Aquatic Conservation Strategy objectives within the Northwest Forest Planning Area.

PG&E alternative condition 20 proposes that the water quality and monitoring plan be filed within two years following issuance of license and appropriate consultation, and noted that routine maintenance and deployment of temperature and turbidity sensors may be delayed as a result of high flows or late snows during spring months. In addition, PG&E recommended that if turbidity and sedimentation in Iron Canyon Creek is reduced during the first five years of monitoring and with the consent of the Forest Service, turbidity monitoring at this location would be terminated. Further, PG&E indicated that maintenance and installation of temperature sensors on private lands would be subject to landowner permission.

NMFS recommends that as soon as listed salmonids are documented as within the McCloud River and affected by the project, PG&E should modify the project's structures or operations necessary to mitigate direct, indirect, or cumulative water temperature and quality impacts or enhance water temperature and quality conditions. According to the NMFS recommendation, these actions would include water temperature management to ensure the optimal survival and distribution of all life stages of anadromous listed salmonids within and downstream of the Commission-delineated physical project boundaries.

Forest Service condition 16 reserves the right for the Forest Service to modify its conditions to respond to any water quality certification issued for this project by the California Water Board.

Our Analysis

Development and implementation of the water quality and temperature monitoring plan would provide guidance for monitoring potential effects of project operations on water quality for the term of the license and ensure proper conditions for aquatic biota. Monitoring temperature annually for a 10-year period would ensure that new project minimum flows and operations during all water-year types are not adversely affecting habitat conditions for aquatic species. Continuous monitoring of turbidity in the Lower McCloud River (at MC-7 or MC-1) during the fishing season and providing real-time data monitoring on the data would be useful for determining the effects of mudflows from Mud Creek on the project waters and inform the public of such occurrences. The implementation of BMPs under the plan would also minimize potential affects to water quality from new construction or maintenance activities at the project and satisfy Aquatic Conservation Strategy objectives within the Northwest Forest Planning Area.

PG&E's proposed construction of the Pit 7 afterbay transmission line may result in soil erosion along inner gorge slopes, leading to increased sedimentation and turbidity in the Pit River. PG&E's plan to conduct erosion control below Iron Canyon dam and monitor turbidity as specified by the Forest Service in Iron Canyon Creek for a minimum of five years would ensure that the erosion control practices are effective in reducing sedimentation in the Pit River.

Although measurements of fecal coliform or *E. coli* taken at McCloud or Iron Canyon reservoirs or McCloud River have not exceeded basin plan criterion, the periodic monitoring of all project reservoirs once every five years for *E. coli* and contaminants would serve to ensure proper water quality conditions for recreational users at the project. Periodic monitoring of DO at McCloud, Pit 6, and Pit 7 reservoirs for the term of the license would evaluate habitat conditions for aquatic biota.

The Commission cannot require PG&E to access private land that is outside of the project boundary. PG&E would need to coordinate with private landowners to gain access to any private land outside of the project boundary, as proposed in PG&E alternative conditions.

In its final license application, PG&E proposed to develop and implement a water quality monitoring plan in consultation with agencies and stakeholders within 1 year of license issuance. The proposed water quality monitoring plan did not provide specific details associated with monitoring frequency, locations, or parameters. Development and implementation of the water quality monitoring plan specified by the Forest Service would ensure a consistent monitoring frequency and duration and provide specific locations and water quality parameters to be monitored for the term of the license.

PG&E alternative condition 20 proposes a timeframe to develop an approvable water quality monitoring plan of up to 16 months. Although coordination with agencies and other stakeholders can be difficult, a time frame of one year from license issuance is typically adequate to address the specific monitoring and management protocol, scheduling, and reporting components of the water quality monitoring plan.

The lower McCloud River currently supports a thriving cold-water fishery. While different species possess differing optimal water quality and temperature conditions, current thermal conditions in the McCloud River are suitable to support salmonids, including listed anadromous salmonids. The Keswick and Shasta dams on the Sacramento River downstream of the McCloud dam are existing barriers to upstream passage of anadromous salmonids including Chinook salmon and steelhead. As part of the restoration plan for these listed species, studies are ongoing to assess the feasibility of alternatives to facilitate fish passage at these two structures. None of the listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River until upstream migration of listed species is implemented through Lake Shasta. Therefore, at this time, the modification of project structures or operations to minimize or eliminate water temperature and quality conditions as recommended by NMFS would provide no benefit for listed species at this time.

Fish Entrainment at Project Tunnels and Intakes

Entrainment of fish into hydroelectric intakes typically causes injury or mortality to a portion of the fish that are entrained, with mortality rates tending to be lower for smaller fish and higher for turbines that operate under higher levels of head, with higher rotational speeds, and with smaller passageways (Cook et al., 1997; Franke et al., 1997; Winchell et al., 2000). PG&E evaluated the potential for fish entrainment in its license application, and concluded that effects of the project on trout populations were likely to be minor, and did not propose any measures to reduce or mitigate for fish entrainment.

NMFS submitted comments on the final license application proposed action and action alternative, stating that if listed salmonid species become established in the McCloud River and fish passage is prescribed over McCloud dam, then the powerhouse intakes would require appropriate screening.

Our Analysis

PG&E developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area.

The study included a tracking study, mark-recapture study, literature review, review of the likelihood of entrainment based on the physical characteristics of each intake, and assessment of fish populations upstream and downstream of each intake.

The results of PG&E's entrainment studies and literature review indicate that entrainment potential at the existing and proposed McCloud-Pit reservoir intakes is probably low because of generally slow maximum intake velocities compared to the swim burst rates of resident fish species, absence of obligatory migratory fish species, and low instances of interbasin fish movement. Although the fish stocking program indicated by PG&E and California Fish and Game is related to meeting recreational fishing demands, supplementation of wild fish would serve to augment fish populations in project reaches and offset the negligible effects of entrainment. PG&E and California Fish and Game could use population assessment data to guide the fish stocking program and ensure that the stocking effort is directed to reaches where it would provide the most benefit to trout populations.

The Keswick and Shasta dams on the Sacramento River downstream of the McCloud dam are existing barriers to upstream passage of anadromous salmonids including Chinook salmon and steelhead. As part of the restoration plan for these listed species, studies are ongoing to assess the feasibility of alternatives to facilitate fish passage at these two structures. None of the listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River until upstream migration of listed species is implemented through Lake Shasta. Therefore, the screening facilities recommended by NMFS would provide no benefit for listed species.

Fish Population Monitoring

Monitoring of aquatic resources could provide a tool for assessing the success or identify appropriate modifications to either the new prescribed flow regimes or the gravel and sediment management plan. In its final license application, PG&E did not propose developing and implementing a fish population monitoring plan. Forest Service condition 27 specifies that, within one year after license issuance, as a component of the aquatic biological management plan, PG&E develop a plan to monitor fish populations in project reaches, in consultation with the Forest Service, California Fish and Game, potentially affected tribes, and other interested parties.

The plan specified by the Forest Service would involve:

- Collection of data on population trends, age-class structure, and condition factors.
- A list of fish species to be monitored and use of same sampling methods established during relicensing surveys.
- Fish surveys would be conducted once every three years, or at frequency jointly agreed to by the agencies, potentially affected tribes, or other interested

parties, for the first nine years and then once every five years for the term of the license.

- PG&E would provide the results of fish monitoring to the agencies as a component of the aquatic biological monitoring technical report every five years. In addition to describing the results, the report would include a map (compatible with Forest Service geographic information system [GIS]) that includes baseline data from the licensing study plan surveys and updated data from periodic monitoring.

PG&E alternative condition 27 proposes the addition of a specific subsection to the aquatic biological management plan specified by the Forest Service entitled "fish populations" for clarity and specificity. In addition, PG&E indicated that fish population monitoring of project reservoirs was unnecessary since McCloud and Iron Canyon reservoirs are supported by trout stocking and there are no proposed changes to project operations in Pit 6 and Pit 7 reservoirs; furthermore, the final license application did not propose significant changes to reservoir operations and management that could reasonably be expected to affect reservoir populations. PG&E supported fish population monitoring in project streams as specified by Forest Service condition 27 with some minor changes to the methodology.

PG&E alternative condition 27 proposes that one year to develop the aquatic biological management plan following issuance of license specified by the Forest Service would not provide adequate time to complete the plan. PG&E suggests that two years would be necessary to complete the plan and provided rationale for this determination based on the time required to receive license articles from the Commission; review, accept, and implement the license articles; procure a contractor; develop the draft plan; and schedule and complete relicensing participant meetings to review and finalize the plan. PG&E alternative condition 27 proposes a timeline for plan development of up to 16 months.

Our Analysis

Monitoring fish populations would assist with determining the effects of any changes in operation or measures that are implemented in the new license to enhance resident fish populations, and for assessing whether any modifications or additional measures are needed. The monitoring program would also provide information to guide studies and management decisions of the Listed Salmonid Technical Integration Committee. Potential changes to project operations under a new license could alter the existing flows and water quality characteristics of project streams and affect resident stream fish populations. Monitoring fish populations in project streams would help determine if changes to project operations under the new license are affecting fish populations. Because reservoir fish populations would likely be monitored as a component of plans to stock fish in project reservoirs, and no substantial changes to project reservoirs are expected as a result of the new license, additional monitoring of reservoir fishes under the aquatic biological management plan would be redundant.

PG&E alternative condition 27 proposes that a separate subsection of the aquatic management plan be included specifically outlining the conditions for monitoring fish populations. Addition of a specific fish population monitoring subsection to the aquatic management plan specified by the Forest Service would improve understanding of the requirements of the plan specific to this aquatic resource, without altering Forest Service condition 27.

PG&E alternative condition 27 proposes that the timeframe to develop an approvable aquatic biological management plan could require up to 16 months. While coordination with agencies and other stakeholders can be difficult and a time frame of one year from license issuance should be adequate to thoroughly address the specific monitoring and management protocol, scheduling, and reporting components of the aquatic biological management plan.

Benthic Macroinvertebrates

The effects of project operations on sorting and distribution of stream substrate affects benthic habitat and could affect the benthic invertebrate community, an important source of forage for other aquatic biota including resident trout. Forest Service condition 27 specifies that, within one year after license issuance, as a component of the aquatic biological management plan, PG&E monitor benthic macroinvertebrates in the Lower McCloud River and Iron Canyon Creek, in consultation with the Forest Service, potentially affected tribes, and other interested parties.

The monitoring specified by the Forest Service would involve:

- Collection of data on population robustness and heterogeneity, composition of functional feeding groups, and pollution tolerance and intolerance trends.
- Benthic macroinvertebrate sampling would be conducted once every three years during the first nine years and then once every five years for the term of the license.
- PG&E may modify the number of sampling sites, site locations, and the frequency of monitoring, following consultation with the Forest Service, potentially affected tribes, and other interested parties.
- Ten percent of the benthic macroinvertebrate monitoring sites would be located within the first one and one-half miles of the Lower McCloud River below the McCloud dam.
- PG&E would provide the results of benthic macroinvertebrate sampling to the agencies as a component of the aquatic biological monitoring technical report every five years. In addition to describing the results, the report would include a map (compatible with Forest Service GIS) that includes base data from the study plan surveys and updated data from periodic monitoring.

PG&E alternative condition 27 proposes that periodic benthic macroinvertebrate sampling specified by Forest Service condition 27 should initiate following the

"Commission's acceptance of the monitoring plan" rather than following license issuance. PG&E also indicated that required consultation concerning modifications to sampling protocols should include only the Forest Service and other interested parties and that the number of sampling sites and site locations should be consistent with sites sampled during the relicensing studies on Forest Service lands. In addition, PG&E noted that sampling methods and data protocols used to monitor benthic macroinvertebrates should be the same as those used during the relicensing studies.

Our Analysis

Benthic macroinvertebrate monitoring would assist with determining the effectiveness of measures implemented in the new license for enhancing water quality, substrate characteristics, and resident fish populations, and for assessing whether any modifications or additional measures are needed.

Initiating the benthic macroinvertebrate monitoring component of the aquatic biological management and monitoring following Commission approval, would provide adequate time to conduct sampling once every three years for the first nine years (i.e., three annual surveys) as specified by the Forest Service.

Sampling benthic macroinvertebrates using the sampling methods and data protocols used during the relicensing studies would ensure the comparability of the methods and the data from the two programs, and would minimize biases associated with potential changes in sampling protocols. Sampling at site locations used during the relicensing studies would help in identifying changes, if any, to the benthic macroinvertebrate community following relicensing.

Fish Passage and Restoration

The design and condition of some culverts on reservoir tributaries at Forest Service roads could act as impediments to fish passage. Forest Service condition 27 specifies that, within one year of license issuance, as a component of the aquatic biological management and monitoring plan, PG&E develop specific management actions and schedule for providing fish passage and monitoring for affected reservoir streams, in consultation with the Forest Service, California Fish and Game, potentially affected tribes, and other interested parties.

These management actions specified by the Forest Service would include:

- Constructing or correcting fish passage structures on Dudlun, McGill, Cedar Salt Log, Little Gap, and Gap Creek on Iron Canyon reservoir and Tarantula Gulch and Battle Creek on McCloud reservoir.
- Maintaining the fish passage structures on an annual basis, if needed, concurrent with road condition surveys.
- Monitoring each stream reach every three years to determine fish passage structure effectiveness

- PG&E would provide the results of fish passage monitoring concurrently with aquatic monitoring reports.

PG&E alternative condition 27 proposes that roads impeding fish passage on tributaries to the project reservoirs are not project roads. However, PG&E did indicate that it would provide compensation to the Forest Service for fish passage maintenance as part of an off-license road agreement specified in section 3.3.7, *Land Use and Aesthetic Resources*.

NMFS recommends that, as soon as listed salmonids are documented within the McCloud River and affected by the project, PG&E should, in consultation with the U.S. Bureau of Reclamation, NMFS, FWS, California Fish and Game, and the Commission, create and implement a Listed Salmonid Technical Integration Committee. According to the recommendation, the Listed Salmonid Technical Integration Committee would assess and mitigate the project's affects on listed salmonids and could be integrated with the existing Fish Passage Steering Committee (or affiliated Technical Advisory Committees) to begin discussions of passage logistics at Shasta dam habitat assessments that include studies of McCloud River historic anadromous salmonid habitats.

Our Analysis

PG&E conducted a survey of fish passage conditions within the inundation zone of the project reservoirs in October 2007 and found no impediments to fish passage; however, in the final license application, PG&E noted that upstream fish impediments may exist at road crossings along FR 37N78 upstream of the influence of reservoir fluctuations. The Forest Service owns and maintains the roads that may block fish passage to project reaches. The Forest Service roads span the project reaches with the use of culverts and bridges which may restrict flow and entrain large debris resulting in project reaches becoming impassable to some fish.

The Keswick and Shasta dams on the Sacramento River downstream of the McCloud dam are existing barriers to upstream passage of anadromous salmonids including Chinook salmon and steelhead. As part of the restoration plan for these listed species, studies are ongoing to assess the feasibility of alternatives to facilitate fish passage at these two structures. None of the listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River until upstream migration of listed species is implemented through Lake Shasta. Currently, no anadromous salmonids have been documented within project reaches because of the existing barriers to upstream passage, therefore, at this time, NMFS's recommendation for PG&E to create a Listed Salmonid Technical Integration Committee to assess and mitigate the project's affects on listed salmonids would provide no direct benefit to listed salmonids. Further, continued agency and stakeholder consultation in combination with the implementation of various proposed monitoring programs for aquatic habitat, biota, and water quality parameters would provide a mechanism to allow for the various management programs to adapt to changing conditions in the project area, including the introduction of new species of concern, such as listed anadromous salmonids.

Special Status Aquatic Mollusks

During the relicensing studies, PG&E identified one special status aquatic mollusk (California floater) in Pit 6 and Pit 7 reservoirs. In addition, PG&E identified nugget pebblesnail inhabiting the Lower McCloud River, outside of the project boundary. Forest Service condition 27 specifies that, within one year of license issuance, as a component of the aquatic biological management plan, PG&E monitor special status aquatic mollusks.

The monitoring specified by the Forest Service would involve:

- Monitoring population trends and changes in distribution of the California floater, nugget pebblesnail, scalloped juga, and montane peaclam.
- Special status aquatic mollusk monitoring would occur once every three years (or for a period determined by the Forest Service that is consistent with other monitoring requirements) during the first nine years and once every five years for the term of the license.

PG&E alternative condition 27 disagrees with the Forest Service language specifying that periodic monitoring may be conducted "for a period determined by the Forest Service to be sufficient that is consistent with other monitoring requirements". In addition, PG&E proposes that periodic monitoring would begin in the third year after plan approval by the Commission. PG&E also proposes that sampling sites, locations, methods, and data protocols used to monitor special status aquatic mollusks should be the same as those used during the relicensing studies.

Our Analysis

PG&E alternative condition 27 did not provide rationale for PG&E's disagreement with the Forest Service's specification to conduct monitoring for a period determined by the Forest Service. Because all other components of the aquatic biological management plan follow similar monitoring periods, it is assumed, that the Forest Service may alter monitoring periods based on the results, and the potential for inclusion of new species that might be found in the project area.

Monitoring special status aquatic mollusks using the methods and data protocols used during the relicensing studies and consistent, to the extent possible, with the aquatic biological monitoring plan completed during the relicensing of Pit 3, 4 and 5 project would ensure the comparability of the data from the two periods and projects without potential biases associated with any changes in sampling protocols. Sampling at site locations used during the relicensing studies would help in identifying changes, if any, to special status aquatic mollusks following relicensing.

The monitoring of special status aquatic mussels and the results from the monitoring program would provide periodic information to evaluate the condition of populations and the benefits to aquatic mollusks from improvements to water quality and quantity. The sampling frequency specified in Forest Service condition 27 would ensure

consistency with other monitoring requirements under the plan and allow some flexibility for determining a monitoring period that could be adapted to potential changes associated with conditions (e.g., water temperature, sedimentation rates) in project reaches during the term of the new license.

3.3.2.3 Cumulative Effects

The presence and operation of the McCloud-Pit Project contributes to cumulative effects on water resources and fisheries resources within the McCloud and Pit River basins. Project effects on water temperatures are the result of interbasin water transfer from the McCloud reservoir to the Pit River watershed via the James B. Black powerhouse. Although ambient water temperatures on the Pit River above the James B. Black powerhouse ranged from 12 to 22°C from June through September, water entering through James B. Black powerhouse was cooler, with temperatures below Pit 6 powerhouse less than 19°C. However, during periods when cooler water inputs occur, there has been no observed affects to the native transition zone fish species in these reaches. The lack of observable affects is likely the result of the tolerance of transition zone fish to a wide range of temperatures. Therefore, the waters of the Pit River combined with inputs from the McCloud River basin seem to be capable of supporting both transition zone and coldwater fish species, and any cumulative effects are insubstantial.

PG&E impoundments and tunnels also modify the duration, distribution, and dissipation of natural mudflows from Mud Creek through the lower McCloud watershed and support interbasin transfer of material from these events which contributes to occasional cumulative increases of turbidity in the Pit River watershed. However, of two significant turbidity events associated with Mud Creek in 2008, only one was detected in the Pit River at about 1 NTU above ambient conditions, which did not exceed the basin plan numerical criteria for turbidity. Continued monitoring of turbidity levels in Iron Canyon Creek and the Pit River following future mud flow events would help to determine cumulative effects, if any, on the Pit River watershed resulting from the project.

The Lower McCloud River and Iron Canyon Creek support self-sustaining populations of rainbow trout, with the McCloud River highly regarded as a productive sport fishery. Operation of the project in accordance with the various proposed, recommended, and specified flow regimes may improve the production, growth, and condition of trout by providing more optimal flow-habitat during growth and spawning seasons.

The McCloud and Pit River watersheds historically provided habitat for several listed species including Chinook salmon and steelhead. Although the project dams acts as barriers to upstream migration, construction of the Shasta and Keswick projects downstream on the Sacramento River prevent access for these species to the upper Sacramento River and its tributaries including the McCloud and Pit Rivers and their tributaries. As part of restoration plans for these species, studies are ongoing to evaluate

options that would provide passage at the Keswick and Shasta projects, but it could be a decade before these goals become reality and listed anadromous species are able to enter the lower McCloud River to access available spawning habitat.

Bull trout, at the southern extent of its range, was historically an important part of the aquatic community of the McCloud River. The extirpation of this species from the watershed is postulated to have been the cumulative effect of a number of factors including, but not limited to, loss of juvenile Chinook salmon, an important forage base, excessive fishing pressure, competition from other managed game species, and reduction of habitat associated with construction of McCloud dam. Efforts by California Fish and Game in the1970s to restore the species through stocking were unsuccessful. Restoration is not currently a primary management goal of the agency and no recommendations have been proposed specifically to support restoration of this species.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

3.3.3.1.1 Vegetation

To provide baseline information on vegetation communities in the project area, the licensee conducted vegetation mapping efforts to characterize and quantify all existing vegetation types within 0.5 mile of the project boundary. Elevations in the study area range between 1,100 and 3,500 ft msl, with moderate to very steep terrain.

The project area includes a variety of upland vegetation types typical of mid-elevation forests and valleys found in the southeastern Klamath Mountains and southern Cascade regions, and is dominated by Douglas fir, Douglas fir-ponderosa pine, mixed conifer and canyon live oak plant communities that together comprise about 84 percent of the upland vegetation cover within the project area. Douglas fir-ponderosa pine is the most common vegetation type within the project area and generally occurs throughout all portions of the area. Associated understory species for the most common upland vegetation communities include small specimens of canopy species as well as shrubs and vine species. Groundcover varies from sparse to moderate for these communities and is characterized by various species of grasses and forbs.

Vegetation mapping within the proposed new construction and transmission line corridors identified a total of 17 vegetation series, three other vegetation types and three non-vegetated features. The non-vegetated features included the McCloud Cemetery, McCloud Golf Course, and paved roads. Together these three features encompassed about 159 acres (2 percent). As identified within the existing project area, uplands were primarily determined to be mixed conifer vegetation series (32 percent), ponderosa pine (31 percent), Douglas fir (6 percent) and Douglas fir-ponderosa pine (5 percent). The community of McCloud is represented by urban land (10 percent). Mixed willow riparian vegetation community and California annual grasslands were also relatively common (3 and 2 percent, respectively).

Other habitats encountered that are not defined by vegetation included littoral, riverine, lacustrine, and barren areas. Littoral habitats within the study area consist of the reservoir fluctuation zones surrounding lacustrine habitats. Most of these areas are devoid of vegetation, particularly around the steep shoreline of the McCloud reservoir. Portions of the littoral zone do support vegetation during draw-down periods, including various woody and herbaceous riparian and upland species such as cheat grass, intermediate wheatgrass, and prickly lettuce. Littoral habitats surrounding the more gradual slopes adjacent to Iron Canyon reservoir are characterized by denser vegetation, and in general, included a large number of weed species such as yellow star-thistle, Himalayan blackberry, Kentucky bluegrass, and wooly mullein. Over the project area, about 34 acres of littoral habitats were mapped.

Riverine habitat areas consisting of non-vegetated open water occur along the free-flowing portions of the Pit and McCloud Rivers. These areas are highly variable and range between moderate, low gradient, and steep, moderate gradient stream reaches in moderate to well confined stream channels. About 240 riverine acres were mapped.

Lacustrine habitats within existing facilities are open water areas including areas inundated by the two project reservoirs as well as the Pit 6 and Pit 7 reservoirs, and Pit 7 afterbay. A total of about 1,056 acres of lacustrine habitat were mapped within existing facilities. A pond at the McCloud sewer treatment facility east of Squaw Creek Valley Road is within the proposed transmission line corridor and is about 11 acres.

Barren areas consist mainly of non-vegetated, man-made features scattered throughout the study area, such as fill slopes and old construction sites, non-vegetated landings resulting from previous logging operations, and naturally occurring rock outcrop and/or talus slope features. About 15 acres of barren areas were mapped in the project area; 22 acres were mapped along the proposed McCloud transmission line route.

Riparian and Wetland Vegetation

Wetland and riparian habitats are dependent on particular hydrologic regimes and are, therefore, considered particularly sensitive to potential project effects. Historical photo analysis was conducted for the Lower McCloud River from McCloud dam downstream to Shasta Lake to analyze longitudinal changes in riparian vegetation distribution over time. Historical aerial photographs from the Forest Service were compared with PG&E's 2006 aerial photographs. Photographs of selected stream reaches were available for the years 1944, 1952, and 1970 (the project was constructed in 1965). Significant changes in the longitudinal and cross-sectional extent of riparian vegetation due to project-related flow alterations were not detected during this analysis.

In addition to reviewing aerial photographs, vegetation mapping identified about 493 acres of riparian habitat and less than one acre of wetland habitat within the project area; more than 631 acres of wetland habitat were identified along the proposed McCloud line corridor due to the relatively low gradient, broad meadow features within the corridor. Spikerush vegetation series accounted for 85 percent (540 acres) of wetland

vegetation. Overall, 121 vascular plant species, 10 vegetation series, and 18 provisional plant associations were identified in the riparian zone of the Lower McCloud River.

The riparian zone of the Lower McCloud River, as defined by the presence of riparian vegetation, is generally less than 75 ft wide because of the steep nature of the surrounding valley walls that form a confined channel. White alder vegetation type was the most common riparian plant community (65 percent of riparian cover) and occurred along most of the drainages within the project area as narrow to moderately wide bands of vegetation within and along the margins of river, stream, and other drainages. Mixed willow and big-leaf maple vegetation communities were also common and together comprised an additional 30 percent of riparian vegetation. Riparian habitat ground layer was characterized as open to dense in cover and dominated by rushes, sedges, forbs and grasses. Spikerush, sedges, cattail, bulrush, were species indicative of wetlands within the project area.

Riparian studies in 2007 identified a gap in the age class distribution of white alder resulting from flooding in 1997, the largest annual peak flow in the 45-year record. The 1997 flood mobilized the channel bed and the resulting scouring action removed the existing riparian vegetation. Since then, no other bed-mobilizing flood events have occurred. Young white alder trees and other riparian vegetation have colonized the lower bank elevations of the Lower McCloud River and expanded laterally into the Lower McCloud River channel. Alterations in riparian vegetation structure were evident on gravel bar and split channel features in river reaches through Nature Conservancy and McCloud River Club owned lands upstream of the Squaw Valley confluence. Results of the aerial photograph interpretation of riparian vegetation determined that no distinct difference in vegetation character or longitudinal extent of riparian vegetation was apparent along the Lower McCloud River. Some areas of localized changes in density, height, and age of riparian vegetation have occurred within the active channel. Long-term shifts in species composition of riparian vegetation on mid-channel gravel and cobble bars versus along the channel banks were not evident during the study.

Noxious Weeds

Botanical surveys for invasive plant species were conducted within the project area and included land adjacent to project facilities, designated and dispersed recreation sites, and proposed infrastructure construction areas and their associated buffers. In addition, incidental information on targeted invasive plant species located along cross sections of the Lower McCloud riparian corridor between McCloud dam and Squaw Valley Creek is included; this information was collected as part of the riparian vegetation study.

In order to differentiate the level of survey effort necessary for each species, this combined target list of species was divided into high, medium, and low priority species based on their abundance in mapped areas. As a result, 16 high-priority, 9 medium-priority, and 40 low-priority targeted, terrestrial invasive plant species were observed, for a total of 65 species. No invasive aquatic weed species were observed. Of all the

targeted, high-priority invasive plant species that were surveyed, four species were particularly pervasive: yellow star-thistle, bull thistle, Himalayan blackberry, and spreading hedge-parsley. The most ubiquitous low-priority species were hedgehog dogtail and common St. Johnswort. Existing roads and transmission lines were heavily infested with noxious weeds due to the disturbed soils and maintenance activities. Reservoir shorelines also have high levels of infestation due to fluctuating water levels that allow noxious weeds to invade. New plants can become established as a result of water-borne seed transport, or seeds may be present within the soil bank of the shoreline and new plants can colonize newly emerging shorelines as water levels recede. Recreational activities such as boating can also break off portions of plants that can propagate.

Black locust, an invasive tree, occurs in the upland and riparian areas along the Lower McCloud River. The origination of black locust is in a former homestead in the Ah-Di-Na area, and the species' occurrence is concentrated at Ah-Di-Na though it is dispersed throughout the Lower McCloud River. No black locust was found at the most upstream or the most downstream study sites. The species prefers habitat of coarse-grained sediment in areas of infrequent inundation.

Special Status and Special Interest Plant, Lichen, and Fungi Species

Consultation with agencies and a literature review were used to develop a list of special status plant, lichen, and fungi species with the potential to occur in the project area. Field botanical surveys were conducted to determine if populations of the listed species were present in the project area. A total of eight special status vascular plant species were located during the surveys. No special status lichen or fungi species were documented in the study area.

Shasta eupatorium is a perennial shrub in the sunflower family and endemic to Shasta County. It occurs from 1,300 to 5,900 ft msl in chaparral and lower montane coniferous forest with rocky carbonate soils or on limestone cliffs. One small patch of about five plants was found growing on a bank of exposed bedrock at a dispersed recreation site adjacent to the Lower McCloud River.

Butte County morning glory is a perennial, rhizomatous herb in the morning glory family endemic to California and found in the High Cascade Range, Klamath Range, and San Francisco Bay Area, as well as in Butte, Contra Costa, Del Norte, Mendocino, Shasta, and Tehama Counties. The Butte County morning glory prefers dry rocky soils and occurs from 1,900 to 5,000 ft msl in chaparral, open areas of lower montane coniferous forests and occasionally along roadsides. It blooms from May to July. Five populations of Butte County morning glory were found in the study area. One population was located in a shady location along Pit 6 Road, in lower montane coniferous forest flats; a second population was located along the Pit 6 transmission line, and the remaining three populations were all observed along the existing Pit 7 transmission line.

Northern clarkia is an annual herb in the primrose family and is endemic to California (Shasta and Trinity counties) growing from 1,300 to 4,400 ft msl in chaparral, cismontane (west of the Sierra Nevada) and foothill woodlands, as well as lower montane coniferous forest. The blooming period is June to September. A total of 20 northern clarkia populations were found throughout the study area: 16 populations along Oak Mountain Road, two along Pit 6 Road, and two along the Pit 6 transmission line.

Butte County fritillary is found only in Tehama, Butte, and Shasta Counties in the Cascade Range from 160 to 4,900 ft msl. A perennial herb in the lily family, Butte County fritillary and is conspicuous between March and June on dry benches and slopes, generally in chaparral, cismontane woodland, and in openings in lower montane coniferous forest. Six populations of Butte County fritillary were found within the proposed Pit 7 afterbay powerhouse and proposed access road to Pit 7 afterbay powerhouse areas.

Howell's lewisia is a perennial herb in the purslane family distributed from Idaho through Oregon to Northern California. Specifically in California it is found in Shasta, Del Norte, Trinity, Humboldt, and Siskiyou Counties. It blooms from April to July on rock outcrops and canyon walls in broadleaf upland forest, chaparral, cismontane woodland, and lower montane coniferous forest at elevations ranging from 490 to 6,600 ft msl. One population of Howell's lewisia was found at a Lower McCloud River recreation site, and a second population was found at a recreation site between McCloud dam and Hawkins tunnel.

English peak greenbriar is a perennial, herbaceous vine endemic to California and is found in the Cascade and Klamath ranges, as well as Del Norte, Shasta, Siskiyou, and Trinity Counties, typically at elevations of 1,900 to 8,000 ft msl. It occurs primarily in association with alder thickets marshes and swamps, lake margins, stream banks including lake margins and stream banks within, lower montane and montane coniferous forest and deciduous forests. It blooms from May to July or August. Five populations of English peak greenbriar were documented along the Iron Canyon reservoir road.

Long-fruit jewel flower is a short-lived perennial herb in the mustard family endemic to California and more specifically to Butte, Shasta, and Tehama Counties. Recently described by Clifton and Buck (2007), long fruit jewel flower is limited to the eastern side of the Klamath Range at the southern edge of the Cascade Range and the western side of the northernmost Sierra Nevada Mountains. It occurs at elevations from 2,350 to 5,000 ft msl and blooms from April to September throughout cismontane woodlands and lower coniferous forest openings with a variety of soil types, often in disturbed areas. Three populations of this newly described species were documented: two populations along Oak Mountain Road and one population along the Pit 6 road.

Slender false lupine occurs in the Klamath and North Coast ranges in California north through Oregon, specifically in Del Norte, Humboldt, Shasta, Siskiyou, and Trinity Counties. It is found at elevations ranging from 300 to 4,500 ft msl in open, often dry sites (sometimes roadsides), including chaparral, cismontane woodland, lower montane

coniferous forest, meadows and seeps, and north coast coniferous forest. An herb in the pea family, it blooms from March to July. Six populations of slender false lupine were located across the study area, one along Pit 7 afterbay road, two along Oak Mountain Road, and three populations along the proposed route for the Pit 7 afterbay transmission line.

Special Interest Plants

Special interest plants include native plant populations suitable for revegetation source material; culturally significant plant species, as defined by the Pit River and Winnemem Wintu Tribes; and elderberry (*Sambucus mexicana*) plants suitable for supporting the federally threatened VELB, section 3.3.4, *Threatened and Endangered Species*.

A confidential list of culturally significant plants, including a threshold abundance criterion for each species, was developed in consultation with the Pit River and Winnemem Wintu Tribes during a series of meetings in early 2007. The list and survey results related to culturally significant plants was presented directly to the Pit River and Winnemem Wintu Tribes as a confidential report attachment and is also confidential. A total of 95 populations, containing 32 species of culturally significant species were located during the survey.

Elderberry is a large, deciduous, perennial shrub or small tree in the honeysuckle family. It typically occurs along stream banks and forest openings below 9,840 ft msl within a variety of habitats including chaparral, foothill woodland, red fir forest, riparian forest and woodland, and yellow pine forest throughout California. Fifteen populations of elderberry were documented in the McCloud reservoir, McCloud tunnel, Iron Canyon reservoir, Iron Canyon tunnel, and Pit 7 afterbay areas. Most of the populations were sparse, with between one and 10 individuals; however, two populations contained between 11 and 50 individuals and one population had more than 100. Aside from abundance, percent cover, and patch size, no additional VELB habitat-specific information (i.e., number of stems greater than or equal to 1-in. diameter at ground level and the presence or absence of VELB exit holes) was recorded for the elderberry population.

3.3.3.1.2 Wildlife

General Wildlife

As a result of the diverse vegetation community structure within the project area, wildlife resources are also diverse and include common, resident, and migratory species. Invertebrates, amphibians, reptiles, birds, small and large mammals, game species, and special status species are represented. Wildlife resources were assessed using methodologies that included literature review, agency consultation, and field surveys. Unless otherwise noted, information for this section was derived from the license application and technical memos resulting from specific surveys and provided in the license application (PG&E, 2009a).

Sierran mixed conifer forest is the most common forest type in the project area, and provides habitat for small mammals such as chipmunks, western gray squirrel, deer mouse, and bats. Larger mammals typically found in Sierran mixed conifer forest include gray fox, black bear, and mule deer. Dead trees (snags) and large trees provide nesting sites for predatory birds (raptors) such as red-tailed hawks. Other species of birds typically found in this vegetation community include dark-eyed junco, mountain chickadee, Steller's jay, western wood-pewee, and northern flicker. Western fence lizard may also occur on the forest floor.

Montane hardwood is the second most frequent wildlife habitat type in the project vicinity. This woodland vegetation provides habitat for many species that are reliant on acorns as food. Many bird species such as western scrub jay, evening grosbeak, acorn woodpecker, white-breasted nuthatch, and Hutton's vireo utilize this habitat type (Forest Service, 1995). Western gray squirrel, California ground squirrel, and chipmunks also rely on acorns. All of these species inadvertently distribute acorns and, as a result, enhance the growth of oaks in the community. This vegetation community also provides habitat for raptors including owls and hawks.

Similar to Sierran mixed conifer forest, ponderosa pine forest provides habitat for raptors including red-tailed hawk and small mammals such as western gray squirrel. Other species that may use this vegetation community include mountain quail, western scrub jay, and deer.

Blue oak-foothill pine woodlands are found between lower elevation grasslands and the lower montane mixed coniferous forest and, consequently, generally share species with adjacent vegetation communities resulting in a high diversity of wildlife species.

Mixed chaparral occurs adjacent to the previously described blue oak woodlands. Wildlife using chaparral habitat is varied and may include deer, bushtit, green-tailed towhee, wrentit, and mountain lion (Forest Service, 1995).

Many species depend upon riparian, wetland, or littoral habitat including beaver, muskrat, long-tailed weasel, American mink, California red-legged frog, black salamander, yellow warbler, willow flycatcher, and Pacific fisher. Freshwater emergent wetlands are used by aquatic and semi-aquatic species of wildlife including tailed frogs, northwestern pond turtle, bald eagle, river otter, water shrew, ducks, geese, and shorebirds (Forest Service, 1995).

Generally terrestrial wildlife species within the project area use the open water associated with the creeks and forebays of the project as foraging habitat and water source. The open water also provides resting and foraging habitat for aquatic bird species (grebes, waterfowl, wading birds, shorebirds, gulls, and terns) and aerial insect foragers such as swifts, swallows, flycatchers, and bats. Fish-eating species such as osprey, bald eagle, and belted kingfisher are also found. Many common mammals use open water as a source of drinking water, and raccoons forage for prey along the shoreline.

The developed/disturbed urban habitat surrounding the development facilities attracts species that are tolerant of human activity and have adapted to maintained vegetation (lawns and landscaped areas). Typical species include rock pigeons, western scrub jay, northern mockingbird, house finch, house sparrow, opossum, raccoon, and striped skunk.

A wide variety of game species occur within a variety of wildlife habitats in the project area including game birds such as band-tailed pigeons, blue grouse, mountain quail, mourning dove, ruffed grouse, wild turkey, California quail, ducks, and geese. Mammal species that are hunted include black bear, elk, mule deer, wild boar, gray squirrel, Douglas squirrel, hares, rabbits, bobcat, beaver, coyote, and gray fox (Forest Service, 1995). Amphibian and reptile surveys located ensatina, black salamander, western fence lizard, western skink, ringneck snake, and western rattlesnake in the project area.

Bat species detected by acoustic and capture surveys in the project area, including existing and proposed infrastructure areas, include Mexican free-tailed bat, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, fringed myotis, Yuma myotis, and western pipistrelle. Five other species were detected (pallid bat, Townsend's big-eared bat, spotted bat, western red bat, and western mastiff bat) and are discussed in the special status wildlife section below. Yuma myotis was the most abundant species captured during surveys, and was captured at the highest number of sites; this species was also detected at every acoustic survey site.

Survey results identified roost sites in the project area and include power-generation and dam structures, siphons, campground structures, overflow spillways, and a natural limestone cave complex on the west shore of McCloud reservoir. Two structures were confirmed to support day roosts for maternity colonies: James B. Black powerhouse and McCloud intake. Willow Creek siphon is also likely a maternity colony. These sites are critical to bats during the reproductive season, generally spring to fall. Winter hibernacula were observed at McCloud reservoir intake, McCloud dam diversion/outlet tunnel, Ah-Di-Na campground old cellar building, and Iron Canyon reservoir overflow spillway.

Special Status Wildlife Species

Special status wildlife species include species that may be protected by the state of California as endangered or threatened, California species of concern, California fully protected species, species identified as watchlist species by California Fish and Game, and other species identified as special animals by California Fish and Game. Also included are Forest Service Region 5 species of concern and species on the California BLM Animal Sensitive Species List (BLM, 2006). Federally listed rare, threatened, or endangered species; candidate species for listing; and any applicable designated critical habitat for a listed species are discussed in section 3.3.4, *Threatened and Endangered Species*.

Based on discussions with California Fish and Game and FWS, the licensee developed a list of special status wildlife species that are known to occur or have the potential to occur where suitable habitat exists in the project area: VELB; bald eagle; golden eagle; northern goshawk; peregrine falcon; Northern spotted owl; willow flycatcher; bank swallow; greater sandhill crane; American marten; Pacific fisher; Sierra Nevada red fox; California wolverine; ringtail; pallid bat; spotted bat; Townsend's big-eared bat; western red bat; western mastiff bat; Shasta salamander; tailed frog; foothill yellow-legged frog; northwestern pond turtle; and 10 species of terrestrial mollusks, six of which are considered Forest Service special status species and four of which are considered BLM sensitive species. As federal-listed species, VELB, northern spotted owl, Pacific fisher, and California red-legged frog are addressed in section 3.3.4, *Threatened and Endangered Species*.

Other species considered but eliminated from further discussion include: great gray owl, California spotted owl, bank swallow, southern torrent salamander and Cascades frog. Great gray owls are not discussed due to the distance of the project area from the typical range of the species (more than 150 miles) (California Wildlife-Habitat Relationships [CWHR], 2010). The Forest Service identifies the range of northern spotted owls as north of the Pit River, and California spotted owls as south of the Pit River, and commented that the project is not within the range of the California spotted owl; therefore, it is not further addressed (PG&E, 2006). The project area does not provide suitable habitat for southern torrent salamander or Cascades frog.

Terrestrial Mollusks

Three of the 10 terrestrial mollusk species were detected within the project area: Shasta chaparral snail, Shasta hesperian, and the Oregon shoulderband snail.

Shasta Chaparral Snail—The Shasta chaparral snail is endemic to Shasta County and is generally found within 100 m of lightly to deeply shaded limestone areas. In the project area it was detected at the Pit 6 and 7 reservoirs and facilities.

Shasta Hesperian Snail—The Shasta hesperian snail is found on damp ground near springs, seeps, and at stream margins under or on loose rocks, woody debris, or decaying leaves and is considered common along the middle reaches of the Pit River. It was the most abundant and ubiquitous of the special status terrestrial mollusk species detected within the project area. In the project area, it was found near year-round sources of water under rocks, leaf litter, or woody debris. This species was found at McCloud reservoir, Lower McCloud River; Iron Canyon reservoir, Iron Canyon Creek, Pit 6 reservoir and project facilities, and Pit 7 reservoir and facilities. The Shasta hesperian snail was found at the proposed Pit 7 powerhouse site and all of the sites along the proposed Pit 7 transmission line route. In the proposed McCloud construction site, the Shasta hesperian snail was found in low abundance at Tarantula Gulch.

Oregon Shoulderband Snail—The Oregon shoulderband snail is associated with talus and other rocky substrates wherever permanent ground cover such as rock fissures

or LWD, or moisture is available but is somewhat adapted to dry conditions during a portion of the year. The Oregon shoulderband snail was found in the Lower McCloud River, Iron Canyon reservoir, James B. Black facilities, Pit 6 reservoir and project facilities, and the Pit 7 reservoir and project facilities. This species was also found in the study area associated with the proposed Pit 7 afterbay construction area where it was detected under boulders at the USGS gage building.

Amphibians and Reptiles

Shasta Salamander—The Shasta salamander is listed as threatened under the California ESA and is a BLM sensitive species. The Shasta salamander primarily inhabits limestone outcrops and caves and adjacent slope habitats in mixed forests of Douglas-fir, foothill pine, and black and canyon oak, at elevations from 1,000 to 3,000 ft msl, though it may also use a variety of non-limestone habitats within its known range. The Shasta salamander lays and broods its eggs in limestone caves in summer. Individuals were found at McCloud reservoir and Fenders Flat / Pit 7 afterbay dam during surveys.

Tailed Frog—The tailed frog is a California species of special concern. This species uses cold, rocky streams in humid forests of Douglas-fir, pine, spruce, hemlock, redwood, maple, and alder, with interspersed grassland or chaparral (Stebbins, 2003). Most breeding occurs in early fall; eggs are laid in June and July and attached to rocky streambed. Hatching occurs in August and September. Adult and tadpole stages of tailed frogs were found at Ladybug Creek, a tributary to the Lower McCloud River. The Forest Service commented on November 18, 2006, that the tailed frog is known to be present in the McCloud reservoir based on unpublished data from a Forest Service employee.

Foothill Yellow-Legged Frog—The foothill yellow-legged frog is a Forest Service sensitive species, a BLM sensitive species, and a California species of special concern. The foothill yellow-legged frog inhabits small streams below 5,000 ft msl where breeding occurs in low to moderate gradient streams in shallow edgewater areas, often close to confluences with tributary streams. In the spring, the foothill yellow-legged frog deposits masses of eggs on the downstream side of cobbles and boulders in gently flowing water once water temperatures reach about 53 to 55°F. Tadpoles tend to remain near the hatching site; these areas are typically associated with edgewater habitat and are adjacent to riffles, cascades, main channel pools, and plunge-pools that provide escape cover and food. Tadpoles metamorphose into juvenile frogs in 3 to 4 months. Juvenile and adult individuals prefer perennial streams and ephemeral creeks with pools and areas that provide exposed basking sites and cool shady areas adjacent to the edge of the water.

During amphibian surveys in the project area, foothill yellow-legged frog individuals were observed at seven sites located between river mile 1.4 and 5.7 on the Lower McCloud River and in associated tributaries. Evidence of breeding (egg masses or tadpoles and post-metamorphic frogs (adults, juveniles, or young of the year) were observed at four mainstem sites. Post-metamorphic frogs were also observed in three tributaries. Twelve egg masses were observed in the Lower McCloud River between

May 8 and June 10; seven of these showed evidence of successful hatching (tadpoles were found nearby), and the other five failed due to scouring, fungal infestation, or predation.

Northwestern Pond Turtle—The northwestern pond turtle, also called the north Pacific pond turtle or the western pond turtle, is a species of special concern in California. It is distributed from western Washington to northwest Baja California, mostly west of the Cascade-Sierra crest, and may be found at elevations up to 6,696 ft but mostly below 4,980 ft msl (Stebbins, 2003). It inhabits ponds, lakes, rivers, marshes, streams, and irrigation ditches with rocky or muddy bottoms and herbaceous vegetation. Natural Heritage records exist for this species in Shasta and Siskiyou Counties, and in the McCloud, Upper Pit and Lower Pit watersheds.

Surveys for northwestern pond turtle were conducted by boat in 2007 and 2008 in the McCloud, Iron Canyon, Pit 6, and Pit 7 reservoirs; individuals were found in the Pit 6 and Pit 7 reservoirs. In addition to the reservoir surveys, individuals were observed during surveys for foothill yellow-legged frog at four sites on the Lower McCloud River, in Pit 6 reservoir, and in Pit 7 reservoir.

All northwestern pond turtle individuals found in the Pit 6 and Pit 7 reservoirs were sighted in the lower reaches of the reservoirs. Areas of suitable habitat in Iron Canyon and McCloud reservoirs were found to be well above the waterline in 2008; refuge areas in shoreline brush and basking areas were greatly reduced by low water levels. It was surmised that it is unlikely that either Iron Canyon reservoir or McCloud reservoir supports a northwestern pond turtle population, although there is potential for individual turtles to escape detection. The tributary streams upstream of Iron Canyon reservoir are likely too small to support northwestern pond turtle populations. Those tributaries upstream of McCloud reservoir may lack sufficient slow-water habitat and may be too cold.

Birds

Bald Eagle—The bald eagle was removed from the federal endangered species list in 2007; however, it continues to be protected by the federal Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act, as a California listed threatened species and fully protected species and as a Forest Service sensitive species.

The bald eagle tends to nest in areas of mature / late successional or old-growth forest where large trees are available for nest building in fairly close proximity to large bodies of water used for hunting. Winter habitat requirements include adequate food supplies and the presence of roosting sites generally located close to open water but which can be over 20 miles from foraging areas. Important perch and roost sites include snags and dead-topped, live trees in areas with minimal human disturbance. Fish are the primary diet, although waterfowl, gulls, and other birds; mammals; and carrion may also be taken.

The licensee has monitored all known bald eagle territories since the mid-1980s located within the area defined in the *Pit River Management Zone of the Pacific Bald Eagle Recovery Plan*, developed and implemented by FWS in 1986. Overall, the population of eagles has increased in the project area; nest success and productivity is below average for the state; and nests along reservoirs have had better productivity than those along rivers, suggesting that as the population increases in the area some territories are established in marginal habitat affecting nest success and productivity.

Prelicensing surveys located eight bald eagle nesting territories within the project area including two previously unknown territories on Chatterdown Creek and McCloud Bridge. Other territories in the project area located at McCloud reservoir, McCloud River, Iron Canyon reservoir (two), Pit 6 reservoir, and Pit 7 afterbay near Pit 7 dam. Winter sightings of adult bald eagle individuals near known territories indicate that pairs are likely year-round residents. Bald eagle prey studies in the 1980s at McCloud and Iron Canyon reservoirs revealed a diverse diet of salmonids; water and land birds; and mammals including deer and squirrels; though it is suspected that salmonids make up a large portion of the diet of these eagles (Nevares et al., 2008a).

Golden Eagle—The golden eagle is protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, and is a California fully protected species. Golden eagles use a variety of habitats including conifer, hardwood or mixed woodland, alpine, grassland, cliff, desert, savannah, and tundra. Golden eagles were noted as occurring in the project area for the Pit 1 new license environmental assessment, about 50 miles from the McCloud-Pit project (PG&E, 1999). No surveys were conducted in the McCloud-Pit project area for golden eagles.

Northern Goshawk—The northern goshawk, a large forest-dwelling raptor that uses a wide variety of habitat types, is a federal species of concern, California species of concern, and Forest Service sensitive species. The northern goshawk prefers dense, late successional stage forest for nesting that is interspersed with meadows and other openings, and low-elevation riparian habitats for foraging. The goshawk nesting period extends from mid-February through mid-September.

Surveys of potentially suitable habitat were conducted to determine if northern goshawks were present and if active nesting was occurring. The broadcast acoustical method was used for initial surveys, and the stand search method was used for follow up surveys. Two surveys occurred during the breeding season (June 1 through August 15) of 2007 and 2008. Although no active nests were identified, there were six northern goshawk detections during the 2007 survey season; no detections were documented during 2008 surveys. The majority (four) of the detections were associated with a suspected northern goshawk activity center located on Forest Service land about 0.5 mile south of Ah-Di-Na Campground. This area is considered a suspected northern goshawk activity center due to detections occurring in each survey period and the observation of at least two birds displaying aggressive/territorial behavior. The remaining detections

occurred at the southeast end of the Pit 6 transmission line about 1.5 miles northwest of Wengler (Nevares and Lindstrand, 2008a).

Peregrine Falcon—The peregrine falcon was officially removed from the federal list of endangered species in 1999 and from the California state list in 2009 (California Fish and Game, 2010), but remains a California fully protected species, and is protected under the Migratory Bird Treaty Act of 1918. Individuals feed primarily on birds from warbler- to mallard-sized, taken in flight over various habitats including forest edges, meadows, and water bodies (reservoirs, rivers, and streams). Steep-walled canyons and limestone outcroppings provide potential nesting habitat for peregrine falcons. Eggs are laid and young are reared on ledges or in small caves. The breeding season extends from about March to mid-August, although timing can vary.

Several territories have been documented in the vicinity of the project area, and surveys to assess habitat and presence of nesting individuals resulted in the documentation of nesting pairs along almost all major project water bodies within the project area. Peregrine falcon nesting pairs were documented in large rock outcroppings along the McCloud River, Iron Canyon Creek, Pit 7 reservoir, and Pit 6 reservoir. The 2007-2008 surveys also documented breeding at four territories and each nesting pair produced at least one young and, in most cases, two young were observed (Nevares et al., 2008b).

Willow Flycatcher—Willow flycatcher is a California listed endangered species and a Forest Service species of concern. Suitable habitats occurring in the project area include "monotypic, willow, marsh-lake margin" and "mixed shrub riparian–varying stream size" habitat types and meet willow flycatcher protocol criteria of having patchy shrubby riparian vegetation, and at least some surface water or saturated soil during the early portion of the breeding season. Surveys conducted in 2008 detected non-territorial individuals in suitable habitat at the Cedar Salt Log, McGill Creek, and Fenders Flat / Pit 7 afterbay dam survey areas. The individuals detected are considered migrants; however, it is possible that some individuals may breed in the project area (Nevares and Lindstrand, 2008b).

Bank Swallow—In California, the state-listed threatened bank swallow relies on naturally eroding habitats of major lowland river systems (California Fish and Game, 2003). This species nests in colonies and creates nests by burrowing into vertical banks of fine-textured soils. Currently, individuals are locally common only in portions of California where sandy, vertical bluffs or riverbanks are available. The current range for this species does not appear to overlap the project area.

Greater Sandhill Crane—The greater sandhill crane is a California fully protected species, and is state-listed as a threatened species. This species feeds on a variety of prey items (amphibians, snakes, invertebrates) as well as grasses and grains in wet meadows, flooded grain fields, pastures, shallow water habitats, and wetlands. Pairs return to the same territory and even the same approximate nest location every year (California Fish and Game, 2003). Based on the survey data recorded since 1981, areas of suitable

wetland and meadow habitat in Shasta and Siskiyou Counties support breeding individuals; however, individuals in the project area are on the edge of their range (CWHR, 2010).

Mammals

American Marten—American marten is a Forest Service species of concern. Natural heritage records exist for American marten in Shasta and Siskiyou Counties, and the Lower Pit and McCloud watersheds (NatureServe, 2009). Martens are medium-sized carnivores that inhabit dense, coniferous, mixed, or deciduous forests and occupy holes in tree stumps. Loss or degradation of habitat due to timber harvesting is the primary threat to this species. The project area is within the known range of American marten (CWHR, 2010); surveys were not conducted in the project area for this species.

Sierra Nevada Red Fox—The Sierra Nevada red fox is a state-listed threatened species. The range of the Sierra Nevada red fox is described as the southern Cascade Range in northern California, southeastward to the northern Sierra Nevada, and then south along the Sierra Nevada crest to Tulare County. Preferred habitat for the Sierra Nevada red fox appears to be red fir and lodgepole pine forests in the sub-alpine, and in the alpine of the Sierra Nevada. The current status of the Sierra Nevada red fox is unknown, and threats to the species have not been identified. This species is assumed to be present in the project area though it was not detected during prelicensing surveys (PG&E, 2006).

California Wolverine—The California wolverine is a California listed threatened species and is also considered a California fully protected species. This species requires dense cover for resting and reproduction, and open areas for hunting. The home range size of the California wolverine is extremely variable (less than 39 square miles to over 347 square miles) and appears to depend on the abundance and distribution of food. Dens are found in trees, dead standing trees (snags), downed logs, abandoned beaver lodges, among boulders, rock ledges, in old bear dens, and in caves. Riparian areas are used as travel corridors. The environmental assessment for the Pit 1 license lists wolverines as present in the Pit 1 project area, which is located about 50 miles from the McCloud-Pit project (table 11, PG&E, 1999). The project area is within the known range of the California wolverine (CWHR, 2010), but no survey was conducted for this species. Though it was undetected during prelicensing surveys, the California wolverine is assumed to be present in the project area (PG&E, 2006).

Ringtail—The ringtail is an omnivorous, raccoon-like mammal and a California fully protected species found in desert scrub, chaparral, pine-oak or conifer woodland habitats with rocky areas and fallen log debris (NatureServe, 2009). It is known to occur near the project area in the Central Valley. The licensee reported ringtail in the Pit 1 environmental assessment for a new license; the Pit 1 project is located about 50 miles from the McCloud-Pit project (PG&E, 1999). No surveys were conducted in the project area for this species.

Special Status Bats— Four special status bat species—pallid bat, Townsend's big-eared bat, spotted bat, and western red bat—were detected during acoustic and capture surveys in the study area which included existing project structures, reservoirs, and project-affected stream reaches.

Pallid Bats. A California mammal species of special concern and Forest Service sensitive species, the pallid bat roosts in structures, cavities, and live or dead trees anywhere from the riparian zone to ridges above, or in rock features on slopes of river drainages. A pallid bat colony can range from 35 to 300 individuals. The pallid bat has one litter per year and often gives birth to twins. This species forages primarily on ground-dwelling arthropods, most frequently in riparian zones, open oak savannah, and open mixed deciduous forest habitats, and uses pools in rivers and streams as a source of water.

Individuals were captured at the Pit 6 and 7 dams and along the existing Pit 7 transmission line corridor. The capture of a juvenile at Pit 7 dam confirmed the presence of a reproductive population and acoustic records document the presence of this species throughout the proposed McCloud and Pit 7 afterbay infrastructure sites during the summer breeding season (July through September). This species is not known to be migratory, and likely hibernates in the area, as suggested by one acoustic detection record from February, 2009, at the McCloud dam spillway.

Townsend's Big-Eared Bat. Townsend's big-eared bat is also a California mammal species of special concern and a Forest Service sensitive species and is widely distributed in the lava bed and limestone areas of Shasta, Siskiyou, and Modoc Counties where it roosts in tunnels, caves, mines, or rock shelters that are close to water. Townsend's big-eared bat forages in riparian zones as well as creek and river drainages feeding primarily on moths, and, like the pallid bat, uses pools in rivers and streams to drink. Colony size ranges from 35 to 500 individuals and adult females give birth to a single young per year. Acoustic records document the presence of Townsend's big-eared bat only in association with the exposed limestone along the margin of McCloud reservoir where one adult female (non-reproductive) was captured.

Spotted Bat. The spotted bat is a mammal species of special concern in California and, although rare and patchily distributed, is known to occur in the project vicinity. The spotted bat forages over open areas and along forest areas, particularly in association with wet meadows, and uses creeks and rivers as a source of water. This species roosts in rock features, often on steep slopes or rock outcrops associated with river drainages. The spotted bat is thought to be non-colonial, and females give birth to a single young each year.

Documented in the Pit 4 development area in 2000, individuals were detected acoustically in spring and late summer in a clearing adjacent to an inactive sewage lagoon near the town of McCloud, within the proposed construction footprint for the McCloud transmission line.

Western Red Bat. The western red bat is a California mammal species of special concern and a Forest Service sensitive species that is known to occur in the project vicinity, and likely uses the Pit and McCloud Rivers as migration corridors. This species roosts in riparian vegetation and uses riparian edge habitats as well as a variety of terrestrial and aquatic habitats for foraging. The western red bat is non-colonial, and females give birth to one litter of twins per year. Individuals were detected at proposed McCloud infrastructure sites, Pit 7 afterbay sites including the afterbay powerhouse construction site, and both proposed transmission corridors. During the survey effort, most acoustic records were between late July and early October, at a time when this species begins to move south in fall migration. Individuals were detected year-round at the proposed Pit 7 afterbay and existing Pit 7 transmission line sampling sites indicating that the Pit River may be a fall migration corridor for the western red bat, and that not all individuals migrate. No western red bat activity was recorded during the winter at proposed McCloud infrastructure sites.

Western Mastiff Bat—The western mastiff bat is found in rock features, often steep slopes or rock outcrops associated with river drainages, under slabs of exfoliating granite, or in basaltic columns. Colony size ranges from 35 to 200 individuals. Females give birth to a single young each year. This species is an open-air forager, and has been detected flying/foraging over reservoirs elsewhere in their range. Individuals were detected acoustically at the Pit 6 dam in September, 2007, the first record of this species for the Pit River.

3.3.3.2 Environmental Effects

3.3.3.2.1 Vegetation

Upland Vegetation

The vegetation community within the project area is relatively stable and is subject to disturbances from non-project related influences (rock slides, fire, disease, insect infestation). Periodic maintenance work along existing transmission lines, roads, tunnels, gages, powerhouses, associated facilities and reservoirs would cause short-term, minor localize disturbance or removal of vegetation. Mechanical activities such as snowplowing, road grading, ditch cleaning, and slide removal could cause surface to shallow depth disturbance of vegetation and top soil layers; however, no adverse affects to the existing seed bank within the soil would be expected. Over time, vegetation would be expected to reestablish as a result of pioneering of plant species in adjacent areas and growth of plants from the existing seed bank. The spraying of herbicides as part of O&M activities to control undesirable vegetation such as non-native invasive or noxious weed species (section 3.3.1.1, *Noxious Weeds*) could cause localized loss of upland vegetation susceptible to the herbicide(s) being used.

Proposed construction of the two new powerhouses and the Pit 7 afterbay substation are associated with primarily developed areas surrounding the existing project dam structures. There would be temporary minor disturbance to upland vegetation

during construction of the facilities and a permanent loss of vegetation within the footprint of the construction area.

The proposed Pit 7 afterbay transmission line would potentially remove vegetation along a corridor about 1.6 miles long and 150 ft wide. Disturbance or removal of vegetation along the construction corridor would be short-term. Upon completion of the transmission line, a 40-ft-wide corridor would undergo periodic maintenance to protect the transmission line from vegetation encroachment and allow access for maintenance and repairs. The McCloud transmission line is proposed as a corridor of about 14 miles in length and during construction would be about 150 ft wide; the final width of the transmission line is expected to be 25 ft. Construction of the proposed McCloud transmission line would require significant tree and vegetation clearing to establish the 150ft-wide construction corridor. Tree removal would result in a long-term alteration of vegetation community structure. Post-construction, it is expected that the area would gradually return to natural vegetation through pioneering from adjacent species, revegetation from the existing seed bank, and natural succession.

PG&E has proposed protection and enhancement measures that are designed to minimize the environmental effects of project operations and proposed construction on vegetation within the project area. In PM&E Measure 13, PG&E has proposed to develop a vegetation management plan (VMP) in consultation with the Forest Service and other appropriate agencies. The VMP would guide the management of vegetation within the project and project affected area including transmission line and would address vegetation-related issues at the project for the term of the new license. The VMP would contain specific elements including: (1) identification, protection and monitoring of special status species potentially affected by project-related activities to maintain well-distributed, viable populations within the project-affected area; (2) protection of culturally significant plant populations potentially affected by project-related activities and to enhance populations when feasible opportunities exist; (3) invasive plant species management and monitoring to minimize the introduction and spread of noxious weeds and to assess the success of noxious weed management activities associated with project O & M activities; (4) use of BMPs to avoid and / minimize effects on wetlands; (5) restoration of native vegetation in relevant areas disturbed by project-related O&M activities within the project-affected area; (6) invasive plant species management and monitoring; and (7) the restoration of native vegetation in relevant areas disturbed as a result of project related operations and activities. In addition, employees would receive employee awareness training that would provide employees working within the project area with the knowledge base to ensure effects from disturbance and direct removal of vegetation are minimized and that revegetation activities are monitored. Employee awareness training would ensure the coordination of the implementation of the VMP with other management plans. The VMP would include a process and schedule for reporting survey and monitoring results and provide for periodic review and revision of the VMP.

Forest Service condition 25 specifies that PG&E file a Vegetation and Invasive Weed Management Plan developed in consultation with the Forest Service, appropriate

County Agricultural Commissioner, California Department of Food and Agriculture, potentially affected tribes and other interest parties. The plan specified by Forest Service condition 25 would also be approved by the Forest Service and would be developed within one year of license issuance. Components of the plan include: treatment protocols and measures for removing or trimming vegetation within the Project and project-affected area; protection of special status and culturally significant plants and populations; invasive species management and monitoring and pesticide or herbicide use restrictions and prohibitions. Each component would provide specific guidance elements.

Treatment protocols and measures for removing or trimming vegetation include: (1) hazard tree removal and trimming and power line / transmission line clearing that would include slash disposal for both management protocols; (2) vegetation management for habitat improvement; (3) revegetation of disturbed sites, including standards of success, monitoring schedule, and remediation measures; (4) soil protection and erosion control including use of certified weed-free straw and other methods that minimize the risk of introducing non-native invasive plant species; (5) establishment of and / or revegetation with culturally important plant species; and (6) use of clean, weed-free seed with guidance on the use of locally collected native seed, and a plan to collect and propagate or otherwise acquire an adequate supply of appropriate native plant material for use in erosion control.

The plan includes the development of a monitoring component for special status and culturally significant plants approved by the Forest Service. Current locations, (including boundaries) for populations of special status and culturally significant plant species would be identified and delineated by GPS. Periodic monitoring of the known locations would occur every five years and every ten years for the project and project-affected area to determine if additional special status or culturally significant species have become established in the project or project-affected area to provide measures for addressing populations of newly established species. Surveys would also be conducted for new, listed special status species potentially occurring within the project or project-affected area; if identified species would be monitored. Information on locations, protection, monitoring, and survey measures for sensitive, culturally significant, invasive species and other rare plant locations would be shared with managers of O&M activities of any power distribution lines that cross portions of the project area.

The special status species survey element would be initiated by consultation with the Forest Service, concurrent with the annual consultation meeting as specified in Forest Service condition 1, to review the most current list of special status plant species that might occur on Forest Service lands in the project area or the project-affected area. When species are added to any of the lists, consultation would determine if suitable habitat occurs on Forest Service lands and, within one year, PG&E would develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the project on the species. PG&E would prepare a draft report that provides the objectives, methods, results, and recommended resource measures as appropriate, schedule for implementation, to the Forest Service for review and approval; the final

report would be filed with the Commission and would include documentation of consultation.

PG&E alternative condition 25 proposes modifications to specific elements of Forest Service condition 25, including an alternate schedule for preparation. PG&E assures that adequate protection and utilization of Forest Service lands would be contained within PG&E alternative condition 25 because PG&E would protect, mitigate and / or enhance populations of sensitive plant species potentially affected by project operations by conducting management and monitoring.

In PG&E alternative condition 25, PG&E proposes that the preparation of the Vegetation and Invasive Weed Management Plan be made consistent with the original PM&E measure 13 schedule of "two years after license issuance" instead of the one year that is specified in Forest Service condition 25. PG&E believes that providing two years instead of one year to prepare the plan would allow more careful planning and adequate schedule coordination among the various agencies and other interested parties involved in drafting a plan. During relicensing meetings, Forest Service staff stated that it desired consistency between McCloud-Pit license conditions and those developed for a nearby licensee-owned project, Pit 3, 4, and 5. Two years would provide adequate time to achieve consistency with license conditions for McCloud-Pit and Pit 3, 4, and 5. To support its proposal of a two-year time frame for preparing and implementing a Vegetation and Invasive Weed Management Plan, PG&E presents a time line of approximately 9-16 months which would make the one-year schedule proposed by Forest Service infeasible. PG&E also points out that there is nothing to preclude completion prior to the two year schedule proposed.

The licensee further proposes to limit the scope of Forest Service condition 25 to only culturally significant plant species associated with TCPs. Areas identified during relicensing surveys, that support populations of these plant species, are not considered to be TCPs subject to the requirements of section 106 of the National Historic Preservation Act unless they were also specifically identified by Tribal members. As a result, PG&E notes that there is no regulatory requirement to include culturally significant plant species in any long-term monitoring component for special status plant species as specified for inclusion in a Vegetation and Invasive Species Management Plan by Forest Service condition 25.

Hearst Corporation expressed concern that Hearst lands surround the entire McCloud reservoir and that Forest Service condition 25 would require PG&E to conduct surveys on private land. Hearst Corporation has suggested monitoring and management plans and surveys be limited to project-affected PG&E and national forest lands. In addition, Hearst Corporation has suggested that annual meetings also be opened to "project-affected" private landowners.

Our Analysis

Normal O&M activities currently have negligible effects on established vegetation within the project area. Proposed new construction within the project would have a long-term minor to moderate adverse affect on upland vegetation within the project area. Clearing for the construction of the Pit 7 access road and construction staging area would result in minor, long-term effects to vegetation. Clearing along transmission corridors would result in the loss of linear portions of existing vegetation communities; however, we expect that over the long-term the width of cleared area needed for construction would be revegetated and most vegetation would re-establish. Development and implementation of a Vegetation and Invasive Species Management Plan would provide guidance for the restoration of vegetation using native plant species as well as monitoring to maximize the success of vegetation restoration efforts. Permanent loss of vegetation communities along the proposed transmission line corridors would occur. Vegetation within the permanent corridor would re-establish; however, the vegetation within the corridor would be managed and maintained as necessary and would be permanently altered from the original plant communities that existed prior to the construction of the new transmission lines.

In PM&E measure 13, PG&E addressed vegetation-related issues at the project for the term of the new license that contained generalized plan elements for management, protection, restoration and control of vegetation within the Project boundary, a timeframe for development and implementation, and a proposed schedule for completion of specific monitoring and control elements. Forest Service condition 25 specifies that the licensee file a Vegetation and Invasive Weed Management Plan also developed in consultation with the Forest Service and specifically adds the County Agricultural Commissioner, California Department of Food and Agriculture, potentially affected tribes and other interest parties. The plan specified by Forest Service condition 25 would be developed within one year of license issuance. PG&E proposed alternative condition 25 proposes limitations to the scope of Forest Service condition 25 to only culturally significant plant species and alters the time frame for development and implementation.

PG&E alternative condition 25 proposes a two-year schedule for a Vegetation and Invasive Weed Management Plan to allow consistency with Pit 3, 4, and 5 license conditions. This altered time frame is important to the treatment of vegetation communities of the watershed in a consistent and comprehensive manner to ensure the maintenance of viable plant communities. Implementation of the individual species' monitoring schedule as proposed by the licensee would provide coordination and efficiency of monitoring schedules and allow for multiple-element monitoring conducted concurrently. PG&E alternative condition 25 incorporated into Forest Service condition 25 would minimize adverse affects to vegetation.

Regarding access to private lands, the Commission cannot require PG&E to take action outside of the project boundary. PG&E would need to coordinate with landowners if access is needed to lands outside of project boundary, as proposed in PG&E alternative

conditions. However, if private land is located within project boundary, then PG&E would have access to that land. For any PG&E action that would potentially affect the property of private landowners, PG&E would need to consult with the private landowner.

Riparian and Wetland Vegetation

Inundation frequency and annual peak flows influence the distribution of riparian vegetation with inundation frequency having the greatest effect on lateral extent. Relatively infrequent annual peak flows of high magnitude (once per 20 years) that can mobilize cobble and gravel bars resulting in scouring riparian vegetation appear to occur at a similar frequency as in pre-project conditions; the most recent occurring in 1997. Annual peak flows of lesser magnitude that occur more frequently ($\leq$ 10 years) have decreased since project operations began. The decrease in magnitude of annual peak flows and a decrease in duration of inundation from flooding during the growing season as a result of project operations is increasing riparian vegetation along the lower reaches of the river. The decreased magnitude of annual peak flows is also affecting the age distribution of white alders at higher elevations; mature specimens are not being replaced by younger white alder as a result of decreased flooding flows at higher elevations that allow establishment of young trees.

Riparian vegetation encroaching on the channel could potentially affect the quality and coverage of terrestrial riparian and aquatic habitat along the Lower McCloud River, though the linear extent is not affected and appears to continue at the same level under project operations as it existed under pre-project conditions.

The licensee proposes minimum instream flow regimes (section 3.3.2.1.1, *Water Quantity*) that would provide additional flow volumes over an annual and seasonally distributed schedule. In addition, upward ramping of flows prior to uncontrolled spill events would return scouring flows to the stream channel, which would reduce the ability of riparian vegetation to become established along the channel. California Fish and Game recommends and Forest Service condition 19 specifies a minimum instream flow regime for the Lower McCloud River in order to provide benefits for fisheries.

A total of 820.65 acres of wetland and riparian habitats were mapped within the proposed McCloud transmission line corridor and could be affected by construction activities. To protect wetland habitat, PG&E proposes to follow BMPs to avoid or minimize effects on wetland areas, including pre-construction wetland mapping and associated protection measures.

Our Analysis

Natural riparian systems are well-adapted to the periodic inundation and scouring that flood events can produce. Under the proposed action, increased minimum flows would increase inundation periods during the growing season, restricting growth and encroachment of riparian vegetation and improving the channel width. The proposed action would not alter low frequency, high magnitude scouring floods. As a result, encroachment of riparian vegetation into the channel would be minimized and aquatic

and terrestrial riparian habitat would be improved. Flows would be sufficient to control lateral expansion of riparian vegetation without necessitating manual removal that could destabilize sediments and increase erosion.

Pre-construction wetland mapping prior to the initiation of any construction, and avoidance of existing wetlands to the extent practicable, would minimize effects from construction. Any required state and federal permits would be required prior to construction and any regulatory restrictions, and required BMPs or other conditions would be implemented. Regardless, some adverse effects to wetlands are likely during the construction of the McCloud transmission line. We expect that employment of pre-construction mapping and avoidance in concert with BMPs and permit requirements would minimize effects, and effects would be short-term since no permanent disturbance to the hydrology of the wetland systems is expected to occur as a result of construction. After completion of construction, wetland systems within the width of the construction corridor would return to pre-construction conditions over time as vegetation becomes re-established. Within the permanent corridor of the transmission line, wetland and riparian vegetation could be permanently altered as a result of continued vegetation maintenance and management. We expect that the development and implementation of the Vegetation and Invasive Species Management Plan would also minimize effects on wetlands; elements of the plan would provide restoration guidance, pesticide and herbicide restrictions and prohibitions, and integrate employee training and awareness including use of BMPs.

Noxious Weeds

Activities associated with project O&M, recreation, and construction can cause disturbances to existing vegetation which could spread or facilitate introduction of noxious weeds in the project area or beyond. Project O&M activities with the potential to affect the distribution of noxious weeds include slide removal; road grading; vegetation management activities along transmission lines, roads, tunnels, gages, project facilities, and reservoirs; and ditch clearing. Reservoir fluctuations create disturbances in littoral habitats that make them susceptible to colonization by noxious weeds. In addition, recreation activities that move from outside of the project to recreation sites within the project area can result in noxious weeds and invasive species being introduced into the project area via recreational equipment and vehicles. Newly cleared soil from construction areas can be colonized by seeds from surrounding vegetation or seeds brought into the area by a variety of methods. In addition, seeds and portions of plants that can facilitate propagation and establishment could be dispersed by earthmoving equipment. Vehicles used to access construction sites have the potential to facilitate the spread of noxious weed species into and out of the construction sites. Construction of transmission corridors, especially the construction of the McCloud transmission line with a linear distance of about 14 miles, have the potential to affect sensitive riparian and wetland vegetation communities in the corridor with the spread of invasive noxious weeds.

Black locust prefers shoreline areas where hydrologic conditions reduce the frequency of inundation. No historical information exists to provide insight into the level of abundance of black locust in the Lower McCloud River prior to project operations. Because the decreased flows and less frequent inundation as a result of project operations has likely allowed riparian vegetation to encroach into the Lower McCloud River channel, it is possible that hydrological conditions resulting from project operations have also resulted in conditions that provide opportunity for black locust to increase. A literature review led to the conclusion that black locust seed dispersal is unlikely to be affected by the project, but that germination of seeds could be more successful due to the project-related decrease in inundation frequency.

Specific to invasive plant species monitoring and control, the original licensee PM&E measure 13 proposed invasive plant species monitoring and management as part of the VMP development to minimize the introduction and spread of noxious weeds and to assess the success of noxious weed management activities associated with project O&M activities.

The Vegetation and Invasive Weed Management Plan specified in Forest Service condition 25 would contain several components targeting invasive species management and monitoring and would include elements to: (1) monitor area with ground disturbing activities associated with the license for three years after the completion of activities to assess the presence of any invasive weed populations that may have been introduced as a result of activities; and (2) monitor known invasive plant species populations annually for the first three years after license issuance to determine if noxious weed populations are expanding into any locations of existing special status or culturally significant plant populations; or if other adverse impacts are occurring to these plant populations. After annual surveys for the first three years, monitoring would occur once every five years for the term of the license. All monitoring would occur in the appropriate season when plants are conspicuous but can be coordinated with other concurrent surveys or tasks. In addition, inventory and mapping of new populations of noxious weeds would be employed to update the GIS database maintained by the Forest Service every five years and protocols and strategies to prevent and control the spread of known populations or introductions of new populations would be developed. Spot treatments would be allowed for detections of new, small infestations at the time of detection. The protocols and strategies to prevent and control the spread of known populations would address the following elements: (1) cleaning of construction equipment prior to entering and exiting the Project area (but would not apply to vehicles used for PG&E's regular O&M activities; and (2) the use of weed-free straw, sand and gravel for restoration and construction and restoration activities, rice straw may be substituted. The invasive species management and monitoring component would include additional elements including: development of a schedule for control (containment or eradication of populations of prioritized invasive weed species designated by resource agencies; annual monitoring of know populations for the term of the license in locations tied to project actions or effects, such as road maintenance, facilities, project O&M activity areas;

construction sites to evaluate the effectiveness of revegetation and invasive weed control measures; employee awareness training on the location and identification of invasive weed species that may occur in the area and proper mechanisms for avoiding transport of weed seeds while working and notification of the Forest Service when new populations of invasive weed species are identified. Consultation and coordination with the Forest Service would determine control measures.

With respect to which invasive weed species would be monitored and controlled, Forest Service condition 25 specifies the development of a schedule for control (containment or eradication) of all know populations of California Department of Food and Agriculture rated A, B, and Q species; California Invasive Plant Council "high" and "moderate" rated species, and selected other rated invasive species designated by resource agencies.

PG&E alternative condition 25 proposes a change to focus control on agreed-upon "high-priority" species that are deemed of significant concern to the project and considered to be controllable by current management methods. PG&E also proposes a change to Forest Service condition 25 language that states that new infestations of "A", "B" or "high" and "moderate" agency rated species should be controlled within one year of detection, or as soon as practicable and feasible to focus on the agreed upon "high priority" species considered to be controllable by currently available treatment methods. PG&E alternative condition 25 identifies a list of "high priority" invasive plant species that is consistent with the Forest Service condition 25 list of "invasive species known to occur in the project and project-affected area".

Forest Service condition 15 specifies that PG&E exclude the use of pesticides and herbicides on NFS lands unless prior written approval is received from the Forest Service. Materials used would be limited to those registered by U.S. EPA and consistent with those used by Shasta-Trinity National Forest.

Our Analysis

PG&E PM&E 13 proposes, Forest Service condition 25 specifies, and PG&E alternative condition 25 proposes similar components for invasive species management and all provide guidance, methods, and protocols for treatment and management, monitoring, and other elements that are similar in structure and intent: the avoidance and control of noxious weed species within the project and project-affected area. In combination with employee awareness training and the use of BMPs prior to routine project O&M or construction activities with the potential to increase the introduction or dispersion of invasive noxious weeds, PG&E would monitor the distribution and species composition of high-priority noxious weeds within the project and project-affected area and prioritize populations for feasible management or control measures

We expect annual monitoring of areas that undergo ground or vegetation disturbance including management treatments would be effective in discerning the establishment of noxious weeds that are generally aggressive in pioneering new areas.

However, we consider that monitoring of all areas of "high priority" noxious weed populations that remain undisturbed could be conducted at five-year increments consistent with monitoring special status and culturally important plant populations and the five-year interval inventory and mapping element proposed., as proposed in PG&E alternative condition 25. Implementation of the monitoring schedule as proposed by PG&E would provide coordination and efficiency of monitoring schedules and multiple-element monitoring could be conducted concurrently.

Special Status Plant, Fungi and Lichen Species

Project operations have the potential to affect documented special status plant species that occur within the project area. Special status plant species were identified along the proposed McCloud and Pit 7 afterbay transmission line corridors, along the proposed access road to Pit 7 afterbay powerhouse, and at the proposed Pit 7 afterbay powerhouse. Populations of English Peak greenbriar, northern clarkia, slender false lupine, long-fruit jewel-flower, and Butte County morning glory could be susceptible to project construction and maintenance activities along project roads. In addition, project operations that alter flow in the Lower McCloud River could affect a population of Shasta eupatorium that occurs within the high water mark of the Lower McCloud River if flow regime alterations increase flows. Water level changes as a result of project operations could affect the sole population of Shasta eupatorium within the project area.

Based on a list of culturally significant plant species developed in consultation with the Pit River and Winnemem Wintu Tribes, a total of 32 species of culturally significant species were located during surveys. Survey results for culturally significant plant species results were presented directly to the Pit River and Winnemem Wintu Tribes as a confidential report.

The Tribes have stated that they are concerned about the effects of herbicide applications to culturally significant plant species that grow near McCloud dam and tunnels and are traditionally used by the Tribes. The Tribes are also concerned about the effects of construction of the proposed McCloud transmission line on culturally important plants and habitats; chokecherry, hazel, bear grass, and medicinal plants are gathered in the area between McCloud reservoir and the town of McCloud.

Forest Service condition 25 specifying the development and implementation of a Vegetation and Invasive Weed Management Plan would include provisions for identification, protection, and monitoring of populations of special status plant species (including culturally significant plant species). Specifically, the Forest Service would request that PG&E develop, in consultation with the Forest Service, and approved by the Forest Service a special status plant species component that includes elements to protect and maintain well-distributed, viable populations of special status and culturally significant plant species within the project and project-affected area. The Forest Service specifies that the component for special status plant species (including culturally significant plant species) of the Vegetation and Invasive Weed Management Plan require the delineation of current locations of special status and culturally significant plants using

a global positioning system and ensures that information on locations of special status and culturally significant plant species is shared with other managers of transmission lines that cross the project area. In addition, the component would provide for periodic monitoring once every five years to assess expansion or contraction of existing special status species populations; and include surveys once every 10 years to determine the presence of any new populations of special status species including culturally significant plant species or newly listed special status species. Annual consultation and review of the most current Forest Service list of special status species would determine if any newly listed species or un-surveyed suitable habitat could potentially occur within the project area; additional monitoring would be initiated to detect the presence of the newly listed species within the project area. Should a species be located, a monitoring plan for the species would be developed in consultation with the Forest Service within one year to assess the potential for project-related effects to the species.

In addition to the development of the Vegetation and Invasive Weed Management Plan, PG&E would prepare, for Forest Service approval, a biological evaluation of the potential effects to special status species of any proposed action to construct project features on Forest Service lands. The evaluation would include procedures to minimize any adverse effects, meet any management plan restrictions, and monitor implementation and effectiveness of any measures taken as part the construction.

PG&E alternative condition 25 includes a component for special status and culturally significant plant species proposing that monitoring would begin the first year after the Vegetation and Invasive Weed Management Plan is approved by the Commission and every five years thereafter for periodic monitoring; and surveys for periodic assessment and inventory as well as those implemented for newly species would occur the first year after the Vegetation and Invasive Weed Management Plan is approved by the Commission and every ten years thereafter. In addition and specific to culturally significant plant species, PG&E proposes to limit the scope of the Forest Service condition by removing specific measures for culturally significant plant species from the Vegetation and Invasive Weed Management Plan. Instead, PG&E alternative condition 25 proposes that PG&E would share with managers information on the locations of culturally significant plant populations so that these populations can be considered prior to and during O&M activities and would be undertaken in consultation with the Forest Service. In addition, PG&E would comply with the requirements of the HPMP and section 106 of the National Historic Preservation Act with regard to areas identified in the re-licensing study for cultural resources that are currently utilized by Tribes to gather plants for traditional purposes and that qualify for inclusion in the National Register of Historic Places as historic properties. Finally, culturally significant plant species would be used during revegetation activities where feasible.

Our Analysis

Surveys for special status plant species resulted in the identification of eight special status plant species. Coordination and consultation with the Forest Service during

the development of the Vegetation and Invasive Weed Management Plan would provide ample protection of species and their habitats known to occur within the project area. Elements of the Vegetation and Invasive Weed Management Plan provide potential enhancement of existing populations and habitat by managing and minimizing encroachment of invasive noxious weeds; providing measures to ensure proper use of herbicides; training and awareness for employees on special status species and adaptive management and education of the public. PG&E proposed measures are consistent with Forest Service condition 25, and we expect that implementation of the Vegetation and Invasive Weed Management Plan would minimize and mitigate for any project effects to special status species that may occur as a result of project O&M for the term of the license.

There is no regulatory requirement to include culturally significant plant species in any long-term monitoring component for special status plant species. Pre-licensing surveys not identify any locations of culturally significant plant populations that had been specifically identified by Tribal members prior to and during meetings and populations of culturally significant plant species that were identified are not considered to be TCPs subject to section 106 requirements of the NHPA. PG& alternative condition 25 proposes to limit the scope of this element to only culturally significant plant populations associated with TCPs. Gathering areas that qualify as TCPs would have management measures incorporated into a revised HPMP prepared in consultation with the Tribes, Forest Service, State Historic Preservation Officer (SHPO), and the Commission. A component of the Vegetation and Invasive Weeds Management Plan should be considered to address culturally significant plant species populations and their protection from ground-disturbing or vegetation management activities related to project operations and / or construction activities. In addition, surveys every five years conducted concurrent with other vegetation monitoring would determine the range and extent of existing culturally significant plant populations. We also think that reference to the measures contained within a revised HPMP be incorporated into the Vegetation and Invasive Species Management Plan and that measures contained within the HPMP are coordinated with and consistent with measures of the Vegetation and Invasive Weeds Management Plan. Other, more general components in the Vegetation and Invasive Weeds Management Plan such as employee awareness training and specific guidance on pesticide and herbicide treatments would also protect culturally significant plant populations. Restoration plantings should consider the use of culturally significant plant species where habitat is appropriate. When additional populations of culturally significant plant species are identified during monitoring, those new populations should be assessed for applicability with section 106 requirements and provided in a revised HPMP in coordination and consultation with the Forest Service, tribal members, and California SHPO.

3.3.3.2.2 Wildlife

General Wildlife

Terrestrial wildlife species that occupy habitats within the project area as resident, transient, or migratory species are not, in general, adversely affected by project O&M activities. Noise, lighting, and human activity during all aspects of proposed construction would result in temporary disturbance to wildlife species. Species intolerant of disturbance that are mobile enough to flee or avoid the areas of activity would leave until activity subsides. Activity associated with construction may also result in the mortality of non- or minimally mobile wildlife species. In general, the effects would be short-term and temporary and not severe enough to affect the survival of a species or population.

In the license application, the licensee proposes PM&E measure 14 to develop a wildlife management plan with a primary goal to guide the management of wildlife populations and habitat at the project for the term of the new license. PM&E measure 14 would, at a minimum, contain monitoring methodologies, preconstruction survey protocols, and avoidance and protection measures as appropriate for special status species. The wildlife management plan would also include a process and schedule for reporting survey and monitoring results as well as a process for periodic plan review and revision. In addition to PM&E measure 14, the licensee proposes PM&E measure 16 for avian hazard reduction. As proposed in PM&E measure 16, PG&E would, within three years after license issuance, upgrade segments of the existing distribution line that do not currently meet avian transmission line standards recommended by the Avian Power Line Interactions Committee (APLIC) to prevent bird electrocutions. In addition, PM&E No. 16 would require that all new construction of transmission and distribution of powerlines meet APLIC-recommended avian transmission line standards.

Forest Service condition 26 specifies that, within one year of license issuance, the licensee develop a TBMP, in consultation with the Forest Service, California Fish and Game, potentially affected tribes, and other interested parties, and approved by the Forest Service. The TBMP would include Forest Service special status species (Forest Service Sensitive, Survey and Manage, and Management Indicator Species) potentially affected by the project on Forest Service lands. The plan would be implemented upon approval by the Commission.

The Forest Service requests that, to the extent possible, the development of the TBMP be consistent with completed biological implementation plans for the nearby Pit 3, 4, and 5 Project to provide for similar data collection protocols for species that are found within both project areas and adjacent Forest Service lands. The TBMP would include but not be limited to: (1) monitoring of populations and locations occupied for special status species; (2) periodic surveys throughout the term of the license within the project and project-affected area to determine the location of any additional populations; and (3) reporting every five years (or at species-specific frequencies identified by the Forest Service) of terrestrial survey and monitoring results including suitable habitat, populations, individuals, pairs and nest locations. Results would be compatible with

Forest Service GIS. In addition, and specific to disturbance or construction activities, Forest Service condition 26 specifies pre- and post-construction surveys for Forest Service special status species. All surveys and monitoring would be conducted under Forest Service approved standard protocols. Post-disturbance / construction monitoring would identify whether mitigation measures are necessary. Lastly, Forest Service condition 26 specifies that the licensee observe limited operating periods where required, excluding emergency situations. In order to protect special status avian species, the Forest Service specifies that the licensee conduct surveys for Neotropical breeding birds within suitable habitat prior to disturbance activities or observe annual limited operating periods during April 1through August 30.

Forest Service condition 26 specifies that within one year of license issuance, the licensee file with the Commission, an avian collision and electrocution hazards plan, approved by the Forest Service in consultation with appropriate federal and state agencies, that minimizes adverse interactions between project transmission lines and avian species. All new or rebuilt power poles would conform to guidelines in *Suggested Practices for Raptor Protection – State of the Art in 1996* (APLIC, 1996) or updates of the guidelines when they are issued. Any pole involved in a bird fatality would be immediately repaired/replaced to meet the guidelines.

PG&E alternative condition 26 proposes to revise the length of time allowed to prepare a TBMP from within one year as stated by the Forest Service to two years. The licensee asserts that providing two years instead of one year to prepare the plan would allow more careful planning and adequate schedule coordination among the various agencies and other interested parties involved in drafting a plan. The licensee states that two years would provide adequate time to achieve consistency to the extent possible, with license conditions for McCloud-Pit and Pit 3, 4, and 5. To support its proposal of a two-year time frame for preparing and implementing a TBMP, the licensee presents a time line of approximately nine to 16 months which would make the one year schedule proposed by the Forest Service infeasible. The licensee also points out that there is nothing to preclude completion of the TBMP prior to the two-year schedule proposed.

PG&E alternative condition 26 proposes clarification regarding those survey areas where access is unsafe (steep terrain or high water flows) or private property for which the licensee does not have specific permission to access the property to perform surveys would be excluded. Surveys would be conducted for disturbance/pre-construction activities and monitoring for special status species as specified and clarified in PG&E alternative condition 26.

Avian collision and electrocution hazards is also addressed under PG&E alternative condition 26, with the licensee upgrading segments of existing distribution lines that do not currently meet the APLIC standards within three years of license issuance and ensuring that new lines would meet current APLIC standards. In addition, PG&E alternative condition 26 proposes that any pole involved in a bird fatality would first be assessed prior to repair or replacement; the pole involved in the collision or

electrocution could be a pole compliant with existing APLIC standards and may need further assessment to provide additional safety modifications.

Regarding the licensee measure to develop a TBMP, Hearst Corporation expressed concern that Hearst lands surround the entire McCloud reservoir and Forest Service condition 26 would require the licensee to conduct surveys on private land. Hearst Corporation has suggested that monitoring and management plans and surveys be limited to project-affected and national forest lands.

Our Analysis

General wildlife species that use habitats found within the project area are well-adapted to the project area under current conditions and are disturbed only during non-routine actions. Isolated, short-term disturbances may occur to wildlife as a result of activities associated with O&M activities tasks and could cause mobile wildlife species to leave an area until tasks are completed. Less mobile species may, on occasion, incur direct mortality as a result of actions such as trampling and those related to vegetation management, but mortality would not be beyond what a population could absorb.

Proposed new construction within the project would have a short-term minor adverse effect to wildlife species as a result of disturbance from construction noise and human activity. Short-term and long-term alterations in habitat resulting from the construction of facilities and associated structures, including transmission lines, would result in wildlife species at least temporarily leaving areas of activity and long-term habitat modifications or permanent loss of habitat. Clearing along transmission corridors would result in the loss of linear portions of existing habitat, and wildlife within the proposed transmission line routes would leave the area during activity.

PM&E measure 14 proposed by the licensee in the license application addresses special status wildlife species-related issues at the project for the term of the new license and, as outlined above, contains generalized plan elements for monitoring and protection of special status wildlife species within the project boundary, a timeframe for development and implementation, and a proposed schedule for completion of species-specific monitoring elements. Forest Service condition 26 specifies that the licensee file a TBMP also developed in consultation with the Forest Service and specifically adds California Fish and Game, potentially affected tribes, and other interest parties. The plan specified by Forest Service condition 26 would be developed within one year of license issuance. PG&E alternative condition 26, proposes revisions to specific elements of Forest Service condition 26.

PG&E alternative condition 26 proposes a two-year schedule to develop and implement a TBMP after license issuance to be consistent with original PM&E measure 14 monitoring and protection measures. In addition, coordination of a variety of agencies and other stakeholders can be difficult and a time frame of one year from license issuance may not be adequate to thoroughly address the specific monitoring and management protocol, scheduling, and reporting components of a TBMP. As a result, we believe that

the development and implementation of a TBMP would require two years to complete. If the plan were completed prior to that deadline, it could be implemented as soon as approved by Forest Service and other applicable stakeholders.

PG&E alternative condition 26 proposes that within three years of license issuance, PG&E would upgrade segments of the existing transmission lines that are not currently compliant with APLIC guidance. The licensee asserts that a plan would not be necessary if the appropriate upgrades were simply undertaken within three years of license issuance. In addition, the licensee would construct any new transmission lines to be compliant with current APLIC standards, and it feels that a plan would not be necessary if construction of new transmission lines compliant with APLIC standards to minimize avian electrocutions and collisions is completed.

Special Status Wildlife Species

The potential impacts from project O&M activities to general wildlife species also applies to special status wildlife species.

Forest Service condition 26 specifies that beginning the first full calendar year after license issuance the licensee would, in consultation with the Forest Service, annually review the current list of special status wildlife species (species that are Forest Service Sensitive, Survey and Manage, Management Indicator Species, or on the Shasta-Trinity National Forest Watch List) that might occur on Forest Service lands in the project or project-affected area. If it is determined that newly listed special status species may occur within the project area, the licensee would develop and implement a study plan in consultation with the Forest Service to assess the effects of project O&M on special status species.

When a species is added to one or more of the lists, the Forest Service, in consultation with the licensee, would determine if the species or unsurveyed suitable habitat for the species is likely to occur on Forest Service lands within the project or project-affected areas. If the Forest Service determines that the species is likely to occur, the licensee would develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the project on the species. The licensee would prepare a report on the study including objectives, methods, results, recommended resource measures where appropriate, and a schedule of implementation, and would provide a draft of the final report to the Forest Service for review and approval. The licensee would file the final report, including evidence of consultation, with the Commission. Upon Commission approval, the licensee would implement the resource management measures.

Regarding annual consultation between the licensee and the Forest Service and other agencies, Hearst Corporation has suggested that annual meetings also be opened to “project-affected” private landowners.

Our Analysis

Wildlife, including special status species, has most likely adapted to the routine activity surrounding projects and is disturbed only during non-routine actions. Isolated, short-term disturbances may occur to special status wildlife species as a result of activities associated with vegetation management (e.g., mowing, trimming) or maintenance tasks and could cause mobile wildlife species to leave an area until tasks are completed.

To ensure that continued O&M activities of the existing projects as well as O&M of proposed facilities (if constructed) have minimal effects on special status species potentially occurring within the project area, annual consultation with the Forest Service and other appropriate agencies would be indispensable to the licensee's planning and implementation of normal O&M activities and for any necessary construction activities that may be required. We expect that implementation of Forest Service condition 26 to (1) annually consult and review the most recent listing of special status species, and (2) develop and implement a plan containing resource management measures should a species likely occur, would continue to provide habitat and protection within the project area.

Regarding consultations, for any licensee action that would potentially affect the property of private landowners, the licensee would need to consult with the private landowner.

Terrestrial Mollusks

Terrestrial mollusks could be affected by changes in soil conditions, availability of large rocks or woody debris as well as canopy cover, sources of food, and water. Non-native invasive mollusk species also threaten native terrestrial mollusk species; several species of invasive mollusks were identified within the project area in association with the special status species. Project O&M activities that disturb ground or clear vegetation can cause direct mortality as a result of crushing, injury, or desiccation through exposure. Trampling in recreational areas could also result in mortality. Indirect mortality could be caused by loss or modification of habitat adjacent to project facilities or recreation areas as well as inundation or dewatering of habitat. Proposed construction could also affect special status terrestrial mollusk species directly through various activities (ground disturbance, vegetation removal) that are in the immediate vicinity of mollusk occurrences.

PM&E measure 14, as proposed by the licensee, would contain monitoring methodologies, preconstruction survey protocols, avoidance, and protection measures as appropriate for terrestrial mollusks. Pre-construction surveys would be conducted in areas of suitable habitat potentially affected by any planned construction, and a buffer distance around the construction site would be defined based on existing standards and protocols for mollusk species. Protection or relocation of species would be required when located within the footprint of construction sites.

Forest Service condition 26 specifies that the licensee develop within the TBMP special status species component an element to address terrestrial mollusks. For terrestrial mollusks, the licensee would, within one year of license issuance, conduct monitoring surveys once every five years, and survey potentially suitable habitat for new populations every 10 years for the term of the license. Species to be monitored include the Shasta sideband snail (*Monadenia troglodytes troglodytes*), Wintu sideband snail (*M. troglodytes wintu*), Shasta chaparral snail (*Trilobosis roperi*), Tehama snail (*T. tehama*), and the Shasta hesperian snail (*Vespericola shasta*) at known sites along the McCloud reservoir, Lower McCloud River, Iron Canyon reservoir and Creek, and Pit 6 and 7 reservoirs. Protection or relocation of terrestrial mollusks would occur in development sites.

PG&E alternative condition 26 proposes locations of monitoring or sites within the project-affected area and specificity for survey protocols to be contained in a TBMP. The licensee proposes to monitor only known populations of sensitive terrestrial mollusks beginning the first year after licensee issuance and once every fifth year thereafter. Monitoring proposed PG&E alternative condition 26 would be conducted within project-affected areas within 200 ft of facilities and roads, a 16-ft-wide band surrounding reservoirs, and along both sides of the Lower McCloud River and Iron Canyon Creek. Also included would be limestone outcrops within 100 m of riparian zones or 200 m of project facilities. A subset of sites surveyed would be chosen for monitoring based on documented occurrences. Protection and relocation of any individuals detected within the footprint of construction activities would also occur. PG&E alternative condition 26 proposes that pre-construction surveys in areas of suitable habitat potentially affected by planned construction would be conducted to identify and protect any previously unknown populations in construction areas.

Our Analysis

Terrestrial mollusks within the project area could be adversely affected by construction activities within habitat where they occur, especially Oregon shoulderbanded snail, Shasta hesperian snail, and the Shasta chaparral snail. PG&E alternative condition 26 proposes pre-construction surveys for potential new populations of terrestrial mollusks in suitable habitat identified within the construction footprint instead of periodic monitoring for new populations every 10 years for the term of the license as stated by the Forest Service. Pre-construction surveys in potential habitat for terrestrial mollusks would adequately identify the presence of and potential affect on terrestrial mollusk species from any proposed construction activities. include potential habitat within areas of planned construction, protection by establishing a buffer around construction areas, or relocation of snails, would be implemented prior to the initiation of construction.

PG&E alternative condition 26 proposes monitoring of terrestrial mollusks once every five years to require monitoring of “known” populations every five years. Surveys of terrestrial mollusk populations that are known to occur within the project and project-

affected area once every five years along with any required pre-construction surveys would be adequate to provide information on the existing populations of terrestrial mollusks and their overall condition, and determine if project O&M and construction activities are affecting terrestrial mollusk populations. Management would be adapted to include new species or populations that are detected.

As a result, the elements of the TBMP specific to terrestrial mollusks along with alternative proposed language described above would provide adequate protection to those populations within construction sites. Periodic monitoring and surveys would continue to protect and possibly enhance existing and potential future populations of terrestrial mollusks within the project area for the term of the license.

Amphibians and Reptiles

There are no anticipated project effects on tailed frogs in tributaries to the Lower McCloud River. No project activities are planned near Ladybug Creek or in any other tributary to the Lower McCloud River that may harbor tailed frogs.

Shasta salamander could be adversely affected by normal project O&M in the vicinity of the McCloud reservoir and the Pit 7 afterbay. Ground-disturbing activities (e.g., vegetation management, LWD removal, road work, slide removal) can alter or eliminate habitat for the Shasta salamander. Removing or crushing limestone can also adversely affect the Shasta salamander through alteration or loss of preferred habitat. Disturbance of wet areas or seeps, particularly during the reproductive season, can also cause mortality to salamanders, their eggs, or young. Shasta salamanders are the only special status amphibian or reptile species identified as occurring within proposed construction sites.

Foothill yellow-legged frog individuals were found in the Lower McCloud River where suitable habitat occurs. Environmental conditions that could affect the foothill yellow-legged frog include water temperature, water depth, water velocity, substrate size, food resources availability, and canopy cover. Predation and proximity to tributaries also can affect the foothill yellow-legged frog; however, these factors are not related to project O&M. Project O&M could affect water temperature, depth, and velocity, as well as food availability. Vegetation management could potentially reduce canopy cover.

The northwestern pond turtle near the Lower McCloud River shoreline and the Pit 6 and Pit 7 reservoirs could be adversely affected by unexpected, high volume flows (such as those resulting from emergency shut-downs) that could inundate nest sites. Spills that could cause these conditions are not a part of normal operations and could be expected to occur infrequently. In addition, removal of LWD that provides underwater shelter as well as basking areas could alter suitable nesting and overwintering sites.

The licensee proposed PM&E No. 14 has specific components addressing special status amphibians and reptiles and would be developed in consultation with the Forest Service and other relevant agencies and groups. Included in the wildlife management

plan would be a schedule for reporting survey and monitoring results for all special status species amphibians and reptile monitoring surveys.

Forest Service condition 26 specifies conditions for special status species regarding the development and implementation of a TBMP. Specific elements of the TBMP for special status species are discussed below.

Shasta Salamander—Forest Service condition 26 specifies monitoring of Shasta salamander at known locations once every five years along the McCloud reservoir and Fenders Ferry Flat afterbay as well as surveys of suitable habitat every 10 years to determine any new locations of the species. Estimates of population age and distribution would be included in reports summarizing monitoring surveys.

PG&E alternative condition 26 proposes to eliminate Forest Service condition 26 language for monitoring Shasta salamander at known locations once every five years stating that there is no project nexus for additional monitoring or surveying in areas that are not affected by project operations. PG&E alternative condition 26 proposes to include pre-construction surveys to protect and monitor Shasta salamanders. Pre-construction surveys following the standard protocol for Shasta salamander would be conducted in areas of suitable habitat within 180 m of any proposed new development/expansion or ground-disturbing activity. Protection or relocation of individuals of Shasta salamanders would occur prior to any construction or ground-disturbing activities.

Foothill Yellow-Legged Frog— Forest Service condition 26 specifies surveys once every 10 years for additional populations of foothill yellow-legged frog along the 5.4 miles of National Forest Service lands along the Lower McCloud River and along the Pit 6 and Pit 7 reservoirs and tributaries. Any individuals of foothill yellow-legged frog found in areas proposed for disturbance or construction would be protected or relocated.

PG&E alternative condition 26 proposes that foothill yellow-legged frog surveys begin the first year after plan approval and every tenth year thereafter in suitable habitat, along the tributaries to Pit 6 and Pit 7 reservoirs but excluding 5.4 miles of National Forest Service lands and tributaries to the Pit 6 and Pit 7 reservoirs. The licensee proposes that preconstruction surveys be conducted in suitable habitat at or adjacent to construction or maintenance activities for any proposed new developments or disturbance areas, as well as existing sites to be expanded or redeveloped. The survey area would include 0.8 kilometer (0.5 mile) upstream and downstream of all perennial tributaries that intersect the linear transmission line footprint.

The Forest Service also filed a 10(a) recommendation that, within one year after licensing, the licensee should develop a foothill yellow-legged frog monitoring plan that would include the following provisions: (1) population monitoring during wet and dry seasons for an initial five-year period; and (2) incremental population monitoring every four years. Under the Forest Service recommendation, the licensee would survey foothill yellow-legged frog distribution along the McCloud River from Claiborne Creek to the

confluence with Shasta Lake. Monitoring data would be used to evaluate any project effects on the foothill yellow-legged frog, such as through the development of a predictive tool for use in determining breeding period initiation and termination, in order to prevent flow dynamics from adversely affecting the foothill yellow-legged frog.

The licensee submitted comments on the Forest Service 10(a) recommendation regarding foothill yellow-legged frog population monitoring and specified alternative approaches including the following: (1) submission of a foothill yellow-legged frog monitoring plan within two years for license issuance; (2) annual monitoring during the initial five-year study period; and (3) incremental monitoring every five years. Foothill yellow-legged frog surveys would be conducted at selected sites and tributaries within and along the Lower McCloud River from Tuna Creek to the confluence with Shasta Lake, based on locations where foothill yellow-legged frog breeding and suitable habitat were observed during relicensing studies. Monitoring data would be used to evaluate any changes in foothill yellow-legged frog populations over the license term. The modeling component proposed by the Forest Service would be simplified such that monitoring data would be used to estimate initiation of the breeding period in future years in order to avoid untimely uncontrollable spills or flow fluctuations that could detrimentally affect foothill yellow-legged frog recruitment.

Northwestern Pond Turtle—Forest Service condition 26 specifies monitoring of suitable locations for the northwestern pond turtle once every five years, and suitable habitat would be surveyed once every 10 years to identify additional populations. Estimates of population age distribution would be included in reports summarizing survey results. Individuals located within the area of potential disturbance or construction activity would be protected or relocated.

PG&E alternative condition 26 propose clarifying language for northwestern pond turtle monitoring surveys to be initiated the first year after approval of the TBMP and every fifth year thereafter, for northwestern pond turtle at "known," occupied sites (Pit 6 and Pit 7 reservoirs). Beginning the first year after approval of the TBMP and every tenth year thereafter, surveys would be conducted for the term of the new license in other project reservoirs (McCloud and Iron Canyon reservoirs) to determine if additional populations of northwestern pond turtle occur in suitable but unoccupied habitat. Visual observations would estimate the number of individuals within the age classes of adults, juveniles, and young-of-the-year.

Our Analysis

The licensee-proposed PM&E measure 14 to develop and implement a wildlife management plan would provide monitoring and protection protocols as well as survey procedures to minimize any project effects that could occur to amphibian and reptile special status species occurring in habitats (or with the potential to occur) within the project area. Forest Service condition 26, to develop and implement a TBMP, specifies specific details for monitoring and surveys for listed special status species including amphibian and reptile species. PG&E alternative condition 26 proposes clarifications to

locations and extent of monitoring and surveys. The addition of preconstruction surveys as proposed in PG&E alternative condition 26, in conjunction with implementation of a TBMP, would provide additional protection for individuals of all three species (Shasta salamander, foothill yellow-legged frog, and northwestern pond turtle) when construction or ground-disturbing activities are planned for known locations of these species and could include protective relocation as necessary for individuals of these species located within the footprint of activity.

Specifically for foothill yellow-legged frog, eliminating surveys along the Lower McCloud River and along the Pit 6 and Pit 7 reservoirs would not be necessary as cold water temperature in the Lower McCloud River and absence of appropriate habitat surrounding the reservoirs would preclude the presence of the foothill yellow-legged frog in those areas. Pre-construction monitoring would protect foothill yellow-legged frogs within proposed disturbance activity and would be more effective at maintaining and potentially enhancing populations of the foothill yellow-legged frog in the project and project-affected area. Additionally, proposed flow regimes that include ramping prior to spill events would minimize scouring of substrates reducing the potential for scouring of egg masses of foothill yellow-legged frog from substrates.

Birds

Normal project O&M activities could disturb breeding, causing nest failures as a result of nest abandonment, egg exposure to predation, and premature fledging of young birds, and could result in complete abandonment of the breeding territory. Noise and human activity associated with the proposed construction activities within the project area could result in disturbance to birds, including raptors and special status species. Some individuals may temporarily abandon the area.

Avian transmission line structures provide perching, roosting, and nesting opportunities for raptor species, especially those that inhabit open areas or areas where natural nest sites are absent or limited. Avian mortality can occur directly through electrocution or indirectly from injuries sustained by impacting with lines. Existing project transmission lines (James B. Black, Pit 6 and Pit 7), meet or exceed the APLIC standards for protection of birds from electrocution. A distribution line associated with Pit 5 contains some poles that are not compliant with current APLIC standards.

The licensee proposed PM&E measure 14 in the license application to develop a wildlife management plan to address special status bird species and would be developed in consultation with the Forest Service and other relevant agencies and groups. Included in the wildlife management plan would be a schedule for reporting survey and monitoring results for all special status bird species. Few specific details are provided and would be developed in consultation with federal and state agencies as well as other interested stakeholders.

Forest Service condition 26 specifies a list of special status bird species and detailed monitoring and survey elements to be included in a TBMP. Forest Service

condition 26 specifies species-specific elements of the TBMP for avian special status species in regards to construction. Dependent on the existence of suitable habitat required by avian special status species within proposed construction areas including transmission lines, pre-construction surveys for listed avian species would be conducted. In lieu of a preconstruction survey, limited operating periods could be enforced and are specific to the breeding season for a species. The limited operating periods determined for specific special status avian species are: bald eagle, January 1 to August 1; northern goshawk and peregrine falcon, February 1 to August 15; and willow flycatcher, April 1 to August 30. PG&E alternative condition 26 proposes clarifications to the distance from proposed construction activity for pre-construction surveys by species: northern goshawk – within 0.5 mile; bald eagle – within 1 mile; peregrine falcon – within 1 to 3 miles; and willow flycatcher – within 200 ft of private land where access has been granted to 300 ft on public land.

Northern Goshawk

Forest Service condition 26 specifies northern goshawk monitoring would occur within 0.25 mile of previously identified detection sites once per five years; suitable habitat would be surveyed once per 10 years to identify any additional individuals or pairs.

PG&E alternative condition 26 proposes to eliminate monitoring within 0.25 mile of previously identified detection sites once per five years stating that there are no known active nests in the areas affected by project operations.

Bald Eagle

Forest Service condition 26 specifies monitoring of bald eagle individuals, pairs, and nest productivity annually at McCloud Reservoir, Iron Canyon reservoir, Pit 6 and Pit 7 reservoirs, and any additional locations identified during surveys or monitoring as approved by the Forest Service. Protective actions to minimize disturbance factors would include: buffer zones around each known nest territory; potential zoning of water surfaces in project reservoirs with respect to use and access of watercraft; coordination of the licensee and Forest Service land management activities within bald eagle nest territories such as timber harvest, mining, and woodcutting; periodic monitoring of human use patterns to discern human / bald eagle interaction and development and placement of interpretive signage at McCloud and Iron Canyon reservoirs addressing bald eagles.

PG&E alternative condition 26 proposes to ensure that annual monitoring for bald eagles would be consistent with the licensee's ongoing bald eagle monitoring program and clarifies locations of monitoring sites within the project-affected area.

Peregrine Falcon

Forest Service condition 26 specifies that annual monitoring of peregrine falcon individuals, pairs, and nest activity occur within 0.25 mile of known sites on Forest

Service lands. In addition, Forest Service condition 26 specifies monitoring once per five years in potentially suitable habitat.

The licensee alternative language proposes that surveys for peregrine falcon would begin the first year after TBMP approval and every fifth year thereafter at known nesting sites and at suitable cliff nesting habitat along Pit 6 and Pit 7 reaches of the Pit River Canyon, the McCloud River reach downstream of McCloud dam, and Iron Canyon Creek downstream of Iron Canyon reservoir to the confluence with the Pit River. Specifically excluded are survey areas where access is unsafe or private property which the licensee does not have specific permission to access to perform the survey.

Willow Flycatcher

Forest Service condition 26 specifies the licensee survey suitable habitat for willow flycatcher habitat (including dispersed campsites) once every five years and that habitat for willow flycatcher be restored or enhanced within the project or the project-affected area where project activities affect willow flycatcher habitat vegetation.

PG&E alternative condition 26 proposes to survey suitable willow flycatcher habitat beginning the first year after plan approval and every fifth year thereafter. Although there are no known willow flycatcher nesting sites within the project or project-affected areas, surveys would follow standard protocols for the species and would be conducted in contiguous suitable habitat within 300 ft (on public lands) and 200 ft (on private land where access has been granted to the licensee) from the following features: (1) project-affected mainstem river reaches (the Pit River from the James B. Black powerhouse tailrace to Shasta Lake, Iron Canyon Creek downstream of Iron Canyon dam, and the McCloud River from McCloud dam to Squaw Valley Creek; (2) project waterbodies (McCloud, Iron Canyon, Pit 6 and Pit 7 reservoirs, and Pit 7 afterbay); and (3) project-related recreation sites (e.g., campsites, including dispersed campsites; day-use areas; boat launches).

Specific to special species raptors such as bald eagle, golden eagle, and peregrine falcon, licensee PM&E measure 16 would, within three years after license issuance, upgrade segments of the existing distribution line that do not currently meet avian transmission line standards recommended by APLIC to prevent bird electrocutions. All new construction of transmission and distribution of power lines meet APLIC-recommended avian transmission line standards.

Forest Service condition 26 specifies a request for the implementation of a Forest Service approved avian collision and electrocution hazards plan that minimizes adverse interactions between project transmission lines and avian species and includes compliance of all new or rebuilt power poles with APLIC standards or updates of the guidelines when they are issued. Any pole involved in a bird fatality would be immediately repaired or replaced to meet the guidelines. PG&E alternative condition 26 proposes to eliminate the development and implementation of an avian collision and

electrocution hazards plan in lieu of bringing existing noncompliant transmission lines into compliance within three years.

Our Analysis

Project O&M and construction activities within the project area all have the potential to adversely affect avian species status species. Primary effects would result from noise and activity disturbance near roosting or nesting sites and, in the case of breeding pairs, could lead to loss of a breeding season from nest abandonment, increased opportunity for nest predation, and premature fledging of young. With development and implementation of specific elements of the TBMP specified in Forest Service condition 26 for listed special status species, adverse effects to avian special status species would be negligible. Specific to peregrine falcon and bald eagle nest sites within the project area, buffers for active nest sites would protect them from disturbance due to project O&M activities and could be applied to recreational activities in the vicinity of active nests.

Specific standards for transmission lines developed by APLIC and employed along existing power lines would minimize avian electrocution hazards for special status raptor species. PG&E alternative condition 26 proposes to clarify survey and monitoring locations where appropriate habitat is and identifies appropriate detail to include in the TBMP; however, application of specific distances to be surveyed within specific locations could be limiting to the protective intent of the TBMP.

For all special status species elements, PG&E alternative condition 26 proposes to exclude survey areas where access is unsafe or private property for which the licensee does not have specific permission to access the property to perform the survey(s).

Mammals

Bats

Current project O&M activities have the potential to affect bat species and their habitat within the project area. Special status bat species within the project area utilize project structures and facilities for day or night roosts as well as maternity sites during the breeding season. Individuals could be harmed if directly disturbed or excluded from the structures. Maintenance activities are seldom conducted at night, and would be unlikely to disturb roosting individuals. Project O&M activities that occur during the day at these locations when individuals are present could disturb individuals and cause them to leave the facility; extended maintenance activity could cause individuals to relocate. If facility openings that allow access for individuals are sealed at the wrong time, or inappropriately exclude individuals from gaining access, adverse effects to bat species including the special status species could occur, including indirect mortality and loss of roost habitat. Maternity roost habitat was observed at McCloud intake structure, James B. Black powerhouse, and Willow Creek siphon. Inappropriate exclusion of female bats from maternity sites within these facilities could result in indirect mortality. Unscreened vent pipes at campground restrooms may provide outside access to the vault underneath

the restroom and subsequently allow access into the restroom if the toilet lid is open or absent. Routine maintenance of these restroom structures is unlikely to disturb roosting bats.

Roost habitat could potentially be disturbed or removed as a result of construction activity. Also, ground-disturbing construction activities could affect the entrance and egress points for bats, and could alter patterns of air flow and groundwater dynamics, potentially affecting the micro climate within the cave complex and altering the suitability of habitat for bats using the cave. Transmission line construction along the proposed route could also alter foraging habitat, because altering the vegetation structure could change the composition of prey species. Some bat species may benefit from changes in vegetation structure resulting from the construction if forest edge and open habitats are increased. Night-time construction activity in these areas could result in short-term disturbance to foraging bats; however, disturbance to foraging bats would be negligible since bats could relocate to other undisturbed foraging areas.

Forest Service condition 26 specifies that the licensee conduct annual monitoring for Forest Service special status bat species (Townsend's big-eared bat, pallid bat, and western red bat) at known locations around McCloud reservoir and Pit 7 reservoir, and that the licensee conduct surveys once every five years in suitable habitat. All bathroom vents at existing and proposed recreational sites would be screened to reduce bat mortality and consultation with the Forest Service prior to implementing any bat-exclusion techniques. PG&E alternative condition 26 proposes monitoring at known sites and other project-related suitable habitat that would occur beginning the first year after plan approval and every fifth year thereafter. Appropriate sites for periodic monitoring would be identified in collaboration with participating agencies and would focus on Forest Service special status bat species. Survey methods could include a combination of passive acoustic, active acoustic, and capture techniques such as mist netting and harp traps. For any surveys capture methods, surveyors would have the necessary permits to handle bats.

Forest Service condition 26 specifies pre-construction surveys to be conducted prior to disturbance or construction would be scheduled outside of the limited operating period from March 1 through September 30. Prior to construction or reconstruction within 1 mile of known locations, a strategy/mitigation plan for the land-based bat population at McCloud reservoir would be developed. PG&E alternative condition 26 proposes that preconstruction surveys would be conducted to assess the presence and roosting within areas of suitable habitat potentially affected by construction activity, or construction would be scheduled outside of the limited operating period during the maternity period of May 1 to August 31. The licensee would develop a strategy and mitigation plan that would include noise disturbance distances for the land-based bat population at McCloud reservoir.

Our Analysis

Special status bat species can occur with other species of bats at day and night roost sites. As a result, protection and conservation of roost sites as a result of the development and implementation of Forest Service condition 26 would provide protection to special status bat species (Townsend's big-eared bat, pallid bat, and western red bat) as well as other bat species, ultimately benefiting a number a bat species. The TBMP would provide guidance and protocols for monitoring and surveying bat habitat with project facilities and structures and project-related recreation sites. PG&E alternative condition 26 proposes language specific to special status species bats that is consistent with that of Forest Service condition 26, but provides additional details that do not appear to significantly alter the intent of Forest Service condition 26. We expect that during the development of the TBMP, coordination between the agencies and the licensee would provide an opportunity for discussion of the detailed language proposed by the licensee and possible inclusion in the final TBMP. We expect that overall, through the development and implementation of the TBMP and its specific measures regarding special status bat species, continued project operations or proposed construction would not adversely affect special status bat species within the project area.

Forest Carnivores—Forest carnivores, Sierra Nevada red fox, California wolverine, American marten, and ringtail, could occur in the project area based on available habitat. Sierra Nevada red fox and California wolverine are assumed to be in the project area; American martin is likely to occur, and ringtail has been documented within 50 miles of the McCloud-Pit project.

Forest Service condition 26 does not specify forest carnivores. No other proposed mitigation and enhancement measures or alternative conditions have been proposed by the licensee.

Our Analysis

It is unlikely that normal project O&M activities would affect any of these species. All are mobile and would probably avoid areas of human-induced activity. This would be especially true of active construction sites that would occur during construction of proposed project facilities. We expect that there would be no adverse effects from project activities or proposed construction. Undeveloped lands within the project area would continue to provide potential habitat for these species and as a result could provide a long-term benefit to individuals that are creating new territories.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Valley Elderberry Longhorn Beetle

The VELB (*Desmocerus californicus dimorphus*) is listed as threatened under the ESA. The VELB is associated with various species of elderberry (*Sambucus* spp.) throughout the California Central Valley and foothills below 3,000 ft msl. Shasta County

is within the VELB range, though no critical habitat is designated for the VELB in the county. The VELB occurs within riparian vegetation communities where it feeds exclusively on elderberry in both adult and larval stages. Adult VELBs appear to feed externally on the flowers and foliage of the elderberry. Adult females lay eggs in crevices in the bark of the host elderberry plant (FERC, 2009). After hatching, larvae spend one to two years feeding inside the plant. Prior to pupating, VELB larvae chew an exit hole in the elderberry trunk for the emerging adult.

Botanical surveys documented 15 populations of elderberry containing plants with stems greater than or equal to 1-in. diameter at ground level in areas surrounding the McCloud reservoir, McCloud tunnel, Iron Canyon reservoir, Iron Canyon tunnel, and Pit 7 afterbay. Most of the populations were sparse, with between one and 10 individuals. However, two populations contained between 11 and 50 individuals and one population had more than 100. No survey of identified elderberry plant stems for exit holes created by emerging VELB was conducted.

California Red-Legged Frog

The California red-legged frog (*Rana aurora draytonii*) is listed as threatened under the ESA. This species occurs at elevations ranging from sea level to 5,000 ft msl in wetlands; wet meadows; ponds and lakes; and pools in low-gradient, slow moving stream reaches, with permanent sources of deep water and riparian vegetation. Eggs are laid in ponds or backwater pools and attached to emergent vegetation. The tadpole larval stage inhabits the same area as eggs, spending most of its time in submergent vegetation or organic debris. Following metamorphosis, adults and juveniles are found in emergent and riparian vegetation, undercut banks, semi-submerged root masses, open grasslands with seeps, or springs with dense growths of woody riparian vegetation. Cattails, bulrushes, and willows are good indicator species for potential presence of the frog. Adults are typically associated with deep (greater than 0.7 m), still or slow-moving water. Juveniles prefer open, shallow aquatic habitats with dense submergents. Potential habitat for adult California red-legged frog may extend 1 mile from potential aquatic habitat.

Although the study area does not fall within the current distribution of the California red-legged frog, the northern extent of the current range is in proximity to the Lower Pit River. There are only six known populations of California red-legged frog in the Sierra foothills, and their current range within that area is from Butte County to El Dorado County. No California red-legged frog observations were made during amphibian surveys in the project area. Although FWS has the California red-legged frog on its species list for Shasta County, no records exist in the California Natural Heritage Database (PG&E, 2006). Results of a survey conducted as part of a transmission line separation project determined that the California red-legged frog has not been previously identified at any location in the project affected area or in the project vicinity. In addition, the licensee determined the project area does not provide suitable habitat for the California red-legged frog based on aerial photos, aerial video, and ground reconnaissance. No designated critical habitat is located in the project area.

Northern Spotted Owl

The northern spotted owl, a medium-sized nocturnal raptor that inhabits mature forest habitats, is listed as threatened under the federal ESA. Critical habitat has been designated for the species, and a final recovery plan was released in May, 2008 (FWS, 2008).

The northern spotted owl generally inhabits older forested habitats because they contain the structural characteristics required for nesting, roosting, and foraging. Specifically, the northern spotted owl requires a multi-layered, multi-species canopy with moderate to high canopy closure. Competition with the barred owl and loss, degradation, and fragmentation of habitat due to timber harvest, fuel load management (thinning), and natural disturbances (e.g., wildfires and wind storms) are identified as the primary threats to this species. To a lesser extent, linear development projects (e.g., pipelines, power lines, and roads) have been identified as potentially adversely affecting northern spotted owl habitat because of fragmentation and destruction of habitat. The northern spotted owl reproductive period extends from mid-February through September. The nesting season for northern spotted owl extends from early April to mid- to late June. In the weeks after fledging, the young are weak fliers and remain near the nest tree, and adults continue to feed the young until late September.

The survey area included reasonably accessible suitable habitat within a 1.3-mile distance (buffer) of project facilities and project-affected areas in which project operations or recreational use could significantly affect the northern spotted owl or its habitat. Areas surveyed included project water bodies (i.e., McCloud, Iron Canyon, Pit 6, and Pit 7 reservoirs, and Pit 7 afterbay); project facilities (dams and diversion structures, powerhouses, transmission and distribution lines, project roads included in the FERC project boundary, the Ah-Di-Na gage (MC-1) on the McCloud River, and the McCloud tunnel siphon at Hawkins Creek); and recreational sites (e.g., campsites, day-use areas, boat launches). Habitat types in the survey area included Sierran mixed conifer, ponderosa pine, montane hardwood-conifer, montane hardwood, montane riparian, montane chaparral, mixed chaparral, lacustrine, and riverine. Survey elevations ranged between about 1,070 and 4,600 ft msl with gentle to very steep topography.

No northern spotted owl individuals or active nests were detected in the project area. A single female northern spotted owl of unknown reproductive status was detected just outside of the project boundary buffer in the upper Mink Creek drainage, east of Van Sicklin Butte. Three northern spotted owl activity centers were noted in the Iron Canyon reservoir watershed in 2005, but there has been no recent documented activity at that location (Forest Service, 2005, as cited in PG&E, 2006). A barred owl pair was found in the Flatwoods / Pit 6 dam survey area, west of the 1.3-mile survey buffer, in an area known as Reynolds basin (Nevares and Lindstrand, 2008c); this species is known to be expanding its range into this area of California and is known to compete for territory with the northern spotted owl, but these are not project-related effects.

Pacific Fisher

In December, 2000, the West Coast population of Pacific fisher was proposed for listing under the ESA. Listing of the West Coast population segment of the Pacific fisher was determined to be "warranted but precluded by other, higher priority listing actions," although the Pacific fisher is still considered a candidate species for federal listing. The Pacific fisher is a Forest Service sensitive species, a BLM sensitive species, and a California Fish and Game species of special concern. Currently, only three small, isolated populations of the Pacific fisher remain: native populations in northwestern California and the southern Sierra Nevada, and a reintroduced population in the southern Oregon Cascades (Sierra Forest Legacy, 2008). The Pacific fisher dens in hollow trees, rotting logs, and rocky crevices of old growth forests. Its diet consists of small mammals, fruit, truffles, and plants. This species are primarily nocturnal, and its home range is from 50 to 150 square miles. Fishers hunt exclusively in forested habitats and generally avoid opening areas.

The Forest Service and FWS have identified the Pacific fisher as potentially occurring in the project vicinity based on tracks reported in the project vicinity in 1982, and a Pacific fisher skull found on the ridge between Fisher Creek and Bald Mountain Creek in the mid-1970s. More recently, a wildlife biologist observed a Pacific fisher crossing FR 11 on the northeast side of Iron Canyon reservoir on April 25, 2007.

A field survey based on habitat mapping was conducted to identify potential habitat for Pacific fisher within the project area. About 43 percent (15,607 acres) of the study area was found to be potentially suitable Pacific fisher habitat, though the distribution pattern and abundance of potentially suitable Pacific fisher habitat varied throughout the study area, with changes often occurring in relation to elevation, aspect, slope, or timber harvest history. Pacific fisher habitat types in the study area include Sierran mixed conifer, ponderosa pine, montane hardwood-conifer, montane hardwood, montane riparian, montane chaparral, and mixed chaparral, as classified using the CWHR system. Survey elevations within the habitat ranged between 1,070 and 3,830 ft msl, with gentle to steep topography.

Suitable habitat for Pacific fisher occurs in the vicinity of existing and proposed project facilities, including project dams, powerhouses, and campgrounds. Connectivity of suitable habitat is fairly high in most of the project area, with less suitability and connectivity of habitat patches at the lower elevations around the Pit 6 and 7 reservoirs and transmission lines, and at the upper elevations along the proposed McCloud transmission line route (Nevares et al., 2009). The licensee's relicensing approach regarding Pacific fishers is to assume that the species is present, for at least part of the year, in potentially suitable habitat within the project area.

3.3.4.2 Environmental Effects

Federally listed species could potentially be affected by project activities, particularly construction activities that could alter habitat or disturb species.

The licensee proposes that before taking actions to construct new project features on Forest Service lands (including but not limited to proposed recreation developments) that may affect Forest Service special status species or their critical habitat, the licensee would prepare a biological evaluation of the potential effect of the action on the species or its habitat and submit it to the Forest Service for approval (PM&E measure 15). In coordination with the Commission, the Forest Service may require mitigation measures for the protection of the affected species. The biological evaluation would include procedures to: (1) minimize adverse effects on special status species; (2) ensure project-related activities meet restrictions included in site management plans for special status species; and (3) provide implementation and effectiveness monitoring of measures taken or employed to reduce effects on special status species.

Forest Service condition 11 is generally consistent with the licensee's proposed measure.

Our Analysis

Identification of potential effects related to new construction is integral to protection of federal listed special status species and the minimization or mitigation of unavoidable effects that could occur. The proposed measure to require the development of a biological evaluation to be submitted to the Forest Service would provide an important step in identification of potential effects as well as mechanisms for minimizing effects. In addition, federal agencies, including the Forest Service and the Commission, could provide mitigative measures for protecting listed species. Both PM&E measure 15 and Forest Service condition 11 are consistent in providing the necessary guidance for ensuring that the development of a biological evaluation would adequately identify, protect, and mitigate potential effects related to new construction within the project.

Valley Elderberry Longhorn Beetle

Project O&M activities that have the potential to adversely affect VELB habitat include vegetation trimming or clearing and herbicide applications that could damage or kill the elderberry host plant for VELB. Recreational uses including camping and off-road vehicle use have the potential to damage elderberry plants at Deadlun Campground, Hawkins Landing Campground, and dispersed recreation sites at Iron Canyon and McCloud reservoirs.

Measures for protection of elderberry are specified in the licensee's programmatic biological opinion and incidental take permit (FWS, 2003). This consultation outlines routine operation, maintenance, and emergency activities associated with the licensee's gas and electric facilities that may have the potential to affect elderberry plants. Avoidance, minimization, and conservation measures described in the programmatic biological assessment include:

- Provide funding for the acquisition or long-term management of up to 1,000 acres of high quality habitat adjacent to existing VELB populations in the Sacramento and San Joaquin valleys.

- Conduct elderberry surveys within a minimum of 20 ft from a project maintenance site. Flag and avoid elderberry plants found within the project footprint.
- Provide environmental training and education of personnel and contractors involved with project operation, maintenance, and emergency activities.
- Avoid use of herbicides within 20 ft of elderberry plants except for stump cut treatment of removed trees and clearing at the base of certain power poles or towers in compliance with California Public Resources Code section 4292.
- Where possible, fell trees directionally or remove in sections so as to avoid the 20-ft zone around existing elderberry plants.
- Implement erosion control measures if ground is disturbed during maintenance activities in the 20-ft zone around elderberry plants.
- Where feasible, trim elderberry plants rather than remove them.

The licensee would apply these measures to routine O&M activities, including development and maintenance of recreational areas. Incidental take or damage to elderberry plants beyond that permitted by this Programmatic Agreement is not anticipated. Forest Service condition 26 specifies that known suitable habitat should be monitored once every five years for VELB individuals. If the VELB is detected, elderberry plants should be protected from disturbance.

PG&E alternative condition 26 proposes that monitoring of known elderberry populations would occur every five years concurrent with surveys conducted for the vegetation and invasive noxious weed management plan. In addition, PG&E alternative condition 26 proposes to conduct pre-construction surveys for elderberry plant populations and the VELB consistent with the licensee's *Valley Elderberry Longhorn Beetle Conservation Program* developed and approved in the FWS-issued biological opinion (FWS, 2003).

Periodic monitoring reports summarizing VELB habitat locations and annual effects on elderberry at these locations would be submitted to FWS. Avoidance, protection, or mitigation measures would follow those outlined in the VELB conservation program, and the program specifications including the terms and conditions of the 30-year take permit would be described.

Our Analysis

Within the project area, the VELB conservation program established and approved by FWS in its 2003 biological opinion provides adequate protection for elderberry populations. Avoidance, protection, or mitigation measures would follow those outlined in the VELB conservation program.

Forest Service condition 26 specifies monitoring for VELB once every five years in suitable habitat; however, PG&E alternative condition 26 proposes to extend

monitoring to include pre-construction monitoring and states that avoidance, protection, and mitigation measures for construction would be consistent with those outlined in the VELB conservation program already in place and approved by FWS. We believe that monitoring of known elderberry populations concurrent with the five-year monitoring conducted as part of the vegetation and invasive weed management plan, as proposed by the licensee, would be consistent with Forest Service condition 26. We expect that Forest Service condition 26 and PG&E alternative condition 26 would, when implemented, minimize any potential effects to elderberry populations within the project area from O&M activities and most construction activity.

Implementation of pre-construction surveys and avoidance, protection, or mitigation measures consistent with those outlined in the VELB conservation program would minimize effects on the population of elderberry located along the proposed access road corridor from the construction of the Pit 7 afterbay powerhouse and future construction activities.

California Red-Legged Frog

No potential habitat was identified within the project area using aerial photos, video, and ground reconnaissance. Project reservoirs have limited emergent vegetation for breeding, limited availability of sheltered shoreline for adults, and predatory fish species. In addition, no California red-legged frogs were observed during intensive surveys of the project area for aquatic reptiles and amphibians, including northwestern pond turtle and foothill yellow-legged frog.

No specific PM&E or Forest Service conditions have been developed for the California red-legged frog.

Our Analysis

Because the project area does not support a California red-legged frog population or appropriate habitat for the species, we believe that normal project O&M or proposed construction would have no effect on California red-legged frogs.

Northern Spotted Owl

The northern spotted owl is known to be particularly sensitive to human disturbance and habitat alterations during its reproductive period (February 15 through September 30). Prolonged disturbance can reduce the ability of owls to detect prey, disrupt flight responses, reduce nest attentiveness, and decrease the rate of food delivery to the nest (FWS, 2008). These behavioral responses can lead to nest abandonment or failure. However, because no individuals or active nests were detected within the project area, project O&M or recreation activities are unlikely to affect this species.

Transmission line corridors can be lethal to birds, especially raptors such as the northern spotted owl. Birds touching lines can be electrocuted or badly injured if directly striking a line. Existing project transmission lines meet or exceed Avian Power Line

Interaction Committee standards to prevent electrocution of birds with the exception of the Pit 5 distribution line that contains some poles that are not in compliance.

Forest Service condition 26 specifies monitoring for northern spotted owl within 0.25 mile of suitable habitat in the project area once every five years. Surveys conducted once every 10 years in suitable habitat would identify new individuals, pairs, or nest sites. Lastly, surveys would be conducted prior to any disturbance activities, or the licensee could schedule construction or disturbance activities outside of the limited operating period of February 1 through July 9.

PG&E alternative condition 26 proposes to eliminate the requirement for northern spotted owl surveys within 0.25 mile of suitable habitat in the project area once every five years, and within suitable habitat once every ten years. Instead, the licensee proposes pre-construction surveys in suitable habitat within 1.3 miles of proposed construction. Surveys would follow standard protocols for the species. Alternatively, the licensee could schedule construction activity for outside of the limited operating period of February 1 to July 9.

Forest Service condition 26 also specifies requirements to file with the Commission an avian collision and electrocution hazards plan, approved by the Forest Service in consultation with appropriate federal and state agencies that minimizes adverse interactions between project transmission lines and avian species. PG&E alternative condition 26 proposes, in lieu of an avian collision and electrocution hazards plan, to upgrade the non-compliant sections of the existing distribution line within three years after license issuance; construction of all new transmission lines would meet the APLIC standards.

Our Analysis

The northern spotted owl is not known to exist within the project area, though potential habitat does exist. We expect that pre-construction surveys as proposed by the licensee would sufficiently minimize any effects from disturbance to northern spotted owl that project construction activity could cause. Alternatively, avoidance of construction activity during the limited operation period would also protect any individuals within the project area from construction activity. We expect that specific standards for transmission lines developed by APLIC that are employed along proposed power lines and retrofitted on existing lines would avoid or minimize avian electrocution hazards to this species if it occurs within the project area, and that if lines are brought into compliance within three years of license issuance, an avian collision and electrocution hazards plan would not be necessary. We believe that relicensing the existing project, continued normal O&M activities, and proposed construction of new facilities are not likely to adversely affect northern spotted owl in the project area.

Pacific Fisher

The Pacific fisher's association with late successional forest habitats and its avoidance of human activity makes the species highly sensitive to anthropogenic habitat

loss, degradation, and fragmentation related to forest management, development, and noise disturbance. Prolonged disturbance, forest management, and infrastructure development can affect Pacific fishers by altering normal behavior, causing displacement from preferred habitat, and decreasing reproductive success and individual health (Powell and Zielinski, 1994, and 50 CFR 17 as cited in PG&E, 2009a). Potentially suitable Pacific fisher habitat was identified throughout the project area. The licensee does not own or manage forest lands in the project area and therefore does not have an ongoing effect on the general quality and quantity of Pacific fisher habitat. Although hazard tree removal around project and recreational facilities does occur as part of project O&M, it is unlikely that fishers would roost or den in proximity to human activity, and project effects as a result of hazard tree removal are unlikely.

Forest Service condition 26 specifies that the development of a TBMP should provide surveys be conducted once every five years in suitable habitat within the project and project-affected areas. PG&E alternative condition 26 specifies, for the Pacific fisher, to eliminate the requirement for surveys once every five years and, instead provide for pre-construction surveys in areas of suitable habitat within 0.5 mile of any planned construction. Methods for the surveys would involve passive detection systems, such as baited camera stations; however, survey methods could be developed from review of scientific literature and any available standard protocols species to fisher surveys.

Our Analysis

It is unlikely that normal project O&M activity or proposed construction would have an effect on the Pacific fisher. We expect that preconstruction surveys, as proposed by the licensee, are adequate protection for Pacific fisher that may inhabit the project area based on this species' known behavior and the large area for potential occurrence within the project. As a result, relicensing of the existing project, continued normal O&M activities, and proposed construction of new facilities are not likely to adversely affect Pacific fisher in the project area.

3.3.5 Recreation Resources

3.3.5.1 Affected Environment

Regional Recreation Resources

Opportunities for recreation within the region surrounding the project are plentiful. The project partially lies within and adjacent to the Shasta National Forest which provides a variety of formal and informal recreational facilities and opportunities. Much of the National Forest lands are open to the public for recreation. Regional recreational opportunities include fishing, camping, boating, hiking, scenic/wildlife viewing, hunting, and general day-uses such as picnicking and swimming (PG&E, 2008a).

Recreational resources outside of the project but within the region surrounding the project include areas that provide river-based fishing opportunities similar to those available in the lower McCloud River, or reservoir-related activities similar to those

available at McCloud and Iron Canyon reservoirs. These areas are all located in northern California, and most are located within 100 miles of the project area (PG&E, 2008a). Regional bank-fishing resources include the upper McCloud River, Fall River, Hat Creek, Burney Creek, upper and lower Sacramento River, Pit River (above the project), Klamath River, and Trinity River. Regional reservoir-based activity resources include Lake Siskiyou, Shasta Lake, Medicine Lake, Lake Shastina, Castle Lake, Iron Gate reservoir, Whiskeytown Lake, Lake Britton, Baum Lake, and Trinity Lake (PG&E, 2008a).

The project is geographically close to PG&E's Pit 3, 4, and 5 Project (FERC No. 233) with portions of the McCloud-Pit Project no more than 30 miles from the Pit 3, 4, and 5 Project (PG&E, 2008a). Thus, the regional recreational resources for the project overlap with those of the Pit 3, 4, and 5 Project. Recreational opportunities at the Pit 3, 4, and 5 Project generally occur in the area surrounding Lake Britton and within the Pit River Canyon. Lake Britton provides opportunities and facilities for camping, picnicking, boating, swimming, wildlife viewing, fishing, and hiking. Developed facilities at Lake Britton include 155 developed campsites, two developed boat launches, and three developed picnic areas (EDAW, 2001 as cited in PG&E, 2008a). The eastern section of Lake Britton provides more primitive and dispersed recreational opportunities, while the western portion of the reservoir upstream of the Pit 3 dam provides more developed recreational opportunities, such as developed campgrounds and day-use areas (FERC, 2004). The Pit River Canyon provides more undeveloped, dispersed recreational opportunities, such as trout fishing, camping, hiking, whitewater boating, and sightseeing (FERC, 2004).

Lake Siskiyou offers recreational opportunities such as boating, camping, swimming, fishing, and windsurfing. The reservoir provides more than 300 developed campsites, a boat launch, a marina, and two developed picnic areas (EDAW, 2001 as cited in PG&E, 2008a).

Shasta Lake, located in the Whiskeytown Shasta-Trinity National Recreation Area, offers recreational opportunities such as motorized (most notably houseboating) and non-motorized boating, swimming, fishing, camping, picnicking, and hiking. Shasta Lake provides seven developed boat launches, three developed picnic areas, and more than 300 developed campsites (EDAW, 2001 as cited in PG&E, 2008a). Most of the recreation facilities are operated by the Forest Service, except for a few private marinas (PG&E 2008a).

Whiskeytown Lake, located in the Whiskeytown Shasta-Trinity National Recreation Area, offers recreational opportunities such as motorized and non-motorized boating, swimming, fishing, camping, picnicking, hiking, and sailing. Whiskeytown Lake provides three developed boat launches and four developed picnic areas (EDAW, 2001 as cited in PG&E, 2008a). Many of the recreation sites are managed by the Park Service, and day-use activities are encouraged rather than overnight use; however, there are more than 100 developed campsites along the shoreline of the reservoir (PG&E, 2008a).

Baum Lake is located near the town of Cassel on Hat Creek. All motorized boating (except electric trolling motors) is prohibited on the lake, making it open only to non-motorized boating. The primary activity at Baum Lake is fishing, similar to the non-reservoir segments of Hat Creek. A formal fishing access with a primitive boat launch is provided at the reservoir (PG&E, 2008a).

Trinity Lake is located entirely within the Whiskeytown Shasta-Trinity National Recreation Area, and most of the recreation facilities are operated by the Forest Service, except for a few private marinas (PG&E 2008a). Recreational opportunities at Trinity Lake include motorized and non-motorized boating, swimming, fishing, camping, picnicking, and hiking. There are nine developed boat launches, three developed picnic areas, and more than 400 developed campsites at the lake in addition to many primitive boat-in camping areas scattered along the shoreline (EDAW, 2001 as cited in PG&E 2008a).

Medicine Lake, located in the Modoc National Forest, provides fishing and boating opportunities. It has one improved and two unimproved launch ramps and four campgrounds suitable for tent, recreational vehicle (RV), or group camping. All boating is allowed at Medicine Lake as well as water-skiing, jet-skiing, and swimming (FishersNet, 2010). Iron Gate reservoir provides camping, boating, and fishing opportunities with developed campgrounds suitable for tents, RVs, or trailers, and improved boat launching facilities (FishersNet, 2010). Lake Shastina provides opportunities for fishing, all types of boating, water-skiing, and swimming. Lake Shastina also has a marina, tennis, golf, and a water slide (FishersNet, 2010). Fishing, camping, and hiking are available at or near Castle Lake, located mostly within Shasta-Trinity National Forest, including a trail that leads into the adjacent Castle Crags Wilderness Area and connects to the Pacific Crest National Scenic Trail (Forest Service, 2010b and 2010c).

There are a number of river-based fishing opportunities similar to those available in the lower McCloud River located in the region surrounding the project. These include the following: the McCloud River above McCloud reservoir which provides developed campgrounds and dispersed camping opportunities; Fall River with limited developed recreation facilities or dispersed camping opportunities; Hat Creek, which is partially located in the Lassen National Forest with many nearby recreation facilities; Burney Creek, which flows through Shasta National Forest lands and has developed recreational facilities at the McArthur-Burney Falls State Park; the Sacramento River, which provides angling opportunities, limited dispersed camping opportunities, and a developed recreation facility at Castle Crags State Park; Pit River, which provides angling opportunities with a few developed recreation facilities and dispersed camping opportunities; and the Trinity River located nearly entirely in Shasta-Trinity National Forest, which provides fishing opportunities and a number of developed recreational facilities and dispersed camping opportunities (PG&E, 2008a).

Two Forest Service developed campgrounds, Ash Camp and Ah-Di-Na, and The Nature Conservancy's McCloud River Preserve, which is used by some anglers and boaters, are located on the Lower McCloud River downstream of the project. The Lower McCloud River extends 24 river miles from McCloud dam to Shasta Lake and is considered one of the premiere trout streams in California. The Lower McCloud River is accessible at the base of McCloud dam.

The Pacific Crest Trail, which is not part of the project, is a national scenic trail spanning over 2,650 miles from Mexico to Canada. The trail crosses the Lower McCloud River near Ash Camp via a wooden foot bridge. The trail follows the river for about 0.5 mile upstream of the campground. The Pacific Crest Trail crosses Ah-Di Na Road (FR 38N53) about 0.5 mile upstream of the campground.

Project Area Recreation Resources

There are three developed recreation areas within the project boundary: Tarantula Gulch boat ramp at McCloud reservoir; and Deadlun Creek Campground and Hawkins Landing Campground and boat ramp at Iron Canyon reservoir. All of these are located within the James B. Black Development (see figures 3-2 and 3-3).

McCloud Reservoir

The Tarantula Gulch boat ramp was constructed and is operated by the Forest Service (table 3-26 and figure 3-2). Tarantula Gulch boat ramp has a boat launch ramp and a developed picnic area. The single-lane concrete boat launch ramp has a loading dock with parking for 22 vehicles with trailers and a nearby overflow parking area.

PG&E states that the bottom of the boat ramp is 1 ft below the normal minimum operating reservoir level (elevation 2,634 ft) and typically provides boater access during the entire recreation season. The Forest Service reports that sediment and debris accumulate on the ramp and occasionally impede boat launching.

The majority of lands surrounding McCloud reservoir are privately owned, with NFS and PG&E-owned lands that are accessible to the public located on the southern end of the reservoir extending along FR 38N11 from near the access road to Tarantula Gulch (FR 38N81) and continuing across McCloud dam to Star City Creek. Most of the publicly accessible lands are located between FR 38N11 and the reservoir shoreline. Dispersed recreation is allowed on PG&E and NFS lands, unless otherwise designated. PG&E identified nine user-created dispersed recreation sites at lower-gradient access points accessible from FR 11 or Star City Road (FR 38N04Y) around McCloud reservoir and a dispersed campsite on an island in the reservoir. The Star City Creek area is the largest dispersed site at McCloud reservoir with space to comfortably accommodate three to five user groups at one time. The area is typically used for camping, although the site is not formally designated for such use, and there is some disagreement between the Forest Service and The Hearst Corporation over use of this site for overnight camping. The Hearst Corporation is a private landowner with large property holdings that surround McCloud reservoir. When the project license was issued in 1961, the Forest Service and

The Hearst Corporation were completing a land exchange to consolidate ownership in a portion of the forest and to provide for public access to McCloud reservoir. In a 1963 agreement, The Hearst Corporation donated about 95 acres of land around the southern shore to the Forest Service.

Table 3-26. Recreation Facilities at McCloud Reservoir. (Source: PG&E, 2009a and 2008b, and staff)

Site Name	**Facilities**
Tarantula Gulch Boat Ramp (also known as the Lake McCloud Boat Launch)	Single-lane concrete boat launch ramp, a loading dock, 3 picnic tables, 4 wildlife-resistant trash receptacles, 22 parking spaces for vehicles with trailers, vault restroom with 2 unisex accessible stalls, overflow parallel parking with unmarked spaces

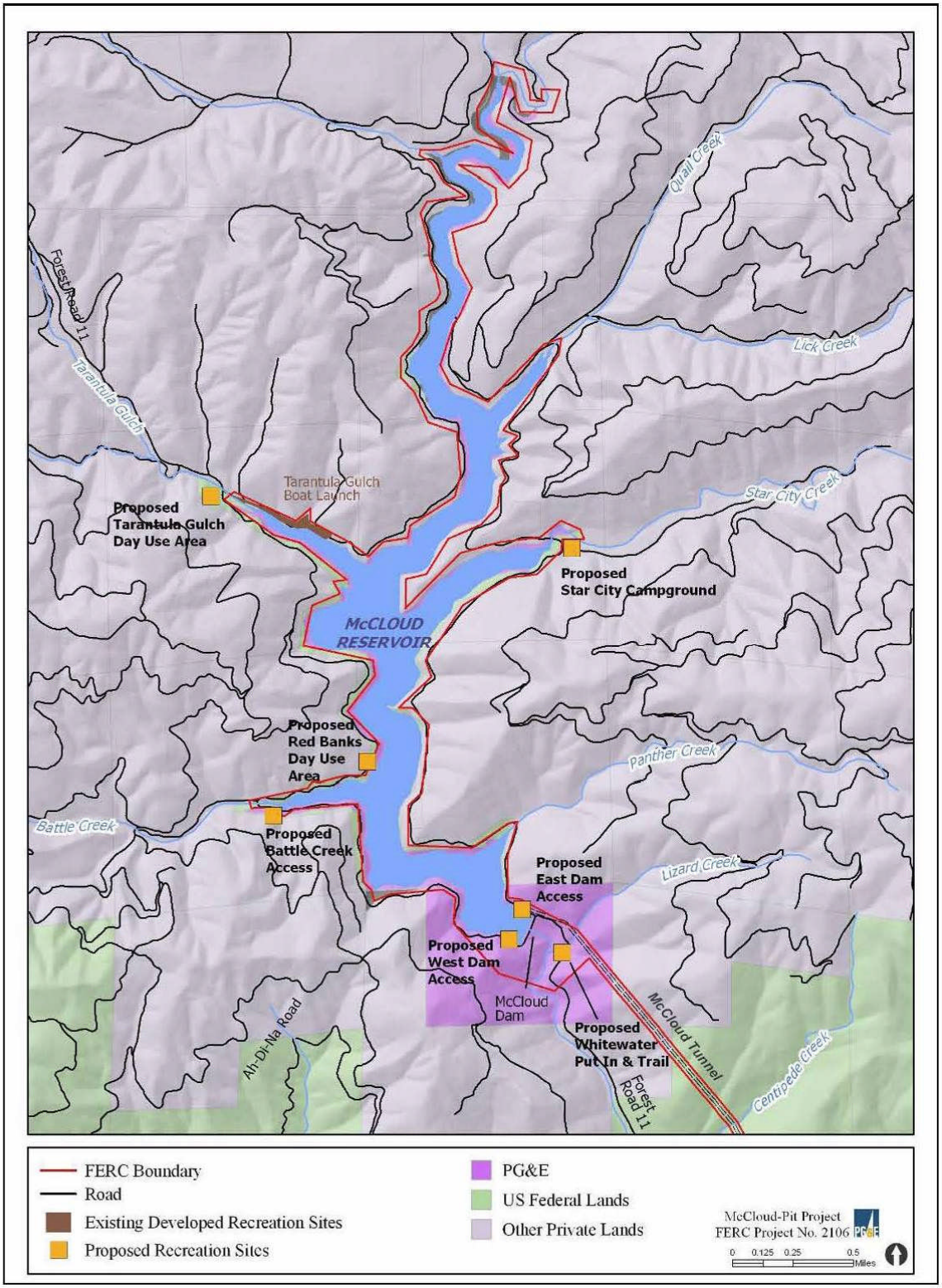


Figure 3-2. Existing and proposed recreation facilities at McCloud reservoir. (Source: PG&E, 2009a)

Iron Canyon Reservoir

There are two developed recreation areas at Iron Canyon reservoir: Hawkins Landing Campground and boat ramp, owned and operated by PG&E, and Deadlun Campground, which is operated by the Forest Service (table 3-27 and figure 3-3).

Hawkins Landing Campground and boat ramp have the only boat launch ramp on Iron Canyon reservoir and provides campsites. None of the Hawkins Landing facilities are Americans with Disabilities Act (ADA) accessible and facilities in the campground are in poor condition. No formal parking is available at the boat launch and the number of vehicles that the boat launch area can accommodate depends on reservoir elevation. Normal project operations can cause the reservoir to fluctuate on a daily basis, which affects the availability of parking at the shoreline near the launch. When the reservoir is at full pool (2,664 ft), visitors park vehicles in the campground. As the reservoir elevation lowers, exposing more shoreline, visitors park along the shoreline, thereby increasing the potential number of vehicles that can park near the launch area. At the minimum operating pool elevation (2,593 ft), the end of the boat launch (2,610 ft) is out of water and visitors have difficulty launching or cannot launch boats. Since 1996, PG&E has voluntarily maintained the reservoir water surface elevation above 2,615 ft to keep the boat ramp useable during the primary recreation season from May 15 to October 15.

The Forest Service Deadlun Campground has about twice as many campsites as Hawkins Landing; however, the sites are positioned away from the shoreline at the back of the Deadlun Creek Cove, making it less appealing to visitors.

Iron Canyon reservoir is easily accessible from Big Bend, California, via FR 11 and Oak Mountain Road, and is accessible via a lengthier route from the town of McCloud (PG&E, 2008b). A section of FR 11 between McCloud reservoir and Iron Canyon reservoir is narrow, rocky, and very rough. Hawkins Landing is the first developed recreation area users pass when traveling north from the town of Big Bend, California.

The majority of lands surrounding the reservoir are PG&E-owned or NFS lands. User-created access trails (pedestrian and OHV) originate from both campgrounds and nearby areas providing dispersed shoreline access. PG&E has identified 22 dispersed recreation sites around Iron Canyon reservoir with heavily used dispersed recreation sites at the areas adjacent to Deadlun Campground and Iron Canyon reservoir spillway.

Table 3-27. Recreation facilities at Iron Canyon reservoir. (Source: PG&E, 2009a and 2008b, and staff)

Site Name	Facilities
Deadlun Campground	27 campsites with fire rings and picnic tables, 3 vault restrooms with single, unisex, ADA-accessible stalls, overflow parallel parking with unmarked spaces
Hawkins Landing Campground and Boat Ramp	Single-lane concrete launch ramp, 11 campsites with fire rings and picnic tables, 1 working non-potable water hand pump, trash receptacle, 2 vault toilets

Lower McCloud River and Hawkins Creek Crossing

Recreation areas downstream of McCloud reservoir include the area at Hawkins Creek crossing (inside the project boundary) and the Lower McCloud River (outside the project boundary). Hawkins Creek crossing is a cleared level area where the McCloud tunnel crosses Hawkins Creek about one mile above the confluence with the Lower McCloud River. PG&E documented two dispersed recreation sites at the project near Ash Camp, a dispersed campsite on Hawkins Creek at Hawkins Creek tunnel that is accessible via the PG&E project road, and a dispersed campsite on the PG&E spoil pile area on Hawkins Creek that is just north of the Hawkins Creek tunnel (PG&E, 2008b).

The Lower McCloud River extends 24 river miles from McCloud dam to Shasta Lake. While the Lower McCloud River is accessible at the base of McCloud dam, most of the Lower McCloud River below McCloud dam is located outside the project boundary.

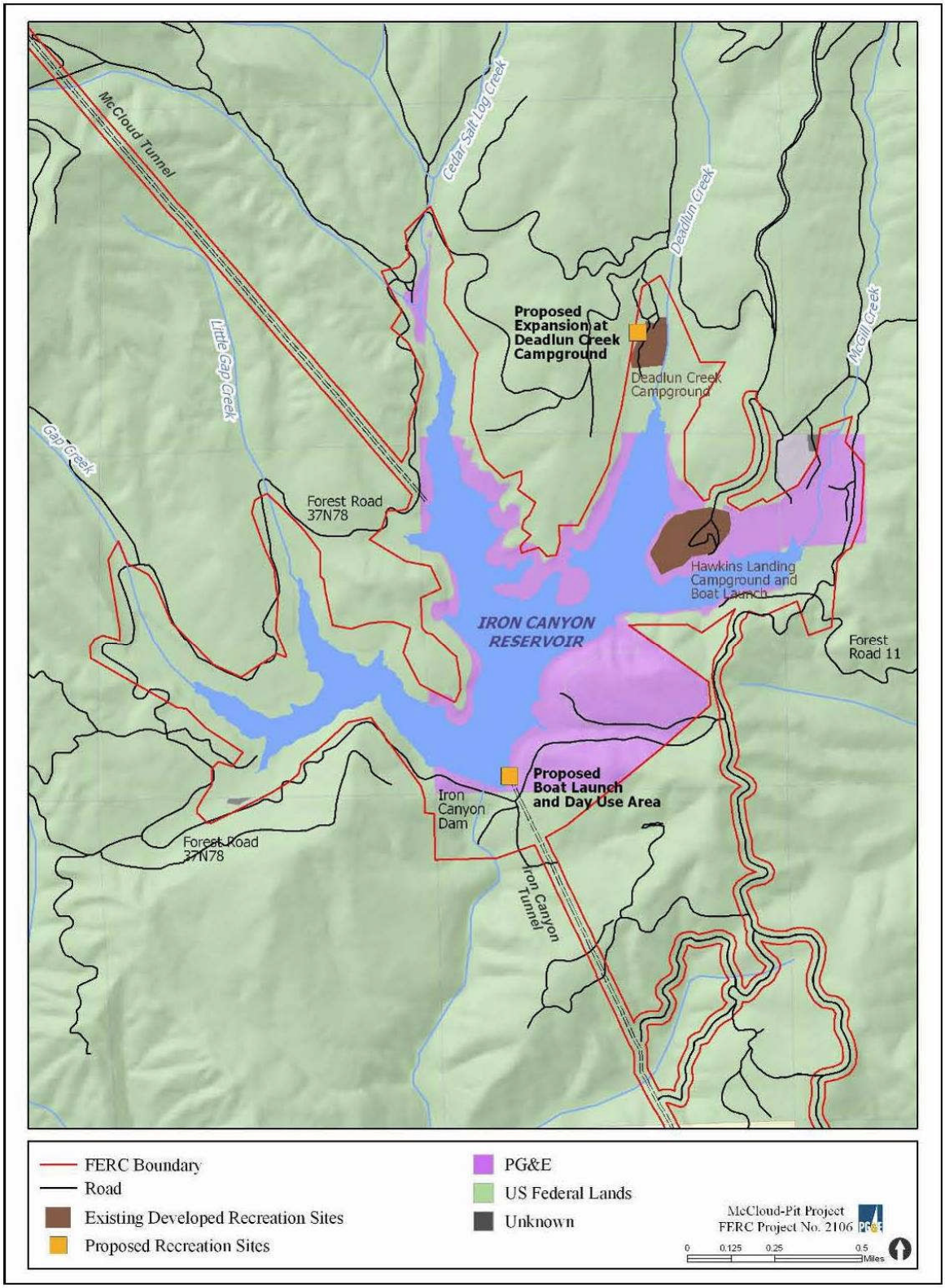


Figure 3-3. Existing and proposed recreation facilities at Iron Canyon reservoir. (Source: PG&E, 2009a)

Pit River (James B. Black Powerhouse, Pit 6 and Pit7 Reservoirs, and Pit 7 Afterbay)

There are no developed recreation sites in the Lower Pit River; however, dispersed recreation is evident in a few locations.

User-created trails and dispersed camping can be found along the Lower Pit River across from the James B. Black powerhouse.[10] The powerhouse is easily accessible via Big Bend Road to the Pit 5 Road from Big Bend, California (PG&E, 2008b).

Vehicular access does not exist to the Pit 6 reservoir. PG&E documented a dispersed recreation site at the base of Pit 6 dam. The Pit 6 dam is easily accessible from Big Bend, California, via Big Bend Road to Cove Road to the Pit 6 Powerhouse Road. There is an angler trail to the Pit 7 reservoir (Pit 6 tailwater) that originates from the Pit 6 Powerhouse Road within sight of Pit 6 dam (PG&E, 2008b).

PG&E documented a dispersed recreation site at the base of Pit 7 dam. Public access to the Pit 7 dam is limited to foot traffic through a PG&E-maintained gate across the access road about 1.5 miles from the dam.

User-created trails and dispersed camping can be found at Fenders Flat in the area of the Pit 7 afterbay (figure 3-4). Fenders Flat is a 5- to 10-acre informal dispersed recreation area located between steep topography to the south and the Pit 7 afterbay to the north. The access road to this area is deeply rutted and only suitable for high clearance vehicles.

Shore lands within the project at the Pit 7 afterbay are administered by the Forest Service (PG&E, 2008a). Because the water level rapidly fluctuates in response to the Pit 7 powerhouse operation, public access to the Pit 7 afterbay is not allowed. A Shasta County boating ordinance prohibits swimming and boating in the afterbay due to public safety concerns (PG&E, 2006 as cited in PG&E, 2008a). For safety reasons, the afterbay is fenced and posted with warning signs to prohibit shoreline access and boating on the afterbay. There is a Forest Service unimproved car-top boat launch directly below the Pit 7 afterbay dam that provides boater access to the pit arm of Shasta Lake during late winter and early spring when high reservoir levels allow boat launching (PG&E, 2008a).

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[10] According to PG&E, a developed recreation site is planned for this location as part of PG&E's Pit 3, 4, and 5 Project license implementation.

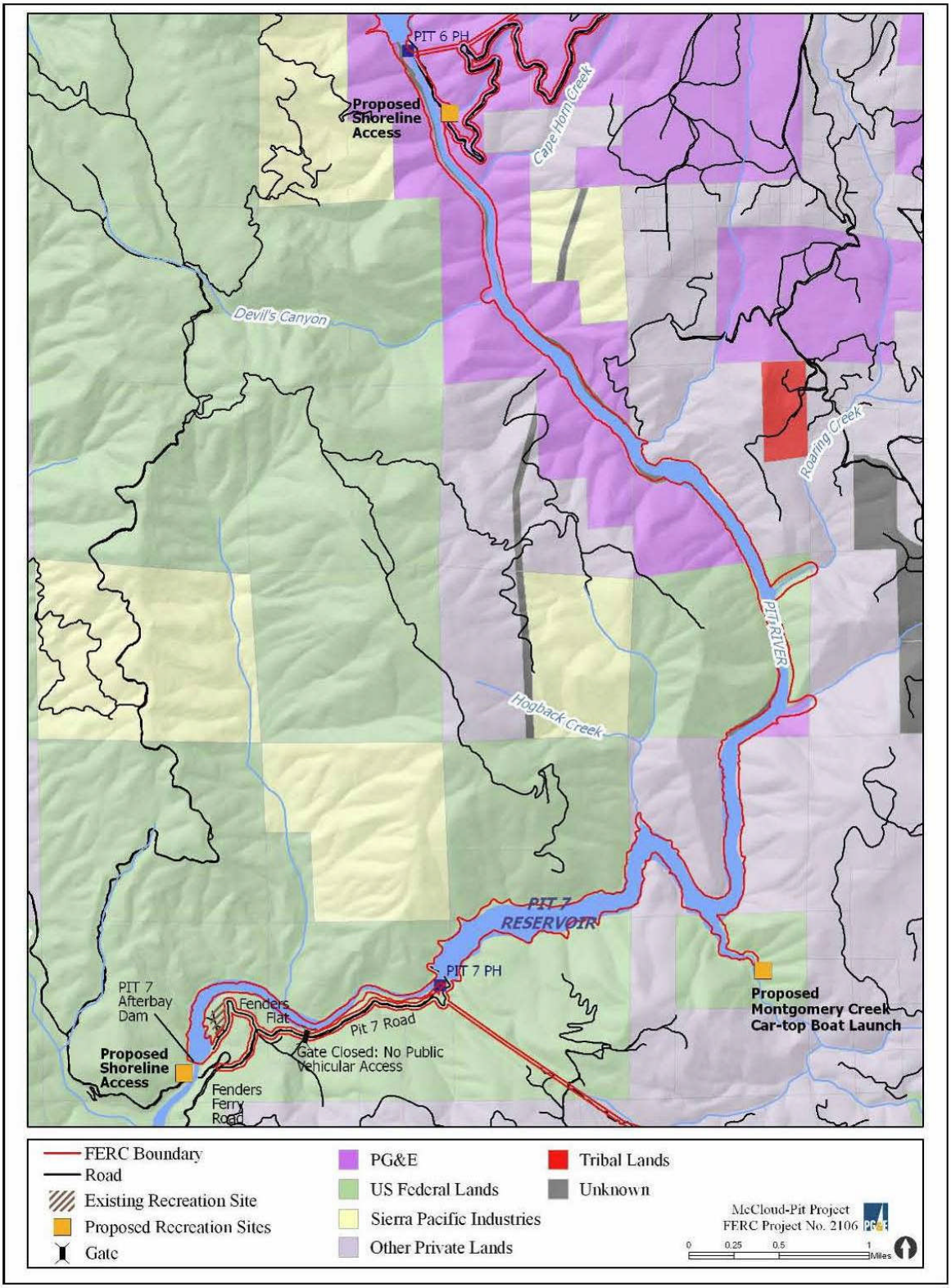

Figure 3-4. Existing and proposed recreation facilities at Pit 7 reservoir and Pit 7 afterbay dam. (Source: PG&E, 2009a)

Recreational Use

PG&E collected recreational use data using direct visual observations during the 2007 and early 2008 recreation season to develop visitation estimates. Recreation use within the project boundary occurs at the three developed recreation areas, and dispersed recreation use occurs in a number of areas throughout the project boundary. For purposes of the relicensing studies, the recreation season for the project was defined to be between April 26 (or first open access after snow melt) to November 15, with the primary recreation season from May 15 to October 15.

Recreation uses at the project include camping, fishing, boating, swimming, water skiing, hiking, picnicking, sightseeing, wildlife viewing, off-road driving, and hunting. McCloud reservoir supports various recreation activities. Based on PG&E's visitor use surveys conducted during the relicensing studies, the primary activities at McCloud reservoir include angling (69 percent); water-based recreation activities (swimming, jet skiing, water skiing, wakeboarding) (18 percent); viewing scenery, wildlife, and nature (16 percent); camping (12 percent); and motorized and non-motorized boating (11 percent) (PG&E, 2008d). The primary activities at Iron Canyon reservoir include angling (80 percent); viewing scenery, wildlife, and nature (13 percent); and camping (13 percent). Visitors to the Lower McCloud River participated in fewer recreation activities, with fly fishing being the most common. The primary activities in the area near the Pit 7 afterbay include angling (55 percent), camping (18 percent), and biking (18 percent). Table 3-28 reports the primary recreation activities of visitors to the project based on PG&E's visitor use survey. Generally, visitors spend most of their time participating in these recreation activities while at the project.

Table 3-28. Primary activity by general area within the project. (Source: PG&E, 2008d, as modified by staff)

	Percentage of Respondents			
Activities	**McCloud Reservoir**	**Iron Canyon Reservoir**	**Lower McCloud River**	**Pit 7 Afterbay**
Angling	69	80	84	55
Camping	12	13	17	18
Picnicking	3	2	1	
Wet recreation (swim, personal watercraft, water skiing, wakeboarding)	18	2	2	
Boat (any)	11	2	0	
Viewing scenery, wildlife, nature/photography	16	13	8	9
Hiking (day and backpacking)	3	1	3	
Hunting	2	4		
Scenic driving				
Biking	3	1	1	18

Note: Totals more than 100 percent due to some respondents choosing more than one primary activity.

Annual recreational use for the project was estimated at close to 33,400 visitors.[11] Visitors to the project predominantly live in neighboring counties or the San Francisco Bay area. Traffic counters recorded traffic volumes during the study period; however, because of the configuration of the road network and the roaming nature of visitors to areas around the project, traffic volume estimates were not the same as numbers of individual users. As such, visitor estimates based on traffic volumes resulted in visitor use estimates that were inconsistent with the number of vehicles-at-one-time (VAOT) or people-at-one-time (PAOT) reported from direct visual observations. Table 3-29 presents PG&E's estimates of existing visitor use using the observation method.

[11] Visitor estimates based on direct visual observation do not include non-project visitors or field study staff and is based on evidence of actual visits to project recreation areas.

Table 3-29. Project study area current use estimates by month using observation method. (Source PG&E, 2008d, as modified by staff)

Month	McCloud Reservoir	Iron Canyon Reservoir	Lower McCloud River[a]	Pit 6 Reservoir[b]	Pit 7 Reservoir[c]	Pit 7 Afterbay
April	908	621	814	–	8	368
May	2,620	932	1,473	–	8	257
June	3,862	648	1,250	–	8	354
July	4,324	499	648	–	8	161
August	4,945	438	689	–	8	206
September	2,956	400	525	–	8	131
October	378	391	1,339	–	8	271
November	220	220	281	–	8	199
Total	20,212	4,148	7,019	0	64	1,947

[a] PG&E's relicensing study included areas outside the project boundary in this study area, including the Ah-Di-Na Campground and Ash Camp Campground.

[b] Nobody was observed recreating within the Pit 6 reservoir during the relicensing study.

[c] Estimate based on assumption from observations of people at the sites and conversations with PG&E operators and staff familiar with the Pit 6 dam area (within Pit 7 reservoir) that indicated visitors rarely fish the Pit 6 dam tailwater.

McCloud Reservoir

Visitor survey results indicate that the majority of visitors to McCloud reservoir come from Siskiyou and Shasta Counties (counties adjacent to or surrounding the project); however, other visitors from northern Central Valley counties were also represented in the survey results. PG&E's study results estimate that McCloud reservoir supported about 20,133 recreation days in 2008 (PG&E, 2008d).[12] Tarantula Gulch boat ramp accounted for 92 percent of the visitation to McCloud reservoir, with overall visitation of 55 percent occurring on weekdays and 44 percent occurring on weekends. Tarantula Gulch boat ramp typically is the first opportunity visitors traveling from the

[12] A recreation day is defined as any visit by an individual for any length of time during a 24-hour period.

town of McCloud have to stop and view the reservoir. Vehicle count data was recorded at times when project roads were covered in snow, indicating that the road to Tarantula Gulch may have been accessible at times or there was possible snowmobile use.

In addition to launching boats, the site is popular with bank anglers and day-users. Use levels are highest during the summer months. PG&E's collaborative analysis of study results with relicensing participants indicate the site is at or over capacity from April to August.[13] The study results show that the picnic area at the boat ramp is rarely used, indicating that recreation use at the site is primarily for reservoir access and shoreline uses. The picnic area's location away from the water, the abundance of star-thistle, and the lack of shade contribute to its undesirability for day-use. Results from user surveys conducted at the boat ramp indicate there is growing conflict between non-boating visitors using the ramp as a swimming dock and fishing platform and visitors launching and retrieving boats at the ramp.

Steep topography surrounding the reservoir limits the number and size of potential recreation sites and results in concentrated uses at a few dispersed recreation sites. For some users, these dispersed use sites provide the informal setting desired on trips to the reservoir. Direct observation counts during the peak recreation months (May through September) indicate that 12 vehicles are typically parked around the reservoir at dispersed sites at any given time during daylight hours, resulting in multiple vehicles at a number of locations. Star City Creek dispersed recreation area is the only site on McCloud reservoir that can accommodate more than three user groups comfortably, and the site consistently receives multiple user-groups throughout the recreation season. The area is typically used for camping, although the site is not formally designated for such use, and there is currently a disagreement between the Forest Service and the Hearst Corporation over use of this site for overnight camping. Similar to Tarantula Gulch boat ramp, Star City is considered to be over capacity from May to August and it is approaching capacity in April, September, and October. Other popular dispersed areas include the parking area at the intersection of Tarantula Gulch Road and FR 11, "Red Banks area," and "Battle Creek." The base of McCloud dam receives modest amounts of recreation use from anglers and boaters putting into the Lower McCloud River.

The recreational setting associated with boating on McCloud reservoir was inventoried using the Water Recreation Opportunity Spectrum (WROS) through a collaborative process that included interested relicensing participants. The WROS is a tool to understand the type and location of six types of water-related recreation opportunities, otherwise known as WROS classes. The six WROS classes range across a spectrum of urban, suburban, rural developed, rural natural, semi-primitive, and primitive classes. Each WROS class is defined by a particular "package" of activities, setting attributes, experiences, and benefits. WROS classes of McCloud reservoir range from

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[13] Sites were determined to be over the physical capacity of the site when 35 to 40 percent of the vehicle spaces were filled on non-holiday weekends.

semi-primitive (head of reservoir, Lick Creek arm, and middle of reservoir/island) to rural natural (main channel north of boat ramp, at Lick Creek, and at the bridge) to rural developed (the boat launch arm, the area above the dam, and the main channel including Battle Creek arm) (PG&E, 2009a and 2008c).

Iron Canyon Reservoir

Similar to McCloud reservoir, the greatest numbers of survey respondents at Iron Canyon reservoir live in Siskiyou and Shasta Counties. PG&E estimates that the Iron Canyon reservoir area supported about 4,163 recreation days in 2008 (PG&E, 2008d). Developed recreation facilities (Hawkins Landing Campground and boat ramp and Deadlun Campground) received 84 percent of the recreation use at Iron Canyon reservoir. Traffic count data recorded at the developed recreation facilities indicate that visitors use the campgrounds as their base while they explore and use dispersed areas throughout the general area. Use levels of Hawkins Landing are highest in July and August when the study results show the campground to be over capacity with slightly less use in the April to June and September to November months. PG&E's relicensing study results show Deadlun Campground is below capacity during all months except for April and May when use was approaching capacity.

The most popular water-based activities at Iron Canyon reservoir are motorized and non-motorized boating and angling. At the dispersed recreation sites around Iron Canyon reservoir, visitors typically participate in camping, driving OHVs, angling, or general shoreline-based activities.

WROS classes of Iron Canyon reservoir range from semi-primitive (Gap Creek arm, Little Gap Creek arm, Cedar Salt Log Creek arm, main body/island, Deadlun Campground arm) to rural natural (the area above the dam and the area around Hawkins boat ramp) (PG&E, 2009a and 2008c). These classifications capture the physical disturbances visible from the water as well as the social setting and potential for interaction between water and shoreline users.

Lower McCloud River

Visitor survey results indicate that visitors to the Lower McCloud River originate from throughout California, with a lower percentage of respondents living in adjacent counties than those visiting McCloud or Iron Canyon reservoirs, suggesting that the Lower McCloud River has greater overall appeal. In addition, survey results indicate that visitors to the Lower McCloud River are primarily anglers and do not visit the project reservoirs, but rather focus activities and destinations along the Lower McCloud River (below McCloud dam). According to survey results, these users also frequent other regional rivers for angling (e.g., Upper Sacramento, Pit, and Trinity Rivers). Visitor survey results indicate that although boating on the river does occur, the estimated number of boating trips (both whitewater and access based) account for about five to ten trips in most years depending on the water year type.

PG&E estimates that the Lower McCloud River supported about 7,050 recreation days in 2008 (PG&E, 2008d). PG&E's relicensing study area included Hawkins Creek Crossing (inside the project) and areas outside the project boundary, including the Ah-Di-Na Campground and Ash Camp Campground. Very few users were observed at the Hawkins Creek crossing, but it is occasionally used by anglers fishing Hawkins Creek.

Pit River (James B. Black Powerhouse, Pit 6 and Pit 7 Reservoirs, and Pit 7 Afterbay)

Anglers seeking access to the Pit River comprise the majority of people using the dispersed recreation sites near the James B. Black powerhouse, the base of Pit 6 and Pit 7 dams, and the Fenders Flat area. Recreational use of the dispersed recreation sites in proximity to James B. Black powerhouse and Pit 6 dam is very low. During the study period, there were no direct observations of recreational use occurring at the base of Pit 6 dam along Pit 6 Road. PG&E reports that the estimated 70 recreation days of use at this area in 2002 is likely an accurate estimate of current use considering the lack of direct observations during the 2007 and early 2008 study seasons. The use of the dispersed access area across from the James B. Black powerhouse was included in the study area for PG&E's Pit 3, 4, and 5 Project license application, whereby PG&E concluded the area received modest use. PG&E estimates that the Pit 7 afterbay supported about 1,947 recreation days in 2008 (PG&E, 2008d).

The flat water boating WROS inventory for the Lower Pit River ranged from a class of rural developed on Pit 6 reservoir to rural developed (put-in below Pit 6 dam, Montgomery Creek node, and Pit 7 dam node), rural natural (private camp node and lower Pit 7 reservoir node), and semi-primitive (Pit 7 reservoir segment, Roaring Creek Cove node) on Pit 7 reservoir. The recreation setting within both reservoirs is comparable and influenced by reservoir elevations (e.g., physical setting scores were lower when shoreline was exposed within the narrow canyon). The absence of other users resulted in primitive social setting; however, the management and physical setting characteristics are more consistent with the rural developed setting. Pit 7 reservoir WROS classifications tended more toward primitive due to its length and the natural slot canyon rock formation at the confluence of Roaring Creek.

Angling

The project waters provide ample angling opportunities. Survey data collected by PG&E indicate a high level of participation of project users in angling. The percentage of visitors whose primary activity included angling was highest in the Lower McCloud River (84 percent) followed by Iron Canyon reservoir (80 percent) and McCloud reservoir (69 percent). California Fish and Game classifies the 7.3-mile-long river reach of the Lower McCloud River immediately downstream of McCloud dam as a wild trout area (California Fish and Game, 2004 as cited in PG&E, 2009a).

The quality of angling along the Lower McCloud River (below McCloud dam) depends on the quantity of flow within the river. PG&E investigated flow relationships

for both angling and boating opportunities (boating opportunities are discussed below under the section titled *Whitewater Boating*). Diversions from the project result in a consistent base flow, and decrease the number of high-flow spill events and the number of days of spill during various types of water years. PG&E's study results indicate that 210 to 375 cfs as measured at the Ah-Di-Na gage (gage MC-1) is optimal for angling, with the acceptable range from 200 to 475 cfs. Anglers who were not calibrated to the gage indicated that the existing summer base flows at Ah-Di-Na of about 160 to 200 cfs provided the best conditions for fishing. The upper segment of the river from the base of McCloud dam to Ah-Di-Na Campground is steeper and more constricted, requiring a different set of flow conditions for a given experience than the lower segment from Ah-Di-Na to Shasta Lake. Study results indicate that typical base flows of 200 cfs at Ah-Di-Na (about 330 cfs or more at Shasta Lake) appear to provide improved boat-based access over the 160 cfs experienced during the summer of 2007 (minimum flow required during a dry year) while providing high quality angling conditions.

Whitewater Boating

As discussed previously under the section titled *Angling*, PG&E investigated flow relationships for both angling and boating opportunities on the Lower McCloud River. Additionally, PG&E and American Whitewater assessed potential boating opportunities on Iron Canyon Creek below the Iron Canyon dam and determined that much of this 4.3-mile reach does not appear to be boatable because it is too steep (PG&E, 2009c). Although boats can access the downstream end of the river from Pit 6 reservoir, this flatwater segment would be of little interest to whitewater boaters, and American Whitewater did not recommend further investigation of the reach.

The quality of boating along the Lower McCloud River depends on the quantity of flow within the river. Project operations affect the number of days when boatable flows exist in the Lower McCloud River. Overall, review of hydrological data under past project operations indicate that between 1974 and 2006, flows suitable for boating opportunities (180 to 3,000 cfs as measured at Ah-Di-Na gage [MC-1]) were available in about 40 percent of the years (13 of 33) with an average of 32 days with flows in the whitewater range (500 to 3,000 cfs as measured at Ah-Di-Na gage)(16 of those days in the standard whitewater range [700 to 1,500 cfs as measured at Ah-Di-Na gage]).

Optimal boating flows can be characterized by the type of boating experience (e.g., access-based or whitewater), by the type of boat (e.g., kayak or raft) and the type of experience (e.g., access-based, technical, standard, or big water). The upper segment of the river from the base of McCloud dam to Ah-Di-Na Campground is steeper and more constricted, requiring a different set of flow conditions for a given experience than the lower segment from Ah-Di-Na to Shasta Lake.

Acceptable flow ranges for various whitewater experiences were developed from responses to a flow-acceptability survey conducted by PG&E that was administered to a study boater panel. The standard flow range for whitewater boating for both kayaks and rafts on the upper segment of the McCloud River from the base of McCloud dam to

Ah-Di-Na Campground is between 700 and about 1,000 cfs depending on the boat type (optimal 800 cfs for both boat types) and between about 600 and 1,500 cfs depending on the boat type on the lower segment of the McCloud River from Ah-Di-Na to Shasta Lake (optimal between 800 and 900 cfs depending on the boat type).

Compared to other rivers, study survey respondents rated the Lower McCloud River between "excellent" and "among the very best" (the two highest ratings on the five-point scale used) with its length of run, up to 24 river miles, fine scenery, solitude, excellent water clarity, remote and undeveloped character, and high quality Class III and IV whitewater as outstanding features. On the negative side, the trip is logistically challenging and the lack of public land for stopping to rest or camp adds additional challenges.

There are no formal put-in sites for whitewater boating access at the project or on the Lower McCloud River. Current whitewater boat trips on the McCloud River generally originate at the base of McCloud dam, Ash Camp, or Ah-Di-Na Campground and end at the McCloud Arm Bridge on Shasta Lake. The Forest Service McCloud bridge developed campground at Shasta Lake is where boaters end their trips.

3.3.5.2 Environmental Effects

Fish Stocking

One of the primary recreational activities associated with the project includes angling. California Fish and Game currently stocks the Pit and McCloud Rivers to improve the recreational fishery. PG&E proposes to continue funding California Fish and Game for the stocking of up to 38,800 pounds of trout and 500,000 kokanee per fiscal year (July 1 through June 30) in the drainages of the Pit and McCloud Rivers below the uppermost project development and in Shasta Lake. PG&E proposes that its cost would not exceed the then-prevailing statewide average cost to California Fish and Game for the production and distribution of catchable trout and fingerling kokanee. Following consultation with California Fish and Game and FWS, PG&E proposes to share the stocking costs equally with California Fish and Game, provided that its share of costs does not exceed $5,000 during any period of three consecutive years, and provide the Commission with an annual report containing an evaluation of study findings on the stocking program.

California Fish and Game recommend in its 10(j) recommendation 14 that beginning in the first calendar year after license issuance PG&E reimburse California Fish and Game for stocking of up to 60,000 pounds of trout annually within the McCloud-Pit Project boundary and that costs would be assessed at the standard rate for catchable-sized hatchery grown trout in the year of stocking. California Fish and Game recommends that PG&E, if requested by California Fish and Game, pay $5,000 annually for monitoring and evaluation of the fish stocking program or for mitigation of sturgeon reintroduction into Shasta Lake. California Fish and Game states that the demand for angling is estimated to increase from 10,010 recreation days in 2008 to 24,403 recreation

days by 2050 on McCloud reservoir and from 2,515 recreation days in 2008 to 6,130 recreation days by 2050 on Iron Canyon reservoir.[14] California Fish and Game further states that the current fish stocking agreement would not be adequate to meet the current and future demands. Additionally, California Fish and Game states that the numerous proposed recreation facility upgrades and construction of new recreation facilities would result in increased angling pressure at the project and a portion of the stocked fish could be allocated to Pit 7 reservoir, which is not currently stocked by California Fish and Game. California Fish and Game also comments that it does not intend to stock kokanee since it has not stocked kokanee into Shasta Lake since 1970.

In its response to 10(j) recommendations filed by California Fish and Game, PG&E stated that it agrees with California Fish and Game's fish stocking 10(j) recommendation, as written.

Our Analysis

Angling is one of the most popular activities associated with the project, and stocking catchable trout would help ensure that the recreational fishery is maintained for the term of the new license. Based on recreation studies completed during the relicensing process, the demand for angling at the project is projected to increase over the term of a new license and the numerous proposed recreation facility upgrades and construction of new recreation facilities has the potential to result in increased angling pressure at the project. Existing stocking levels may not be sufficient to meet estimated future demand for angling for the term of a new license. The proposed kokanee stocking would not be beneficial since California Fish and Game does not intend to stock kokanee.

In 1942, the construction of Shasta dam isolated a population of white sturgeon; however, the population was self-sustaining in the Pit River arm of Shasta Lake, until experiencing a decline in the 1970s and 80s. California Fish and Game began an experimental sturgeon planting program early in 1988 to evaluate stocking as a means of restoring the sturgeon fishery; however, the program was discontinued later that year due to disease problems in the rearing facilities.[15] California Fish and Game states that 1.8 percent of the planted sturgeon were caught or observed from 13 months to 13 years after stocking, indicating that low natural recruitment may be the cause of the sturgeon population decline.[16] California Fish and Game further suggests that the construction of Pit 6 and 7 dams in the early 1960's, which eliminated access to 16 miles of stream likely utilized by white sturgeon during spawning, likely caused the decline. There is no

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[14] Technical Memorandum 30: Regional Recreation Demand Assessment (RL-S1).

[15] Licensee's Pre-Application Document.

[16] California Department of Fish and Game. 10(j) Recommendations for the McCloud-Pit Hydroelectric Project. January 28, 2010.

conclusive evidence, however, that the loss of riverine habitat, or any project-related effects are directly correlated to the low recruitment of white sturgeon.

Increasing the number of fish stocked at the project would help meet the estimated future demand for angling at the project. Furthermore, annual monitoring and evaluation of the fish stocking program would provide the means for coordinated development to allow for the flexibility to increase or decrease stocking numbers over the term of a new license in order to meet future demand for angling.

Recreation Flows

To enhance whitewater boating opportunities downstream of the project, PG&E proposes to provide, beginning no later than the first full calendar year after license issuance, a recreation flow event from McCloud dam (gage MC-7) if a spill flow of at least 300 cfs has not occurred for seven consecutive days during the period of April 1 through October 31 at any time in the previous three calendar years. PG&E defined a recreation flow event as a minimum flow release of 300 cfs from McCloud dam as measured at MC-7 (McCloud dam), for 11 consecutive days during the period between May 15 and June 15. The proposed flows would be equal to or greater than the flows that are required in the current project license (section 3.3.2, *Aquatic Resources*).

As discussed in detail in section 3.3.2, *Aquatic Resources*, the Forest Service specifies PG&E release mean daily flows of at least 175 cfs year-round from the McCloud dam such that the mean daily flow at USGS gage MC-1 at Ah-Di-Na is at least 200 cfs. These flows would be augmented during the period February 15 through June 30 according to the flow rule. The Forest Service states that in terms of boating access, the current flow regime allows flows to drop below 200 cfs in some months. Forest Service further states that its proposed flow regime would provide more days of boating access than what currently exist, especially in drier years. Although Forest Service's proposed flow regime is not significantly different than the current flow regime, it would provide a few more whitewater boating days in wetter years.

PG&E alternative condition 19 is consistent with Forest Service condition 19, part 1, subpart b and proposes to remove the recreation flow event from its original proposal due to lack of support from stakeholders as expressed in the August 27, 2009 Project meeting with relicensing participants.[17]

American Whitewater recommends the release of elevated flows in April and May to provide whitewater boating opportunities in addition to ecological benefits. At McCloud dam, American Whitewater recommends peak flows of 600 cfs during April and ramping down through May in wet and above normal years, at least 400 cfs during the month of April in below normal water years, and flows of 300 cfs ramping down to 200 cfs base flows by the opening day of trout season in dry and critically dry years.

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[17] PG&E's submittal of alternative conditions filed on March 3, 2010.

Trout Unlimited, California Trout, and the McCloud River Club support the Forest Service's proposed minimum baseflow of 200 cfs at Ah-Di-Na (MC-1) but recommend that summer base flows at Ah-Di-Na be the higher of (1) 200 cfs, or (2) the historic average summer (i.e., July and August) base flows during normal years under the existing license (about 210 to 220 cfs). They also recommend the number of available angling days be increased in late April and May.

The Anglers Committee, California Salmon and Steelhead Association, California Fisheries, and Water Unlimited support the existing daily flow requirements for the Lower McCloud River below McCloud dam and recommend that the Commission prohibit recreational boating in the Lower McCloud River below McCloud dam. They state that the Lower McCloud River below McCloud dam was set aside by the State of California as Wild Trout Waters to provide high quality trout fishing for California licensed anglers and that recreational boating adversely affects anglers and trout fishing on the Lower McCloud River. They recommend that whitewater boating only occur during spilling flows in the Lower McCloud River.

The McCloud River Club states that any significant increase in flows on the lower McCloud River during the early fishing season could harm trout populations and the ability of anglers to safely fish during the spring. Furthermore, California Salmon and Steelhead Association and Anglers Committee comment that the proposed increased flows below PG&E's McCloud dam in the Lower McCloud River could have negative effects to disabled California licensed anglers that fish the river with respect to increased flows and higher velocity (effects of flows to wading anglers).

California Trout, Trout Unlimited, Northern California Council Federation of Fly Fishers, and McCloud RiverKeepers comment that minimum and maximum flows from McCloud dam should be established for the protection of the habitat and fishery first and foremost with protection of the rights of the fishing community as the second priority. The Fly Shop also supports the protection and enhancement of rainbow and brown trout, and the overall river system health in the Lower McCloud River and recommends flow management that enhances and protects the extraordinary recreational fishing experience, including the ability to wade.

California Sportfishing Protection Alliance supports putting the aquatic needs of the McCloud River first but also seeks a balancing of measures to reasonably accommodate recreational interests, particularly angling. California Sportfishing Protection Alliance comments that reasonable accommodation consistent with aquatic values also must be made for whitewater boating interests and that it does not oppose all whitewater boating in the Lower McCloud River downstream of the project. Both Friends of the River and American Whitewater comment that they will advocate positions consistent with the protection, enhancement, and restoration of aquatic species and their habitat, and also positions consistent with protection and enhancement of recreational opportunities in the McCloud River and its tributaries.

Our Analysis

As discussed in section 3.3.5.1, *Affected Environment*, the quality of angling and boating along the Lower McCloud River depends on the quantity of flow within the river. PG&E's relicensing studies investigated flow relationships for both angling and boating opportunities. PG&E's study results indicated that 200 to 300 cfs, as measured at the Ah-Di-Na gage (gage MC-1), is optimal for angling with the acceptable range from 150 to 450 cfs. The study also indicated that small increases in flow substantially decrease the quality of angling and above 500 cfs, flows are unacceptable for most anglers. According to the focus group participants, generally flows over 300 cfs are too stressful for all but the youngest and most aggressive waders.[18]

Acceptable flow ranges for various whitewater experiences developed from a flow-acceptability survey conducted by PG&E found that the standard flow range for whitewater boating for both kayaks and rafts from the base of McCloud dam to Ah-Di-Na Campground was between 700 and about 1,000 cfs depending on the boat type (optimal 800 cfs for both boat types) and between 600 and 1,500 cfs depending on the boat type from Ah-Di-Na to Shasta Lake (optimal between 800 and 900 cfs depending on the boat type).

As discussed in detail in section 3.3.2, *Aquatic Resources*, table 3-21 shows that minimum flows based on the flow regime specified by Forest Service condition 19 and proposed by PG&E alternative condition 19 flow regime for various runoff years would result in flows below McCloud dam that are acceptable for angling from mid-May through June and suitable for boating mid-February through June in normal, wet, and very wet years. In these very wet years, some boating flows greater than 600 cfs, as American Whitewater recommends, would likely occur from March through early May.

In comparison to existing flows at the project, the flows proposed by Trout Unlimited, California Trout, and The McCloud River Club would likely provide for fewer days with flows greater than 300 cfs in wet and very wet years and fewer days with flows greater than 600 cfs in very wet years, which would enhance angling and provide increased angling opportunities earlier in the recreation season. Forest Service condition 19 and PG&E alternative condition 19 would likely generate slightly higher flows in late March through mid-May in wet years and slightly higher flows in mid-April through early June in very wet years, hence, providing more opportunities for whitewater boating and fewer opportunities for angling.

Recreation Management Plan

Development of Recreation Management Plan

In order to ensure a quality experience for recreation users over the term of the license, PG&E proposes develop a recreation development and management plan

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[18] Technical Memo 58: Report on Recreation Flow Assessment (RL-S3).

(recreation plan) in consultation with the Forest Service, California Fish and Game, California Water Board, and other interested parties within two years of license issuance. The recreation plan would include the following: upgrading existing recreation facilities and constructing new recreation facilities in accordance with Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) and with the ADA; public use of one, year-round campground; stream flow dissemination for the Lower McCloud River; a project sign plan; an interpretive and education plan; periodic recreation monitoring and reporting; operation and maintenance of project recreation facilities; project-wide patrol of areas including but not limited to Hawkins Creek crossing, Iron Canyon reservoir shoreline dispersed use sites, and McCloud reservoir shoreline access points; and annual coordination with the Forest Service.

Forest Service condition 30 specifies that PG&E develop and implement a recreation plan, to be approved by the Forest Service within two years of license issuance, to address recreation resource needs associated with the project in consultation with the Forest Service, California Fish and Game, California Water Board, and other interested parties. The plan would include annual maintenance, operation, reconstruction, survey and monitoring, water surface management, and project patrol of existing recreation facilities and use at the project. PG&E alternative condition 30 is consistent with Forest Service condition 30; however, it does not include final approval of the recreation plan by the Forest Service.

Recreation Facility Design Standards

PG&E proposes to completely reconstruct all project recreation facilities within 25 years of license issuance so that all project recreational facilities would be reconstructed once during the term of the license. PG&E proposes to use Forest Service design standards and to obtain Forest Service approval on final designs and prior to construction for any facilities located on NFS lands before submitting for Commission approval. As part of this approval, the Forest Service may require adjustments to facility locations and final plans to preclude or mitigate impacts and ensure that the project is compatible with on-the-ground conditions.

Forest Service condition 30 part 2 specifies that all new and reconstructed project recreation facilities located on PG&E's lands would be designed to meet applicable ADA, FSORAG, Forest Service Trail Accessibility Guidelines (FSTAG), and Architectural Barriers Act (ABA) standards as currently written at the time of project design. Further, the Forest Service specifies that all project facilities would be designed to be consistent with the recreation opportunity spectrum (ROS) class and visual quality objective (VQO) where they are located. Forest Service specifies that all project and project-related recreation facilities and infrastructure will be replaced in-kind or with an appropriate upgraded facility within 25 years of license issuance or at the mid-point of the license term, whichever is greater.

PG&E alternative condition 30 is consistent with Forest Service condition 30 and further states that all new and reconstructed project recreation facilities located on

PG&E's lands will also be designed to meet applicable ADA and ABA standards in addition to those on NFS lands. California Fisheries and Water Unlimited also recommend that the Commission enforce ADA standards and provide accommodations for disabled persons at all associated project campgrounds and recreational public facilities, especially at McCloud reservoir.

Our Analysis

PG&E's proposed recreation plan would provide the means to develop and implement the proposed recreation measures in a consistent and coordinated manner. By upgrading or replacing recreation facilities within 25 years of license issuance, recreation facilities and infrastructure would continue to provide safe, reliable public access to recreational opportunities and the project and address growing recreational demand over the term of the new license. Consultation with the Forest Service would help to ensure that the measures being developed and implemented would be consistent with the management goals and objectives of the Shasta-Trinity National Forest. Further, improving access for the disabled at the project would be consistent with the Commission's policy on recreation facilities at licensed projects under which licensees are expected to consider the needs of the disabled in the design and construction of such facilities.[19]

The following sections describe the proposed components of each recreation plan proposed by PG&E and the Forest Service and our assessment of the potential effects of each plan on recreational resources at McCloud Pit Hydroelectric Project.

McCloud Reservoir Recreation Facilities

- Tarantula Gulch Boat Ramp and Day-Use Area: reconstruct the Tarantula Gulch boat ramp to California Boating standards: provide a boarding dock, and extend the launch ramp to 3 ft (vertical) below the minimum operating pool elevation: provide day-use facilities (restroom, paved parking, trash receptacles/removal, tables, and pedestrian trail access) with potable water at Tarantula Gulch boat ramp (between the ramp and the intersection with FR 11).
- Red Banks: provide day-use facility that includes restroom, paved parking, trash receptacles/removal, tables, and pedestrian trail access.
- McCloud Shoreline Access Points: provide access points (paved parking and shoreline access trail) at Battle Creek, West dam, and East dam.
- Star City Campground and Day-Use Area: develop a campground with walk-in sites (estimate six sites), paved parking, vault restroom, potable water, tables, fire rings/grills, trash receptacles/removal, and host site; provide day-

[19] See 18 CFR section 2.7.

use facilities (restroom, paved parking, trash receptacles/removal, tables, and pedestrian trail access) including shoreline access for hand launching boats and potable water.

- Floating Dock or Pier and Trail: conduct a feasibility study to find a suitable location for a floating dock or pier and trail (away from Tarantula Gulch boat launch) for day-use activities, such as fishing and swimming; design and construct this facility if a suitable location is identified.

Forest Service condition 30 also specifies that PG&E rehabilitate existing facilities at McCloud reservoir and improve access. We summarize the differences between the rehabilitation measures specified in Forest Service condition 30 and those in proposed by PG&E, below.

- Tarantula Gulch Boat Ramp and Day-Use Area: reconstruct existing boat ramp to two-lane ramp with boarding dock, sidewalk, and a minimum of 4-ft draft clearance below minimum pool to California Boating standards; redesign existing parking lot and day-use area to include 30-40 additional parking spaces, develop paved parking area and turnaround, and designate parking spaces for vehicles; provide lighting in the parking area that is visible from the courtesy dock; and provide snow removal on the access road (from junction with 38N11) and parking area between April 1 and December 1, when access to the junction is available.
- Tarantula Gulch Inlet: provide paved parking for a minimum of five vehicles, up to three picnic tables with pedestal grills, vault toilet, animal-resistant trash receptacles, and a pedestrian access trail to the high water line.
- Red Banks: provide paved parking for a minimum of five vehicles, up to three picnic tables with pedestal grills, vault toilet, animal-resistant trash receptacles, and a pedestrian access trail to the high water line. PG&E would ensure legal access from roadway to reservoir day-use areas.
- McCloud shoreline access points: include paved parking for three vehicles and an access trail to the shoreline; install picnic tables where space allows; PG&E would ensure legal access from roadway to reservoir access areas.
- Star City Campground and Day-Use Area: develop a campground with two-vault accessible restroom facility and potable water source; up to 10 campsites (including a host site) with a site post, picnic table, animal-resistant food locker, and campfire ring at each campsite; day-use area near the shoreline with a designated swim/beach area, dock, car-top boat access, single-vault toilet, and up to five sites each with a table, pedestal grill, and animal-resistant trash containers.
- Floating Dock or Pier and Trail: develop a fishing/swimming platform to accommodate a fluctuating water level at one of the four proposed day-use

areas or at another designated recreation day-use location around the McCloud reservoir.

PG&E alternative condition 30 is generally consistent with Forest Service condition 30; however, PG&E proposes to exclude language related to the acquisition of rights at Red Banks day-use site and the McCloud shoreline access points. PG&E proposes to cooperate with private landowners to acquire rights of public access by any means necessary, but not including by condemnation pursuant to section 21 of the FPA or any other law, for the purpose of public recreational day-use. Additionally, PG&E comments that initial site investigations have identified site constraints that affect the feasibility of constructing some recreation facilities. PG&E proposes to first conduct a site evaluation within two years of license issuance to determine if constructing a fishing/swimming platform at McCloud Reservoir is feasible and then constructing the facility if a suitable location is found.

The Hearst Corporation expresses concerns over the proposed expansion of overnight camping at McCloud reservoir and unknown details that would be included in the recreation plan. Further, The Hearst Corporation strongly opposes the allowance for open campfires (including those within a fire ring) at McCloud reservoir since it is in a very high fire risk assessment area and public use is concentrated during the dry summer months and would pose great risk to persons and property on Hearst lands. It continues to support the original 1963 agreement which provided for public access to McCloud reservoir and Lower McCloud River across its private property via a road connecting the County road to the Tarantula Gulch boat ramp.

Our Analysis

PG&E's proposed rehabilitation measures for the recreation facilities at McCloud reservoir, as provided for in the recreation plan, would provide the means for future rehabilitation and replacement (as needed) of existing recreational facilities within the project. The facility rehabilitation measures would provide for enhanced access to project facilities and amenities and help ensure that these access sites would continue to provide adequate facilities to meet current and future recreational demand at the projects.

Constructing the proposed day-use area, including a floating fishing/swimming platform, and reconstructing the boat ramp at Tarantula Gulch would help relieve overcrowding and reduce user conflicts at McCloud reservoir. Forest Service specifies that PG&E reconstruct the Tarantula Gulch boat ramp to provide two lanes and a minimum of 4-ft draft clearance below minimal pool level to further reduce crowding at the ramp. However, PG&E states that initial site investigations have identified site constraints that may affect the feasibility of constructing some recreation facilities specified by the Forest Service. Steep slopes constrain design options for providing an additional lane at the boat ramp. Additionally, although PG&E agrees with increasing parking capacity at the boat ramp to the extent possible within site constraints, PG&E states that an initial site assessment determined that a few parking spaces could be added. Currently the bottom of the boat ramp is 1 ft below the normal minimum operating

reservoir level (elevation 2,634 ft) and typically provides boater access during the entire recreation season. PG&E states reconstructing the ramp with the toe of the ramp extending to an elevation not less than three vertical feet below minimum pool would extend the season for launching boats. Demand for boating access coupled with crowding issues at McCloud reservoir demonstrates the need for improved recreational boating access at the project. Moreover, constructing a floating fishing/swimming platform would potentially alleviate overcrowding and user conflicts even further.

Forest Service specified that PG&E provide lighting and snow plowing during the winter at the Tarantula Gulch boat ramp to provide safety for anglers fishing early or late in the day and to improve access at the ramp. Forest Service pointed to the relicensing recreation survey that indicated 10 percent of visitors use the reservoir in winter and noted several comments requesting the need for a longer use season. PG&E states California Boating standards do not require lighting. Lighting would improve safety at the boat ramp and allow anglers to fish longer during the recreation season, however, there is little evidence to support recreation use during the winter months to justify snow plowing at the ramp.

Forest Service condition 30 specifies and PG&E alternative condition 30 proposes to develop an overnight campground at Star City. However, the Hearst Corporation continues to support the original 1963 agreement which specifies, according to The Hearst Corporation, a day-use recreation site at Star City Creek. The 1963 agreement between The Hearst Corporation and the Forest Service allows the Forest Service to use and manage the Star City area located on Hearst Corporation lands for public recreation use. There are no existing campgrounds at McCloud reservoir to meet existing or projected demand for overnight use; however, regular dispersed camping is occurring at Star City. PG&E's suitability assessment shows the only potential site to accommodate camping at the reservoir is at Star City. Providing a campground at this location would help manage the already existing use and reduce negative impacts on natural resources by eliminating erosion and soil compaction from user-created trails and vehicles and by providing for proper sanitation disposal and trash removal. Fire rings would be included at each developed campsite however, fire rings would reduce the threat of wildland fire at Star City. Fire risk and management is further discussed in the fire and fuels plan in section 3.3.7, *Land Use and Aesthetics*.

Lower McCloud River Recreation Facilities

- Base of McCloud Dam: provide a whitewater put-in base of McCloud, parking, vault restroom, trash receptacle/removal, and shoreline pedestrian access trail on river left to the pool below the spillway.

Forest Service condition 30 also specifies PG&E rehabilitate existing facilities at the Lower McCloud river and improve access. We summarize the differences between the Forest Service's rehabilitation measures that differ from PG&E's measures below.

- Base of McCloud Dam: maintain a day-use site that includes access road, paved parking for a minimum of three vehicles, vault toilet, animal-resistant trash receptacle, signing, and trail to accommodate both fishing and boating access from the base of McCloud dam to a point past the instream flow valve release to the splash pool below the spillway
- Lower McCloud River Trail/Ash Camp Campground Trail: upgrade, relocate where needed, and improve tread and drainage of existing user-created streamside river access trail along opposite side of river from Ash Camp Campground that begins at Ash Camp bridge/PCT junction and travels downstream to Ah-Di-Na.
- Ash Camp and Ah-Di-Na Campground: agreement outside with PG&E outside the license to reconstruction, operation, and maintenance of Ash Camp and Ah-Di-Na Campground.

PG&E alternative condition 30 is generally consistent with Forest Service condition 30; however, PG&E alternative condition 30 does not propose the facility as a whitewater put-in; rather it is proposed as a day-use recreation site. Additionally, PG&E does not propose to upgrade and maintain the Lower McCloud river trail nor does PG&E propose to reconstruct, operate and maintain the Ash Camp and Ah-Di-Na Campground.

Our Analysis

Constructing a day-use site and designing an access trail to accommodate both fishing and boating access at the Lower McCloud river would facilitate the use of the area by anglers and boaters. Although improving the trail along the Lower McCloud River from Ash Camp Campground at the Ash Camp bridge/PCT junction to Ah-Di-Na Campground would improve access, the trail is outside the existing project boundary. PG&E states the trail is not an existing project recreation facility and that the Forest Service has not demonstrated a project nexus with this trail. Moreover, both the Ash Camp and Ah-Di-Na Campground are also non-project facilities outside the project boundary that are not currently being used for project purposes. The Forest Service specifies that should an agreement not be reached outside of the license, mitigation at Ash Camp and Ah-Di-Na Campground will be included in the final 4(e) conditions.

Iron Canyon Reservoir Recreation Facilities

- Hawkins Landing Campground: reconstruct Hawkins Landing Campground with the existing capacity (10 sites and a host site) and provide potable water; reconstruct or resurface the access road to allow all-season use and provide a host at the campground during the recreation season.
- Hawkins Landing Boat Ramp: retain concrete ramp surface and replace or repair the surfacing that connects to the concrete ramp.

- Deadlun Campground: reconstruct Deadlun Campground and increase capacity by about 10 sites to provide about 37 sites and a host site; provide potable water and a shoreline access trail.
- Iron Canyon Dam Boat Ramp: construct a new boat launch at the east end of Iron Canyon dam that meets California Boating standards and provide a vault restroom, picnic tables, potable water, and trash receptacles/removal.
- Shoreline Access Areas: conduct a site evaluation to provide three paved parking areas along FR 37N78 each with a capacity of up to three vehicle parking spaces and a pedestrian shoreline access trail and to design and construct these facilities.

Forest Service condition 30 also specifies that PG&E rehabilitate existing facilities at Iron Canyon reservoir and improve access. We summarize the differences between rehabilitation measures specified by Forest Service condition 30 and those proposed in PG&E alternative condition 30, below.

- Hawkins Landing Campground: reconstruct Hawkins Landing Campground to provide for a minimum of 10 single and double camp sites; include entrance gate with signing, surfaced loop road, parking spurs, site posts, picnic tables, animal-resistant food boxes and trash receptacles, fire rings, vault restrooms, potable water, camp host and host site, and a developed trail from the campground to the adjacent boat ramp and shoreline for pedestrian fishing access.
- Hawkins Landing Boat Ramp: reconstruct the Hawkins Landing boat ramp surface (length and width, but not grade) to meet California Boating standard for single lane to be operable a minimum of 155 days during the recreation season (April 27 – November 15); surfaced parking lot above high water level for a minimum of 10 vehicles (minimum five with trailers) and the parking lot would be surfaced, striped, include a single-vault toilet, animal-resistant trash receptacle, and informational sign board.
- Deadlun Campground: re-locate the Deadlun campground to one or two Forest Service approved location(s) along the Iron Canyon reservoir shoreline; provide a mix of single and group campsites; provide a host, entrance gate, surfaced loop road, parking spurs, site posts, picnic tables, animal-resistant food lockers, fire rings, two two-vault restrooms, animal-resistant trash receptacle, and potable water; develop a trail from the campground(s) to the high water line of the reservoir shoreline for pedestrian-only access.
- Iron Canyon Dam Boat Ramp: construct a new single-lane boat ramp to California Boating standards with boarding dock functional at 90 percent of operational lake levels (ramp design and placement should include option for two lanes if needed at mid-license facility review; provide parking for a minimum of 15 vehicles (5 single vehicles and 10 vehicles with trailers); a

single-vault toilet at the parking area; potable water, picnic tables, and trash receptacles; security lighting visible from the dock; and snow removal during shoulder seasons (March/April and December) at parking area when Oak Mountain access road and Iron Canyon boat ramp surface are passable.

- Shoreline Access Areas: provide a minimum of three day-use parking areas around Iron Canyon reservoir with paved parking for up to three vehicles each, and pedestrian-only access to shoreline.

PG&E alternative condition 30 for Hawkins Landing Campground is generally consistent; however, it does propose that Hawkins Landing boat ramp be operable a minimum number of 155 days, if possible, during the recreation season nor does it include that the Iron Canyon dam boat ramp be operational at 90 percent of operational lake levels. Additionally, PG&E proposes to, within two years of license issuance, conduct a site assessment to determine if there is one or more suitable sites to relocate the existing Deadlun Campground along the Iron Canyon reservoir shoreline and to determine the locations for the shoreline access areas. If agreement can be reached on alternate location(s) to relocate the campground and determine feasible access areas, PG&E will construct a new campground and the access areas. If suitable location(s) do not exist for the campground, PG&E maintains that it will reconstruct Deadlun Campground as proposed. Finally, PG&E alternative condition 30 does not propose the lighting specification at Iron Canyon dam boat ramp and PG&E proposes to revise the snow removal specification to specify that when project operations require snow removal from Oak Mountain Road, snow also would be removed from the access road to the boat ramp, parking area, and boat ramp.

Our Analysis

Reconstructing Hawkins Landing boat ramp campground and providing additional parking and restroom facilities would enhance recreational opportunities at Iron Canyon reservoir and ensure that the project recreation facilities meet current and future demand over the term of a new license. Forest Service condition 30 specifies that, if possible under reservoir operations, the Hawkins Landing boat ramp should be operable a minimum of 155 days during the recreation season. PG&E states the new proposed boat ramp near Iron Canyon dam would be usable at minimum operating pool (2,593 ft) and it is not cost effective to modify Hawkins Landing boat ramp to extend the recreation season. PG&E further states that it has voluntarily operated Iron Canyon reservoir at or above elevation 2,615 ft to ensure that visitors could use the only existing boat ramp, Hawkins Landing, during the primary recreation season from May 15 to October 15. Although providing as many usable recreation days as possible at Hawkins Landing boat ramp would improve boating access at Iron Canyon reservoir, the specification for the Hawkins Landing boat ramp to be usable for a certain number of days could be difficult for PG&E to accomplish as a license condition. Furthermore, constructing a second boat ramp to be usable at minimum operating pool (2,593 ft) at Iron Canyon reservoir would help to alleviate overcrowding of Hawkins Landing boat ramp. Again, the specification

that Iron Canyon dam boat ramp be functional at 90 percent of operational lake levels could be difficult for PG&E to accomplish as a license condition. Constructing Iron Canyon dam boat ramp so that it is usable at the reservoir's minimum operating pool would result in public boating access to Iron Canyon reservoir during the entire recreation season.

Reconstructing or re-locating Deadlun Campground would also enhance recreational opportunities at Iron Canyon reservoir by improving camping opportunities at the reservoir. Because dispersed camping generally occurs along the main body of Iron Canyon reservoir and the campground is currently located in a creek off the main body of the reservoir, relocating Deadlun Campground to a more desirable location or providing access to the reservoir from its current location would likely increase the use of this facility.

Constructing the proposed shoreline access areas would provide developed access areas along the shoreline to help alleviate some of the dispersed recreation use occurring along the reservoir shoreline. The Forest Service has not provided suggested locations or evidence that the sites are feasible, therefore conducting the site assessment within two years of license issuance as proposed by PG&E would be appropriate to determine the locations for the shoreline access areas.

Forest Service specified that PG&E provide lighting and snow removal during March-April and December at Iron Canyon dam boat ramp to provide safety for anglers fishing early or late in the day. PG&E comments that California Boating standards do not require lighting. Lighting would allow anglers to fish longer during the recreation season and increase safety at the boat ramp. Additionally, PG&E's proposal to remove snow from Oak Mountain Road, the access road to the boat ramp, parking area, and boat ramp when project operations require it would also allow access to the boat ramp during the winter season with minimal additional cost.

Pit 6 and 7 Reservoir Recreation Facilities

- Shoreline Access Trail: evaluate the feasibility (site suitability and public safety) of providing a pedestrian shoreline access trail at the upper end of Pit 7 reservoir, downstream of Pit 6 powerhouse tailrace, to provide access for angling and pedestrian shoreline access.
- Montgomery Creek Boat Put-in: conduct a feasibility assessment for providing a hand-launch boat put-in where Montgomery Creek enters Pit 7 reservoir, with paved parking, vault restroom, tables, trash receptacles/removal and pedestrian shoreline access trail. Boating would be restricted near project infrastructure for public safety reasons by installing buoy lines at the upper and lower ends of the Pit 7 reservoir.

Forest Service condition 30 also specifies that PG&E rehabilitate existing facilities at Pit 6 and 7 reservoirs and improve access. We summarize the differences between the Forest Service's rehabilitation measures that differ from PG&E's measures below.

- Pit 6 Shoreline Trail: develop a shoreline trail if capacity or demand (based on six-year recreation use monitoring) indicates increased use of the reservoir for fishing or boating.
- Shoreline Access Trail: construct one trailhead with parking for a minimum of three vehicles and develop a river access trail along one side of Pit 7 reservoir for pedestrian fishing and hand-launch boating access. The Forest Service specifies that the access point and trailheads would be located at the upper (Pit 6 dam access road) end of reservoir.
- Montgomery Creek Boat Put-in: conduct a feasibility assessment for providing a hand-launch or boat put-in where Montgomery Creek enters Pit 7 reservoir with paved parking, vault restroom, tables, animal-resistant trash receptacles and pedestrian access trail on public lands. Boating would be restricted from project infrastructure for public safety reasons by installing buoy lines or other safety devices at the upper and lower ends of the reservoir. If Montgomery Creek is not feasible, PG&E would construct a second trailhead with parking for a minimum of three vehicles and develop a river access trail along one side of the reservoir for pedestrian fishing, and hand-launch boat access from the lower end of Pit 7 reservoir.

PG&E did not file an alternative condition to include the Pit 6 shoreline trail specified by Forest Service condition 30. PG&E also does not include a provision for constructing a second trailhead and a hand-carry boat launch at the lower end of Pit 7 reservoir if Montgomery Creek is not feasible. On the other hand, PG&E does propose to conduct a site evaluation within two years of license issuance that considers the suitability and public safety of a pedestrian shoreline access trail at the upper end of the reservoir, downstream of Pit 6 powerhouse tailrace. PG&E' proposes to consult with the Forest Service and, if a suitable location is determined, construct the trail and parking area.

Our Analysis

Providing access to the river near Pit 6 & 7 reservoirs based on the results of future recreation use monitoring would improve recreational access at the project over the term of the license. This measure could be considered in the future if the recreation use data collected every six years shows it is warranted. Alternatively, constructing the proposed river access trail at the upper end of Pit 7 reservoir and the proposed Montgomery Creek boat put-in or a hand-carry launch near the lower end of Pit 7 reservoir would enhance access to Pit 7 reservoir for pedestrian fishing and hand-launch boating while improving public safety. PG&E has expressed concern for public safety if boating access is provided at the upper and lower portions of Pit 7 reservoir due to riverine high flows from the Pit 6 powerhouse and riverine conditions at low reservoir levels (fast flowing water) that could prevent boaters from returning upstream to exit the reservoir. Forest Service's specification for a second trailhead and a hand-carry boat launch at the lower end of Pit 7 reservoir if the Montgomery Creek boat put-in is not

feasible would still improve access to Pit 7 reservoir for pedestrian fishing and hand-carry boating. However, due to public safety, launching boats at this location still remains a concern.

Pit 7 Afterbay Recreation Facilities

- Fenders Flat Day-Use Area: provide a day-use site at Fenders Flat with a capacity of about five; provide parking, vault restroom, tables, fire grills, and trash receptacles/removal; and coordinate with the Forest Service to develop and implement a plan to revegetate disturbed areas and prevent vehicle access beyond the access road and parking area.
- Fenders Flat Boat Launch: grade and maintain FR 35N66 from its intersection with FR 37N78 to the car-top boat launch and provide a vault restroom near the car-top boat launch.
- Pit 7 Afterbay Public Access: continue to prohibit public access to Pit 7 afterbay water surface and shoreline by maintaining fencing, signage and patrols.
- Pedestrian Access in Vicinity of Pit 7 Afterbay Powerhouse: if the Pit 7 afterbay powerhouse is constructed, provide a paved parking area for two to three vehicles at the end of the powerhouse access road or along Fenders Ferry Road and provide a vault restroom, trash receptacle/removal, and pedestrian access to the shoreline between the powerhouse and Fenders Ferry Bridge.

Forest Service condition 30 also specifies that PG&E rehabilitate existing facilities at Pit 7 afterbay and improve access. We summarize the differences between the rehabilitation measures specified in Forest Service condition 30 and those in PG&E alternative condition 30, below.

- Fenders Flat Day-Use Area: reconstruct day-use site below the Pit 7 afterbay at Fenders Flat with single-vault toilet, animal-resistant trash receptacles, picnic tables, pedestal grills (not campfire rings) and designated surfaced parking area for a minimum of five vehicles without trailers.
- Fenders Flat Boat Launch: reconstruct the car-top boat launch with improved grooved concrete surfacing and minimum one-lane width (will not meet all of California Boating standards) and provide revegetation, in consultation with the Forest Service, and prevent vehicle access beyond the access road and parking area.
- Pedestrian Access in Vicinity of Pit 7 Afterbay Powerhouse: construct a surfaced parking area and river access trail on the opposite river bank from Fenders Flat day-use area with a vault toilet and trash receptacles if additional generation is developed at the Pit 7 afterbay

PG&E alternative condition 30 for the Fenders Flat day-use area is consistent with Forest Service condition 30, although PG&E proposes the boat launch reconstruction near Fenders Flat be separate from the day-use area. PG&E's also notes that the at the Pit 7 afterbay powerhouse parking area would accommodate two to three vehicles and be located at the end of the powerhouse access road or along Fenders Ferry Road and subject to public safety and homeland security needs. PG&E states that it proposes to allow public vehicular access on the proposed project access road to the powerhouse however, if the location of access does not ensure public safety near project infrastructure and address homeland security needs, PG&E would locate the parking area along Fenders Ferry Road.

Our Analysis

Reconstructing Fenders Flat day-use area, providing access near the proposed Pit 7 afterbay powerhouse, and providing parking at the end of the powerhouse access road or along Fenders Ferry Road, subject to public safety and homeland security needs, would enhance recreational opportunities in the vicinity of the afterbay by formalizing this existing dispersed recreation area. Coordinating with the Forest Service to develop and implement a plan to revegetate disturbed areas and prevent vehicle access beyond the access road and parking area would further help to reduce resource damage. Moreover, reconstructing Fenders Flat car-top boat launch would improve access in the vicinity of the afterbay and provide boater access to the Pit arm of Shasta Lake during late winter and early spring when high lake levels allow boat launching.

PG&E originally proposed to grade and maintain FR 35N66 from its intersection with FR 35N78 to the car-top boat launch, although this was not included in Forest Service condition 30 or PG&E alternative condition 30. This measure would be addressed, along with all project roads, in the Road and Transportation Facilities Management Plan proposed by PG&E and is further discussed in section 3.3.7.2, *Environmental Effects*.

Public access to the Pit 7 afterbay is currently restricted by PG&E because the water level in the afterbay rapidly fluctuates in response to the Pit 7 powerhouse operation which makes it unsafe for recreation use. Both fencing and warning signs have been posted to prohibit shoreline access and boating access. Additionally, a Shasta County boating ordinance prohibits swimming and boating in the afterbay due to public safety concerns. PG&E’s proposal to continue to prohibit public access by maintaining fencing, signage, and patrols to Pit 7 afterbay water surface would help ensure public safety at the project.

Recreation Facility Operation and Maintenance

PG&E proposes to develop an operation and maintenance (O&M) component of the recreation plan, including fee collection, for all existing and newly constructed project recreation facilities and existing Forest Service recreation facilities within the project area (Tarantula Gulch boat ramp and Deadlun Campground) after they are reconstructed.

Forest Service condition 30, part 1.a specifies that PG&E develop and implement an O&M component as a part of the recreation plan for all project and project-associated recreation facilities (i.e., all facilities identified in Forest Service condition 30). The O&M component should include: annual schedule and standard protocols for opening and closing recreation facilities; water testing protocols for potable water sources; routine maintenance items; annual review and meeting; a percentage of fee retention by Forest Service if used onsite; and maintenance of shaded fuel breaks around project recreation facilities (addressed in the fire and fuels management plan discussed in section 3.3.7.2, *Environmental Effects*). The O&M component would include all existing project recreation facilities, existing Forest Service-owned project-affected recreation facilities identified in Forest Service condition 30, and new project recreation facilities. Finally, discussions of any needed actions would be conducted at the annual consultation meeting.

PG&E alternative condition 30 is consistent with Forest Service condition 30; however, PG&E proposes that existing Forest Service recreation facilities (Deadlun Campground and Tarantula Gulch boat ramp) would become project facilities and included in the project boundary after they have been reconstructed which, at that time, PG&E would be responsible for O&M of these two recreation facilities.

Our Analysis

Operation and Maintenance associated with the project's recreation facilities help to ensure that these facilities and associated public recreational access are provided over the term of the license. Development of an O&M component as a part of the recreation plan in consultation with the Forest Service would help to address Licensee and Forest Service responsibilities. Submittal of a final recreation plan to the Commission for review and approval after consultation with the Forest Service and agencies would help to ensure that the proposed operation and maintenance measures are consistent with the terms and conditions of a new license.

PG&E is responsible for the management, operations, and routine maintenance of all recreation facilities within the project boundary. We recognize that Deadlun Campground and Tarantula Gulch boat ramp are existing Forest Service facilities in need of reconstruction, but delaying the inclusion of these two facilities in the project boundary until they are reconstructed is inappropriate. PG&E states that both the Deadlun Campground and Tarantula Gulch boat ramp have documented health and safety issues as a result of Forest Service construction, operation, and maintenance and that, if brought into the project boundary upon license issuance, this would result in PG&E immediately being held in non-compliance with the new license. If both Deadlun Campground and Tarantula Gulch boat ramp are currently serving a project purpose, they would be included in the boundary upon issuance of a new license.

Dispersed Use and OHV Use

PG&E proposes as a part of its recreation plan to assess and implement closures of existing and future user-created roads leading to the shorelines of McCloud and Iron Canyon reservoirs, in coordination with the Forest Service. The objective would be to prohibit vehicle access at the McCloud reservoir between roads FR 38N11 and 38N04Y and the shoreline, at Iron Canyon reservoir between FR 37N78 and the shoreline, and to prohibit dispersed camping and OHV use between the roads and the shorelines. This does not include closure to developed recreation facilities.

Forest Service condition 30, part 2 specifies that PG&E evaluate road closures, trail closures, and dispersed use around Iron Canyon reservoir. The Forest Service specifies that this evaluation be consistent with the Shasta-Trinity Travel Management Plan and the Historic Properties Management Plan.

Our Analysis

Measures to block vehicle access and discourage dispersed use and OHV use at the project would benefit environmental resources by closing degraded areas to intense recreational use. Assessment and evaluation of road closures, trail closures, and dispersed use closure, in coordination with the Forest Service, would provide information to allow PG&E to determine if additional visitor management controls are needed. PG&E identified several areas around the reservoirs and project facilities where visitors leave trash and cause resource damage due to dispersed use. Although not included in Forest Service condition 30 and PG&E alternative condition 30, McCloud reservoir was identified as an area where resource damage from user-created roads and dispersed use was occurring during the relicensing studies. Including McCloud reservoir in the evaluation would address areas identified at both reservoirs where dispersed use causes resource damage. Prohibiting dispersed camping and OHV use between the roads and reservoir shorelines would help eliminate this resource damage and improve the aesthetic quality of the area for visitors to the project.

Recreation Monitoring

PG&E proposes to conduct recreation monitoring, including visitor surveys and use estimates, concurrent with preparing information for the recreation Form 80 reporting (every six years). Additionally, PG&E proposes to include Hawkins Creek crossing in the recreation monitoring program.

The Forest Service agrees with PG&E and specifies in Forest Service condition 30, part 1.b that PG&E also provide a copy of the report to the Forest Service for approval before being submitted to the Commission. The recreation monitoring should include: annual use data collection at facilities where fees or passes are issued or required for inclusion in the six-year report; conduct a recreational resource survey, with prior approval by the Forest Service, and evaluation of resource impacts from developed and dispersed use; a summary of the most current regional and statewide recreation trends based on available surveys and reports; and consultation with the Forest Service,

appropriate agencies, and interested parties to review and adjust project-wide recreation management objectives, if needed.

PG&E proposes that filed recreation and survey monitoring components be collected for project-related recreation facilities and project lands and waters in PG&E alternative condition 30, which is generally consistent with Forest Service condition 30. PG&E states that revisions are necessary to Forest Service condition 30 to appropriately define the applicability to project-related recreation.

Our Analysis

Recreation use at the project is expected to double over the next 50 years. The level and type of recreation use and recreation user preferences could change over the term of a new license. Periodic monitoring of recreation use, surveying of user preferences, assessment of facility capacity and recreation demand, and inventorying areas used for dispersed recreation can help to determine if the project's recreation facilities meet demand and provide adequate public recreation access to the project over the term of the license. The inclusion of visitor use fees and capacity information, including both parking and campsite capacity at the project facilities, would help assess changes in recreational use and capacity at these facilities. The proposed report would provide the means to summarize and assess the survey information and monitor other recreational management provisions, such as OHV and dispersed use and water surface elevation management. Reporting the recreation monitoring results concurrent with the Commission's recreation Form 80 schedule would ensure that the Commission is updated on recreation use at the project.

Project Patrol

PG&E proposes to provide project-wide patrol of areas including but not limited to Hawkins Creek crossing, Iron Canyon reservoir shoreline dispersed use sites, and McCloud reservoir shoreline access points. This would include trash removal twice a year, reporting observed resource damage to Forest Service, and emergency response at the project. PG&E proposes to prepare a project patrol plan in consultation with the Forest Service to be filed with the Commission within one year after license issuance. At a minimum, the plan would include routine and regular physical inspections of affected lands, project facilities, and other structures, including NFS lands within the project area or affected by project facilities, for purposes of resource protection. The plan also would include a description of reporting responsibilities, including observed violations of law and communications with law enforcement agencies, as well as required documentation of inspections. Additionally, PG&E proposes to provide a campground host at several project campgrounds to also serve as a point person for enforcing campground rules and reporting vandalism.

Forest Service condition 30, part 1.c specifies PG&E develop and implement a project patrol component as a part of the recreation plan for project and project-affected NFS lands. The Forest Service specifies that PG&E coordinate annually with agencies

and other interested parties to review patrol information and plan adjustments, if needed, for the next season. Specifically, PG&E would employ a seasonal part-time (April-November) project patrol person or, alternatively, provide funding to an appropriate federal, state, or local agency for the same, whose duties would include, but not be limited to: monitoring and encouraging compliance with fire safety regulations, closures, and rules associated with camping, parking, and trail use; installing signs; dispersing project-related information to the public including appropriate OHV use, campfire safety, leave no trace; patrolling dispersed use areas within one-quarter mile of all project and project-affected waterways (e.g., Hawkins Creek crossing, Lower McCloud River); watching for and reporting looting/vandalism of cultural sites or other resource damage and illegal activities; cooperating with law enforcement agencies; performing minor maintenance of project recreation facilities; other duties related to public safety and protection of project-affected resources; and documenting activities, key resource issues, and public concerns in an annual report provided at least 30 days prior to the annual consultation meeting. Forest Service also specified a campground host be provided at several project campgrounds to serve a similar patrol purposes. The Hearst Corporation supports the concept of a host or patrol person enforcing the conditions of recreational use and the issuance of a Forest Service "Forest Order" allowing for enforcement action.

PG&E alternative condition 30 is generally consistent with Forest Service condition 30; however, PG&E does not propose the patrol of dispersed public use areas within one-quarter of a mile of the Lower McCloud River nor the distribution of OHV use information. PG&E comments that revisions are necessary to appropriately define the applicability to project-related recreation and to eliminate ambiguous and open-ended terminology that could inadvertently result in non-compliance.

Our Analysis

Project patrol measures would help encourage visitors, including anglers, campground users, and boaters, to comply with regulations. A projected increase in the number of visitors over the term of the new license would likely increase the need for public services, including law enforcement and fire protection, which are provided by the Shasta County Sheriff's office. More visible law enforcement like a project patrol person or a campground host would help reduce conflicts between recreation users and improve visitor safety by providing an authoritative presence to encourage compliance with navigational laws. Additional project patrol at the more remote areas of the project would improve management of environmental resources by increasing visitor contact with enforcement agencies and help to educate visitors about appropriate and restricted uses.

However, within the project area, law enforcement duties are the responsibility of the Shasta County Sheriff's office, the California Highway Patrol, and federal agencies on federal lands. PG&E pays property taxes to Shasta County, which are partially used to fund law enforcement. Further, the Commission has no way of ensuring that the hiring of a patrol person or campground host paid for by the licensee (in this case staffing or

funding a seasonal employee) would accomplish a project purpose or ameliorate a project effect. However, the Commission can enforce specific measurable actions, such as O&M measures, including maintenance of project lands and project recreation facilities to address fire safety and vandalism, and other associated potential effects of dispersed recreation use within the project boundary. Under the informational sign plan, PG&E proposes to post signs about acceptable and prohibited recreation uses, and have proposed new measures that would increase public education to help improve visitor compliance with project rules and regulations. While improved implementation of Forest Service and Shasta County standards and guidelines regarding recreational use would be beneficial, enforcement of those regulations would be outside the jurisdiction and responsibility of PG&E.

Reservoir Water Surface and Shoreline Management

PG&E proposes to clean debris from the McCloud reservoir boat ramp annually by April 1, weather permitting, and as needed throughout the recreation season. Additionally, PG&E proposes to develop a surface water and shoreline management plan for McCloud reservoir that includes installing 5-mph signs on the bridge that spans the northern end of the reservoir, LWD removal from the reservoir, points of public access to the shoreline, and boating speeds. PG&E also proposes to remove lightweight debris from the Iron Canyon reservoir surface annually or as needed.

Forest Service condition 30, part 1.d specifies that PG&E develop and implement a reservoir water surface management component that addresses monitoring and management of recreation user safety, trespass on private lands by project users, and Shasta County code compliance by project users on each reservoir surface (i.e., McCloud, Iron Canyon, Pit 6, and Pit 7 reservoirs). The reservoir water surface management component would include the following: developing protocols for preventing/removing unapproved buoy courses, approved use of docks, and measures to prevent trespass on private lands; submitting requests to the Shasta County Boating Unit of the Sheriff's office for establishment of a 5-mph restriction on McCloud reservoir upstream from the McCloud Bridge, in consultation with the Forest Service, and establishment of a buoy line near Huckleberry Creek on McCloud reservoir to prevent fishing boats from traveling upstream from November 15 to the last Saturday in April each year (submission would be in cooperation with California Fish and Game and the private landowner); annual surface sweeps prior to the start of the recreation season of McCloud and Iron Canyon reservoirs and boat ramps to collect logs and debris from the lake surface with smaller debris and trash removed from NFS lands; monitoring boat use during the recreation season on McCloud and Iron Canyon reservoirs very six years (coinciding with the Commission's recreation Form 80); reassessing any needed water surface management mitigations every six years; and evaluating the need for a speed restriction on Iron Canyon, Pit 6, and Pit 7 reservoirs on a six-year interval.

PG&E alternative condition 30 proposes to develop measures prevent unauthorized access to project lands and waters where necessary to protect public safety,

instead of on private lands. PG&E also proposes to conduct the surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps once every five years or as needed instead of annual sweeps. Finally, PG&E proposes to include monitoring data on boat use on McCloud and Iron Canyon reservoirs in a report filed with the Forest Service, interested agencies, and the Commission concurrent to the Form 80 schedule.

Our Analysis

Developing protocols for preventing/removing unapproved buoy courses and approved use of docks would help prevent boating hazards and improve public recreational safety at the project reservoirs. Surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps would remove surface debris to reduce boating hazards and ensure that the boat ramps are not blocked by debris. PG&E alternative condition 30 proposes surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps once every five years or as needed instead of annually. The Forest Service comments that winter storm debris on the reservoir surfaces accumulates at access points and boat ramps. The annual sweeps proposed in Forest Service condition 30 would ensure that winter storm debris that could accumulate annually is removed prior to the recreation season.

Forest Service condition 30 specifies and PG&E alternative condition 30 propose that PG&E, in cooperation with the Forest Service, would submit a request to the Shasta County Boating Unit of the Sheriff's office for the establishment of a 5-mph restriction on McCloud reservoir upstream from the McCloud bridge and a buoy line to be installed near Huckleberry Creek. Although speeding on the reservoirs has been identified as an issue by project users, enforcement of speed restrictions is not the responsibility of the Commission. PG&E is subject to local laws and ordinances as they pertain to reservoir speed limits.

The Forest Service specifies measures to prevent trespass on private lands to protect public safety. Preventing trespass on private lands outside the project boundary is outside the Commission's authority; it is the responsibility of private landowners to clearly mark their property if trespassing is problematic. However, measures to prevent unauthorized access to project lands and waters where necessary to protect the public would ensure public safety at the project and help address the issue of trespassing at the project, especially at Pit 7 afterbay where public access is prohibited.

Recreation use at the project is expected to double over the next 50 years. Monitoring boat use would help to identify excessive use and potential user conflicts on project reservoirs and this information could be used to examine existing use and develop mitigation measures if use is excessive or creating conflict among reservoir-based recreation users. Including a boat monitoring and reporting protocol as a part of monitoring efforts concurrent with the Commission's recreation Form 80 schedule would ensure project facilities, including reservoirs, are meeting recreation demand over the term of the license.

Project Signage and Interpretative Information

PG&E proposes to develop and implement a project sign plan specific to directional and facility signs for the project and project recreation facilities, but not to include traffic and road signs. In addition, PG&E proposes to develop and implement an interpretive and education plan that would be specific to interpretation and education about the project.

Forest Service condition 31 specifies that PG&E develop and implement a sign plan which includes directional, traffic, and road and safety signs, with the addition of an interpretive and educational component. The plan would include the types of informational signs to be developed, the design and content of each sign, and the locations where the signs will be placed. The interpretive and educational component of the project sign plan would include the design, delivery methods, land a schedule for implementation as well as a website with public information to include information about project recreation facilities such as directions, seasonal fees, stream flow information, seasonal reservoir levels, fish stocking, and scheduled work that would change flows or reservoir levels or affect access to recreational facilities. Informational kiosks containing fee and regulation information, seasonal and safety information, and project maps would also be placed as all developed recreation facilities.

PG&E alternative condition 31 is consistent with Forest Service condition 31; however, PG&E proposes that the most efficient and effective means of providing project recreation information to the public would be to post it on the Forest Service's web site instead of posting the information on a web site hosted by PG&E. Furthermore, PG&E states it would not provide specific information, such as real-time reservoir levels that could be used by competitors, to the public as part of the project recreation information. PG&E views this confidential business information to be proprietary in nature.

Our Analysis

The project currently does not have a coordinated and systematic process for the development of signage and interpretative information associated with the project. Development and implementation of a project sign plan with associated interpretive and educational measures for the McCloud-Pit Project would provide the means for coordinated and systematic development of signage and interpretative information associated with the project. The project sign plan would also provide the means to ensure that signage within the project is maintained and conforms to the Forest Service standards on lands that are visible from NFS lands. Furthermore, providing informational kiosks at the project would also improve recreation access and safety by providing visitors with maps of the area and safety information at each developed recreation site.

Developing a public website to host recreation information on the project would provide a source for visitors to locate recreation information about the project. However, we note that the Commission does not require that proprietary or confidential business information be made available to the public. Although the Forest Service is the main

recreation provider in the area and the source that visitors commonly use to locate recreation information, the Commission only has authority over its licensees and cannot require the Forest Service to post project information on its website.

Provision of Stream Flow Information

PG&E proposes to provide the following information to the public via the internet as a part of the recreation plan: real-time water flow data (hourly average) for the Lower McCloud River using gage data from gage MC-1 (gage at Ah-Di-Na), forecasts of known events that would affect water flow (e.g., powerhouse outage) on the Lower McCloud River, information about typical drawdown patterns for McCloud and Iron Canyon reservoirs, and information during the recreation season on current reservoir elevations in relation to the use of project boat launches.

Forest Service condition 19, part 3 specifies that PG&E operate and maintain existing gages for the purpose of determining the river stage and minimum stream flow on the Lower McCloud River below McCloud dam, Pit River below the Pit 7 dam, and Iron Canyon Creek below the Iron Canyon dam, consistent with all requirements of the Commission and under the supervision of USGS. The Forest Service specifies that PG&E measure and document all instream flow releases to be made available to the public and post real-time flow data at MC-1 on the CDEC or its successor's website. Flow data collected by PG&E from the stream gages would be reviewed by PG&E's hydrographers as part of its QA/QC protocol and made available to USGS in annual hydrology summary reports that USGS could post within its electronic database that can be accessed via the Internet. Forest Service condition 31 also specifies that PG&E develop and implement a public web site with information the above information as a part of the project sign plan.

PG&E alternative condition 31 is consistent with Forest Service condition 31; however, PG&E proposes to provide the information to the Forest Service for posting on the Forest Service web site. PG&E comments that providing public information through the Forest Service website would be more efficient and effective because the Forest Service is the main recreation provider in the area.

Our Analysis

Accurate and timely stream flow information and information about the usability of the project boat launches can assist recreationists in planning water-related visits to the project. If this information is not easily accessible to the public, recreationists may not be able to take full advantage of recreation opportunities and may not be appropriately prepared for stream flow conditions which could lead to public safety issues.

PG&E's proposal to provide accurate and timely stream flow information to the public would provide the means for the public to gain information regarding stream flow and reservoir levels for specified stream reaches and reservoirs at the project. This information could then be used by the public to determine if recreation opportunities and desired flow ranges for angling, boating, and other recreation activities would be

available. This would allow the public to take better advantage of opportunities for recreation use at the project. Although visitors commonly use the CDEC or Forest Service's website to locate water-based recreation information, the Commission only has authority over its licensees and cannot require the CDEC or the Forest Service to post project information on its website.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106 of the National Historic Preservation Act

Section 106 of the NHPA as amended requires the Commission to take into account the effects of licensing a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment if any adverse effects to historic properties are identified within the hydropower project's area of potential effects (APE).

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In this document, we also use the term "cultural resources" to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources need enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archaeological sites may not have enough contextual integrity to be considered eligible. TCPs are a type of historic property that are eligible for the National Register because of their association with cultural practices or beliefs of a living community that: (1) are rooted in that community's history; or (2) are important in maintaining the continuing cultural identity of the community (Parker and King, 1998).

Section 106 also requires that the Commission seek concurrence with California SHPO on any finding involving effects or no effects on historic properties and allow the Advisory Council an opportunity to comment. If Native American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

If existing or potential adverse effects have been identified on historic properties, the applicant needs to develop a HPMP to seek to avoid, reduce, or mitigate the effects. Potential effects that may be associated with a hydroelectric project include any project-related effects associated with the day-to-day O&M of the project after issuance of a new license. During development of the HPMP, the applicant should consult with the Commission, Advisory Council, California SHPO, Indian tribes, and Forest Service. In most cases, the HPMP would be implemented by execution of a Programmatic Agreement that would be signed by the Commission, Advisory Council (if it chooses to participate), California SHPO, and other consulting parties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed new license within a project's APE. The APE is determined in consultation with the California SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. In this case, the APE for the McCloud-Pit Project includes lands within the project boundary, as delineated in the current Commission license, plus lands outside the project boundary where project operations may affect the character or use of historic properties or TCPs.

The APE for the proposed project has been defined by the Commission as the land within the proposed project boundary (project area), and encompasses the following (PG&E, 2009d):

- 100 ft from either side of the banks of the McCloud River, downstream from McCloud dam to the confluence of Squaw Valley Creek (McCloud River Expanded APE);[20]
- Public land between the perimeter road around McCloud reservoir and the water surface from Tarantula Gulch, crossing McCloud dam, to Star City Creek;
- The area between the perimeter road around Iron Canyon reservoir and the water surface; and
- And the area contiguous with tunnel spoil areas having a reasonable potential to contain archaeological materials based on topography and site conditions.

The proposed project area above project tunnels is excluded from the APE as there are no surface activities anticipated in this area. In addition, lands on the west side of the McCloud River, upstream from the Tarantula Gulch boat launch, and lands associated with Fenders Flat at the Pit 7 afterbay, are also included in the APE (PG&E, 2009d).

Also encompassed within the APE are all lands affected by the construction of the proposed powerhouse at the Pit 7 afterbay and McCloud dams. These areas include (PG&E, 2009d):

- A 200-ft buffer around the proposed powerhouse site at the base of McCloud dam;
- A 200-ft corridor centered on the proposed McCloud and Pit 7 afterbay transmission line routes;

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[20] Survey access to the APE on private lands along the McCloud River downstream of The Nature Conservancy lands was not granted.

- A 200-ft buffer around the proposed Pit 7 afterbay powerhouse and substation on the west side of the Pit 7 afterbay dam weir;
- A 200-ft corridor centered on the proposed location of the access road between FR 34N17 and the proposed Pit 7 afterbay powerhouse site; and
- An area on the west side of the Pit River arm of Shasta Lake extending from the high-water mark upslope to the proposed access road corridor between the Pit 7 afterbay dam and FR 34N17.

Preliminary study results from RL-S6, *Traffic Study and Road Condition Inventory*, indicated that uses related to the proposed project are "sufficient to establish a clear nexus with the Project or other Project-related activities," and have the potential to create impacts to historic properties; thus, a portion of the road near Blue Jay Creek on NFS lands is also included in the APE. Similarly, lands located outside of the Commission-defined project boundary that was identified in TM-16, *Data Summary for Developed and Dispersed Recreation*, are included in the APE as well (PG&E, 2009d).

Cultural History Overview

The study area is located in the southern-most extension of the larger Cascade Range, within what is described as the Cascade Range Geomorphic Province (PG&E, 2009d; Harden, 1998 as cited by PG&E, 2009d; Schoenherr, 1992 as cited by PG&E, 2009d). The majority of the Cascade range is typified by rolling, forested terrain, with the dominant ecology in lower elevations consisting of yellow pine forest, while higher elevations are represented by Mount Lassen and Mount Shasta, two of the regions highest volcanic peaks. Mount Lassen measures 10,457 ft in height and sits amid an active volcanic region that includes hot springs, cinder cones, calderas, lava tubes, and fumaroles. Mount Shasta is a large stratovolcano, 14,162 ft in height, and is located about 80 miles north of Mount Lassen (PG&E, 2009d; Harden, 1998 as cited by PG&E, 2009d). Although the Cascade Range has been volcanically active for about 36 million years, most volcanoes in the range are between two and five million years old (PG&E, 2009d; Harden, 1998 as cited by PG&E, 2009d; Schoenherr, 1992 as cited by PG&E, 2009d).

The Pit River and the McCloud River are the two main waterways that drain the northern California Cascade Range, both of which feed into Shasta Lake. Several creeks, including Hat Creek, Burney Creek, and Clark Creek run into the Pit River. Several waterfalls line the Upper McCloud River, north of McCloud reservoir, while the Lower McCloud River flows through a deep, narrow canyon after leaving the reservoir (PG&E, 2009d). Human occupation of the area began as small, scattered sites serving a hunter-gatherer culture, eventually evolving into a subsistence economy as technology progressed (PG&E, 2009d).

The cultural chronology of Shasta County proposed by Clewett and Sundahl identified a four-part chorological sequence of human occupation stretching back 8,000 years (PG&E, 2009d; Clewett and Sundahl, 1982, 1983 as cited by PG&E, 2009d).

Evidence of human occupation in Shasta County prior to 8,000 years ago is minimal, consisting of a few isolated fluted projectile points and crude metavolcanic tools typically dating from circa 12,000-10,000 BP. The argument has been made that these tools represent a late Pleistocene/early Holocene occupation, as they were found on Pleistocene terraces; however, no stratified, undisputed Paleoindian site has been identified within Shasta County (PG&E, 2009d; Brott and Dotta, 1978 as cited by PG&E, 2009d; Dillon, 1994 as cited by PG&E, 2009d).

Clewett and Sundahl termed the earliest period of occupation the Early Archaic (6000-3000 BC) period, which is characterized by wide-stemmed projectile points and ground stone implements, leading some scholars to assert cultural affiliation with the Borax Lake area in southeastern California (PG&E 2009a; Moratto, 1984 as cited by PG&E, 2009d). Early Archaic settlements appear to have been small and scattered in foothills and along waterways, with ground stone assemblages that suggest a heavy reliance on seeds and nuts with supplemental additions of mammals and fish. Few faunal assemblages from the period have been analyzed, however, and it has been suggested that the "correspondence between wide-stem points and elk distributions in other parts of California" indicate a reliance on elk as a food source during this period (PG&E, 2009d; Kowta, 1984 as cited by PG&E, 2009d).

The Middle Archaic, spanning 3000-500 BC, is characterized by a more diversified tool kit, encompassing medium to large corner and side-notched projectile points. Though the use of ground stone tools continues during this period, their use does decrease. Settlements are believed to have been similar in type and location to those of the Early Archaic period, with the addition of a systematic use of upland zones. A large-scale, mid-Holocene, warming trend, characteristic of the western United States at this time, may have spurred this shift in subsistence and settlement patterns (PG&E, 2009d; Kowta, 1984 as cited by PG&E, 2009d).

During the Transitional Period (500 BC-AD500), considerable changes occurred in assemblage structure, subsistence, and settlement patterns. A multitude of corner notched projectile points, as well as the appearance of mortars and pestles, typify assemblages of the period. The addition of acorns as a dietary staple during this period is assumed due to the appearance of the mortar and pestle, and may signal a shift from a more mobile society to a diversified subsistence economy. The labor-intensive process required for the consumption of acorns and the eventual development of an acorn-based economy may have prompted the creation of a sociopolitical ranking system (PG&E, 2009d; Basgall, 1987 as cited by PG&E, 2009d).

The Shasta Complex (AD 500-AD 1850) represents the final phase of Clewett and Sundahl's chronology. The introduction of the bow and arrow along with various small, Gunther Barbed, Desert Side-notched, and Cottonwood Triangular projectile point types characterized the assemblage of this phase. Settlements remained near streams and rivers and included semi-subterranean dwellings. Subsistence activities concentrated on acorn gathering, hunting, and fishing.

Sundahl subdivided the Shasta Complex into three temporal phases using variations in artifact attributes (PG&E, 2009d; Sundahl, 1982 as cited by PG&E, 2009d). All three phases, 1250-750 BP, 750-350 BP, and 450-100 BP, are characterized by Gunther Barbed projectile points, winged drills, bi-pointed fish gorges, bone gaming pieces, incised bone pendants, and spire-looped Olivella and glycymeris beads. The assemblage of the second phase, 750-350 BP, lacks winged drills, but includes a contracting-stem variant of the Gunther Barbed projectile point, the Desert Side-notched projectile point, large drills manufactured of basalt or chert, sandstone arrowshaft polishers, and Haliotis pendants. The third phase, 450-100 BP, includes Desert Side-notched points, hafted drills, incised pebbles, biconically-drilled pebble pendants, incised charmstones, and clam shell disc beads (PG&E, 2009d; Clewet and Sundahl, 1982 as cited by PG&E, 2009d; Moratto, 1984 as cited by PG&E, 2009d; Sundahl, 1982 as cited by PG&E, 2009d). Some scholars have identified the appearance of Shasta Complex artifacts and sites as representative of a new group of peoples into the region (PG&E, 2009d; Sundahl, 1982 as cited by PG&E, 2009d). Two of the most representative sites in Shasta County from this period are located north of Redding along the Sacramento River (PG&E, 2009d; Moratto, 1984 as cited by PG&E, 2009d; Treganza and Heicksen, 1960, as cited by PG&E 2009a).

At the time of European-American contact in the region, the Pit River and the Wintu Native American groups were living in the area that is now Shasta, Siskiyou, and adjacent counties. Along with the Shasta and Yana groups, these were the descendants of Native American peoples who had migrated from Asia and settled in the region several thousand years earlier. The Pit River group inhabited an area south from Goose Lake along the western side of the Warner Mountains, to just south of Eagle Lake; to the west, the Pit River territory included land north of Mount Lassen, and north to the eastern side of Mount Shasta. Many of the main Pit River villages were located along both the northern and southern banks of the Pit River, as well as along Pit River tributaries. West of the Pit River territory was Wintu territory, encompassing parts of what is now Trinity, Shasta, Siskiyou, and Tehama Counties. Wintu territory was crossed by various waterways, including the Sacramento, Trinity, and McCloud Rivers, as well as Cottonwood, Hayfork, and Stillwater Creeks. Both the Pit River and the Wintu groups were hunter-gathers, relying on acorn and pine nuts (buckeyes were also important to the Wintu), deer, waterfowl, and numerous species of fish. Salmon were a particularly important resource, for which the Wintu constructed salmon houses across the river from which they could spear the fish (PG&E, 2009d).

The Pit River and Wintu were both comprised of several smaller groups. The Pit River people were also called the Achumawi, spoke a Hoken-derived language, and included the Hewisedawi, Kosalektwi, Astariwawi, Hammawi, Atwamsini, Aporige, Atuge, Ajumawi, Ilmawi, Itsatawi, and Madesiwi. The Wintu spoke a Penutian language related to the Nomlaki language, included the Nomtipom, Winnemem, Dawpom, ʔelpom, λ'abalpom, Nomsuus, Dawnom, Norelmaq, and Waymaq. Family was the dominant social unit in Shasta, Pit River, Wintu, and Yana societies. The family was largely self-

sufficient, fulfilling economic process through a gender-based division of labor, with women gathering plant foods and men hunting, fishing, and making tools. Social organization was based on tribelets, consisting of "one or more household groups that included immediate family members… and any associated relatives… living together in a village or community" (PG&E, 2009d; Krober, 1925 as cited by PG&E, 2009d).

The first recorded expeditions by Euro-Americans into the area are credited to traders with the Hudson Bay Company between 1826 and 1833. At this time the Native American population in the area was large and culturally varied. Diseases introduced by these first explorers, however, decimated the Native populations. Nearly 40 percent of the Pit River Tribe and almost 75 percent of the Wintu people had fallen to epidemic by 1833 (PG&E, 2009d; Loofbourow, 2009 as cited by PG&E, 2009d). The Native American population suffered more losses during the 1840s and 1850s, with the massacre of Wuntus and Yanas by American military under the leadership of John C. Fremont, and the "friendship feast," in which white settlers served Wintu guests poisoned food (PG&E, 2009d).

The discovery of gold at Sutter's mill in 1848 brought a rush of miners and settlers into California. Gradually, Native American lands were lost to white claims. Shasta County, established in 1850, became the "Gateway to the Northern Gold Rush" (PG&E, 2009d; Smith, 1996 as cited by PG&E, 2009d). Star City Creek, located along the northern banks of Grizzly Peak and flowing into McCloud reservoir, was especially productive. As Shasta County drew more and more prospectors, streams and creeks relied upon by Native American groups became increasingly polluted from mining operations, causing numerous violent incidents between the miners and Native groups. In response, the American military established Fort Cook near the Fall River in 1857 (PG&E, 2009d; Shasta Historical Society, 2003 as cited by PG&E, 2009d).

As gold mining diminished, many prospectors turned their hand to small-scale ranching and timber operations. Nineteenth century land grants drew more settlers to the area. Between 1899 and 1920, several families and individuals homesteaded the area that later became the Iron Canyon reservoir. Fenders Ferry, another early American settlement in the vicinity of the Pit 7 dam, is thought to have acquired its name from the Fender brothers, who established a ferry near Potem Creek in 1860 (PG&E, 2009d; Durham, 1998 as cited by PG&E, 2009d). Many settlers allowed their livestock to graze on plants vital to the Native American diet, further fueling tension and violence between the two groups. Despite resistance, most Native Americans in the area had been relocated to various reservations by the late nineteenth century. Many of the Pit River people were moved to the Round Valley Reservation east of Redding and the Nome Lackee Reservation in Tehama County. The Wintu were taken to reservations on the Mendocino coast. Eventually, Pit River and McCloud River Natives did return to their traditional lands (PG&E, 2009d).

By the late 1870s, logging had become a major industry in the region. McCloud Flats, east of the town of McCloud, was a particularly valuable timber area (PG&E,

2009d; Zanger, 1992 as cited by PG&E, 2009d). By the 1890s, copper mining had replaced gold mining, especially along the copper-zinc belt in the west-central portion of Shasta County. Smelting facilities were constructed in the area around Iron Mountain, the first being at Keswick. Copper production in the area was effectively ended by a court order in 1919 mandating the closure of smelting plants, which were producing toxic fume detrimental to livestock and crops (PG&E, 2009d; Smith, 1996 as cited by PG&E, 2009d).

The McCloud River had developed a reputation for exceptional fishing as early as the 1870s. The McCloud River Association was formed in 1900, organizing recreation fishing on the river (PG&E, 2009d; Guilford-Kardell, 1994 as cited by PG&E, 2009d). The association originally had 20 members, each of whom paid an annual fee of $1,000.00 for fishing privileges. The association officially became the McCloud River Club in 1902 or 1903 (PG&E, 2009d; Cranfield, 1984 as cited by PG&E, 2009d). Phoebe Appleton Hearst, mother of William Randolph Hearst, began development at the Wyntoon Castle estate in the first decade of the 1900s. The "wyntoon" name was a derivation of the word "wintu" associated with the Winnemem Wintu. In 1929, the Wynoon Castle was built (which later burned down). William Randolph Hearst used the estate as a hideaway from his more well-known San Simeon estate on the coast. Today the Hearst private estate consists of a 67,000 acres containing a number of built structures (including a village) which surrounds the McCloud Reservoir and is adjacent and includes some project lands. Presently, the Wyntoon Castle estate is managed by the Hearst Corporation.

The topography of the area lent itself to the development of hydroelectric power facilities beginning in the last decade of the nineteenth century. The first recorded use of hydroelectric power in Shasta County occurred at Gladstone Mine in 1894. The Northern California Power Company, which had originally been established as the Keswick Electric Company to supply power to the Keswick Smelter, took over electrical operations of the Gladstone Mine sometime around 1900 (PG&E, 2009d; Smith, 1996 as cited by PG&E, 2009d). PG&E purchased the water rights of the Mount Shasta Power Company in 1917, and in 1919 purchased the Northern California Power Company. The construction of the Pit River facility spanned from 1921 to 1966, and was the single largest construction project in PG&E's history (PG&E, 2009d).

Previous Cultural Resource Investigations

In preparation for the pre-application document, PG&E conducted an archival record search between June 23 and 27, 2005 at the California State University (CSU), Chico, Northeast Information Center to identify previous investigations in the vicinity of the project APE, as well as previously recorded cultural resources in the area. The Northeast Information Center houses all cultural resources data for Shasta and Siskiyou Counties. Data reviewed includes site records, base maps containing site and survey locations, letter reports, survey reports, site testing and evaluation reports, National Register listings, California Register listings, California Historical Landmark listings, and

California Points of Historic Interest. Additional sources of information consulted include the Shasta-Trinity National Forest, the Shasta County Historical society in Redding, the Shasta County Public Library in Redding, and the special collections of the Meriam Library, CSU, Chico (PG&E, 2006).

In addition, PG&E consulted the California Native American Heritage Commission concerning documented areas of tribal significance in the project APE. Tribal groups with ties to or interest in the project area were also contacted concerning sensitive cultural resources within the project APE. Subsequent meetings were held with the Pit River Tribe, the Redding Rancheria, and the Winnemem Wintu and Toyon-Wintu Tribes (PG&E, 2006).

There have been 49 previous investigations conducted in and around the project APE, ranging in date from the early 1960s to 2004. These studies were conducted to identify cultural resources prior to the sale or transfer of timber or land, timber harvests, or project-specific ground-disturbing activities. About 40 percent of the total APE for the project had been investigated previously; however, many of the existing site records and survey efforts are more than 10 years in age and are not considered to be in adherence with current professional standards (PG&E, 2006).

Albion Environmental, Inc, was contracted to conduct archaeological field work as outlined in Study Description CR-S1. Archaeological surveys were conducted during September, October, and November 2007, and during January, April, May, and July 2008. The surveys were designed to examine locations that had not been recently examined, that had been surveyed but with an unknown survey strategy, or that had been surveyed with a survey strategy that was not undertaken according to current professional standards. In addition to the archaeological survey crew, representatives of the Pit River Tribe and of the Winnemem Wintu Tribe were invited to participate in the field work as official Native American monitors and observers. Only the Pit River Tribe provided monitors (PG&E, 2009d).

In areas where it was safe to survey, crew members traversed parallel transects spaced 15 to 20 meters apart. In areas where 75 percent or more of the ground cover was obscured by vegetation, or the terrain exhibited a slope greater than 49 percent, transects were expanded to 20 to 40 meters apart. Areas of the project APE that were inaccessible because of steep terrain, extremely dense foliage, or unsafe conditions were bypassed (PG&E, 2009d).

Surveys of both McCloud and Iron Canyon reservoirs were undertaken when the reservoirs were at low levels so that potentially submerged resources could be identified; however, neither reservoir was at the lowest historic levels during the 2007 field season. Restricted access to privately owned land along the McCloud reservoir necessitated initial survey of the reservoir by helicopter, during which potentially sensitive areas within the project APE were identified on a topographic map. These areas were then accessed by boat and surveyed using the methods described above. Pit 6 and Pit 7 were also accessed by boat (PG&E, 2009d).

A preliminary inspection of the McCloud transmission line route was undertaken on July 21, 2008. This inspection did not constitute a formal archaeological survey, which will be undertaken after the final transmission line route and type have been determined. An additional survey of NFS lands was undertaken on April 30, 2009. At the request of the Pit River Tribe, a two-day field visit was hosted by PG&E to identify areas of tribal concern located at the Pit 6 and Pit 7 reservoirs. Access to McCloud River Club lands was denied, and consequently were not field surveyed (PG&E, 2009d).

Identified Resources

Archaeological and Historic Era Resources

A total of 87 archaeological and historic-era resources were identified within the APE for the proposed project. Of these total 87 sites, 14 were identified on lands that were inaccessible during field survey and 18 were not relocated during archaeological field survey. The remaining 55 resources, which include 30 archaeological sites, 22 isolated finds (artifacts unassociated with an archaeological site), and three historic structures, were physically located during archaeological field survey.

Comprising these 55 resources are 33 sites (nine newly identified, 24 previously recorded) and 22 isolated finds. The nine newly identified sites consist of eight prehistoric archaeological sites and one historic-era site. The 24 previously recorded sites consist of 21 prehistoric archaeological sites and three sites containing both prehistoric and historic components. Isolated finds include three historic structural features and 19 prehistoric resources (PG&E, 2009d).

None of the 22 isolated finds (defined as less than five artifacts per square meter) are considered eligible for listing on the National Register. Of the 33 archaeological and historic-era resources, two are eligible for listing and six have been recommended ineligible. The eligibility of the remaining 25 archaeological and historic-era resources is unknown; therefore, these resources would be treated as eligible for listing on the National Register until such time that any previous evaluation of these resources is identified, or until these resources are formally evaluated eligible (PG&E, 2009d). The 33 archaeological and historic-era resources, along with National Register eligibility, are identified in table 3-32.

A preliminary inspection of the proposed McCloud transmission line corridor, as described in the supplement submitted by PG&E on October 17, 2007, was conducted as part of archaeological field survey. The inspection consisted of viewing the proposed route of the transmission line by vehicle from FR 11, and noting areas that may potentially be archaeologically sensitive. Formal archaeological survey will be conducted upon final determination of the final corridor route (PG&E, 2009d).

Table 3-30. Archaeological and historic-era resources located on McCloud River Club lands within the McCloud River Expanded APE. (Source: PG&E, 2009d; Berryman, 1999)

Resource Number	Description [a]	National Register Eligibility	National Register Integrity
P-45-003188	Lithic scatter, fire-cracked rock, house pits, projectile points, and historic components	Unknown	Unknown
P-45-003189	Footbridge	Unknown	Unknown
CA-SHA-3190	Lithic scatter, midden deposit, fire-cracked rock, house pits, projectile points, manos	Unknown	Unknown
P-45-003191	Lithic scatter, midden deposit, house pits	Unknown	Unknown
P-45-003192	Lithic scatter, house pits	Unknown	Unknown
P-45-003193	Lithic scatter, projectile points, and historic components	Unknown	Unknown
P-45-003194 [b]	Lithic scatter, midden deposit, fire-cracked rock, and historic components (village: “Haupom”)	Unknown	Unknown
P-45-003195	Lithic scatter, midden deposit, house pits	Unknown	Unknown
P-45-003196	Pasture, fence, and prehistoric components	Unknown	Unknown
P-45-003197	Footbridge	Unknown	Unknown
P-45-003198	Lithic scatter, midden deposit, and historic components	Unknown	Unknown
P-45-003199	McCloud River Club Resort	Unknown	Unknown
P-45-003202	Lithic scatter, midden deposit, fire-cracked rock, house pits (village “Sulanharas”)	Unknown	Unknown
P-45-003205	Lithic scatter, midden deposit, projectile point	Unknown	Unknown

[a] Resource descriptions are taken from Berryman, 1999.

[b] Partially located on Shasta-Trinity National Forest lands; Shasta-Trinity National Forest portion identified as ALB-12/FS 05-04-61-601.

Table 3-31. Previously recorded archaeological and historic-era resources that were not relocated during Archaeological field survey. (Source: PG&E, 2009d)

Project Location	Resource Number	Description	National Register Status	National Register Integrity
Pit 7 Reservoir	CA-SHA-143 [e]	House pit, obsidian points	Unknown	Unknown
Pit 7 Reservoir	CA-SHA-144 [a]	House pits	Unknown	Unknown
Pit 7 Reservoir	CA-SHA-145 [d]	Projectile points, mano	Unknown	Unknown
Pit 7 Reservoir	CA-SHA-147 [a]	House pits, midden, shell	Unknown	Unknown
Pit 6 Reservoir	CA-SHA-147/247 [e]	Midden, shell	Unknown	Unknown
Fenders Flat	CA-SHA-150 [a]	Obsidian flakes, shell, small stemmed point	Unknown	Unknown
Fenders Flat	CA-SHA-151 [a]	Obsidian, shell	Unknown	Unknown
Pit 7 Reservoir	CA-SHA-152 [b]	House pits, midden, shell	Unknown	Unknown
Pit 7 Reservoir	CA-SHA-153 [b]	Obsidian flakes, shell	Unknown	Unknown
Pit 6 Reservoir	CA-SHA-248 [e]	Obsidian flakes, shell	Unknown	Unknown
McCloud River	CA-SHA-969 [f]	Depressions, obsidian flakes, scrapers, cores, projectile points, bowl mortar, midden	Unknown	Unknown
McCloud Reservoir	ICI320-1 [c]	Percussion flake, possible house pit	Unknown	Unknown
McCloud Reservoir	ICI320-2 [c]	Percussion flakes, projectile points, midden	Unknown	Unknown

Project Location	Resource Number	Description	National Register Status	National Register Integrity
McCloud Reservoir	ICI230-3 [c]	Percussion flakes, projectile points	Unknown	Unknown
McCloud Reservoir	ICI230-4 [c]	Percussion flakes	Unknown	Unknown
McCloud Reservoir	ICI230-5 [c]	Percussion flakes	Unknown	Unknown
McCloud Reservoir	ICI230-6 [c]	Percussion flakes, superficial midden	Unknown	Unknown
McCloud Reservoir	ICI230-7 [c]	Percussion flakes	Unknown	Unknown

[a] Recorded by Baumhoff et al. (1955)

[b] Recorded by Baumhoff and Bennyhoff (1955)

[c] Recorded by Clemmer (1963)

[d] Recorded by Flint et al. (1955)

[e] Recorded by Heicksen (1962)

[f] Recorded by Henn (1977)

Table 3-32. Documented archaeological and historic-era resources located within the APE. (Source: PG&E, 2009d)

Project Location	Resource Number	Type [a]	Description	National Register Status	National Register Integrity [b]
Iron Canyon Reservoir [c]	ALB-3 (FS-05-14-58-424)	P	Native American site; lithic scatter	Unknown	Low
Iron Canyon Reservoir [c]	ALB-4 (FS 05-14-58-425)	P	Native American site; lithic scatter	Unknown	Moderate
McCloud Reservoir [d]	ALB-5	P	Native American site; lithic scatter	Unknown	Low
Pit 6 Transmission Line [c]	ALB-6H	H	Historic trash scatter with associated pit and milled board feature	Unknown	Low
Pit 7 Transmission Line [c]	ALB-7	P	Native American site; lithic scatter	Unknown	Low
McCloud River [d]	ALB-8 (FS 05-14-61-598	P	Native American site; lithic scatter	Unknown	High
McCloud River [d]	ALB-9 (FS 05-14-61-599)	P	Native American site; lithic scatter	Unknown	High
McCloud River [d]	ALB-10	P	Native American site; obsidian flakes and Gunther projectile point	Unknown	High
McCloud River [d]	ALB-11 (FS 05-14-61-597)	P	Native American site; lithic scatter	Unknown	Low

Project Location	Resource Number	Type [a]	Description	National Register Status	National Register Integrity [b]
McCloud River [d]	ALB-12 (FS 05-14-61-601; P-45-003194)	P/H	Prehistoric site with historic component; lithic scatter, ground stone fragment, midden	Unknown	Moderate
McCloud River [d]	ALB-13 (FS 05-14-61-600)	P	Prehistoric site with historic component; lithic scatter, ground stone fragment, midden	Unknown	Moderate
Pit River [c] *(Pit 7 Reservoir)*	CH-SHA-243	P	Native American site; lithic scatter	Unknown	High
Pit River [c] *(Pit 7 Reservoir)*	CH-SHA-244	P	Native American site; lithic scatter	Unknown	High
Pit River [c]	CA-SHA-246	P	Native American site; lithic scatter	Recommended	Moderate
Pit River [c] *(Pit 6 Reservoir)*	CA-SHA-249	P	Native American site; possible pit house features, obsidian flakes, basalt ground stone fragment	Recommended	Moderate
Pit River [c]	CA-SHA-252	P	Native American site; possible pit house features, ground stone artifacts; previously excavated by M.H. Heicksen (1962)	Recommended	High

Project Location	Resource Number	Type [a]	Description	National Register Status	National Register Integrity [b]
Iron Canyon Reservoir [c]	CA-SHA-498 (FS 05-14-58-42)	P	Native American site	Unknown	Low
McCloud River [d]	CA-SHA-622 (FS 05-14-61-185)	P	Native American site; lithic scatter, midden	Unknown	High
McCloud River [d]	CH-SHA-623 (FS 05-14-61-168)	P	Native American site; lithic scatter, possible pit house features	Recommended	Low
McCloud River [d]	CA-SHA-624 (FS 05-14-61-187)	P	Native American site; lithic scatter, possible pit house features	Recommended	High
Iron Canyon Reservoir [c]	CA-SHA-664 (FS 05-14-58-53)	P	Native American site; lithic scatter, modern fire ring	Unknown	Low
Iron Canyon Reservoir [c]	CA-SHA-665 (FS 05-14-58-54)	P	Native American site; lithic scatter, possible modern rock circle feature	Unknown	Moderate
Iron Canyon Reservoir [c]	CA-SHA-666 (FS 05-14-58-55)	P	Native American site; lithic scatter	Unknown	Low

Project Location	Resource Number	Type [a]	Description	National Register Status	National Register Integrity [b]
Iron Canyon Reservoir [c]	CA-SHA-667/H (FS 05-14-58-56; ALB-1)	P/H	Native American site (archaeological and historic); obsidian scatter mixed with historic ceramic, bottle fragments, and metal piping; apple tree and walnut tree present on site	Unknown	Low
Iron Canyon Reservoir [c]	CA-SHA-668 (FS 05-14-58-57; ALB-2)	P	Native American site; lithic scatter	Unknown	Low
McCloud River [d]	CA-SHA-686/H (FS 05-14-61-08)	P	Large Native American site; extensive lithic scatter, midden	Eligible	Low - Moderate
McCloud River [d]	CA-SHA-687 (FS 05-14-61-32)	P	Large Native American site; lithic scatter, midden	Eligible	Low
McCloud River [d]	CA-SHA-688 (FS 05-14-61-33)	P	Native American site; rock shelter, obsidian lithic debitage	Eligible	High
Iron Canyon Reservoir [c]	CA-SHA-1623 (FS 05-14-58-228)	P	Native American site; lithic scatter	Unknown	High
McCloud River [d]	CA-SHA-1657 (FS 05-14-61-301)	P	Native American site; lithic scatter, basalt chopper, midden	Unknown	Moderate

Project Location	Resource Number	Type [a]	Description	National Register Status	National Register Integrity [b]
McCloud River [d]	CA-SHA-1658 (FS 05-14-61-302)	P	Native American site; possible house pit features, obsidian lithic debitage	Recommended	High
McCloud River [d]	CA-SHA-1659 (FS 05-14-61-303)	P	Native American site; lithic scatter	Unknown	Low
Iron Canyon Reservoir [c]	CA-SHA-2109 (FS 05-14-58-365)	P	Native American site; lithic scatter, ground stone fragment	Unknown	Low

[a] P = prehistoric, H = historic

[b] Low = extensive impacts to resource, Moderate = limited impacts to resource, High = almost no impacts to resource

[c] Within FERC project boundary

[d] Outside of FERC project boundary, in McCloud River Expanded APE

Historic Buildings and Structures

Only three historic structures were identified within the APE, all three of which are located in the McCloud River expanded APE on McCloud River Club lands. These resources include two foot bridges (P-45-003189, P-45-003197) and the McCloud River Club Resort (P-45-003199). Survey access to lands owned by the McCloud River Club located within the APE was not granted, nor is National Register-eligibility for these resources known; therefore, PG&E proposes to treat these resources as eligible until such time that any previous evaluation of these resources is identified, or until these resources are evaluated for listing on the National Register.

Traditional Cultural and Religious Sites Inventory and Impact Study

Two Native American communities, the Pit River Tribe and the Winnemem Wintu Tribe, have formally requested to participate in the relicensing project. The Pit River Tribe is a federally recognized tribe. The Winnemem Wintu Tribe has petitioned for federal recognition. Other Native American communities in the vicinity either have not requested to participate in the project, or have only asked to be kept apprised of project progress. The Pit River Tribe expressed interest in the Iron Canyon and Pit River areas of the APE. The Winnemem Wintu Tribe expressed interest in the McCloud reservoir and McCloud River areas of the APE.

The Pit River and Winnemem Wintu tribes have requested separate TCP investigations, as is outlined in Study Description CR-S2, *Traditional Cultural Properties*, (PG&E, 2009e), from which two separate reports addressing the study results for each tribe will be produced. In addition, both tribes requested formal agreements outlining the conduct of the TCP studies. PG&E entered into an MOU with each tribe, recognizing the sensitivity of the resources under study, and the historical and cultural events that have affected the tribes. The MOUs also recognize the importance of identifying TCPs within the APE and incorporating the management of these resources into the overall management plan for the proposed project. Full details of Study Description CR-S2 and the MOUs for each tribe are available in the *Historic Properties Management Plan* (PG&E, 2009e). So far only the Pit River Tribe TCP study has been completed (PG&E 2009f). At this time, there continues to be an impasse between PG&E and the Winnemem Wintu on completion of the draft TCP report due to what particular contractors have access to review and comment on the draft TCP report.[21]

The Pit River TCP study resulted in the identification of a total of 158 resources, of which 22 were considered sacred sites, 16 resource procurement locations, 14

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[21] See letter from Mark Franco, Winnemem Wintu Tribe, dated July 5, 2009; letter from Steve Nevares, PG&E, dated July 30, 2009; letter from Steve Nevares, PG&E, dated April 23, 2010, and letter from Stephen Volker, Attorney for Winnemem Wintu Tribe, dated May 25, 2010.

habitation sites, two battle sites, 11 multiple use locations, and 78 place names (PG&E 2009f). Of these 158 resource sites, 31 are located within the project's APE, consisting of 15 place names, 4 habitation sites, 7 resource procurement locations, 2 trails, and 3 sacred sites. Of these 31 resources, four are considered as eligible for listing in the National Register as TCPs, while 9 are considered as potentially eligible TCPs (currently undetermined), while the remaining 18 are considered ineligible for listing in the National Register as TCPs.

3.3.6.2 Environmental Effects

Project-Related Effects on Cultural Resources

Project-related effects to cultural resources within the project's APE are likely to occur from project operations and maintenance, use and maintenance of project roads (including associated drainage ditches), recreation, vandalism, and modifications or repairs to project facilities. Project-related adverse effects to cultural resources considered eligible for the National Register (i.e. historic properties) would require PG&E to resolve such effects, in consultation with the California SHPO, and with other parties depending on the nature and location of the affected historic property.

Project Operations

The project operates both as a peaking system and a load-following system, using the available water supply after satisfying minimum instream flow requirements that results in regular fluctuation in reservoir levels. Regular fluctuation in reservoir levels created by project operations can result in the erosion of archaeological sites by either deflating or washing away cultural deposits. Thus, project-related erosion along the shorelines of the McCloud, Iron Canyon, Pit 6, and Pit 7 reservoirs may affect archaeological sites situated on the shoreline or presently inundated by the reservoirs. Archaeological sites situated along the shoreline in the reaches below the reservoirs can also be affected by erosion in a similar manner.

Road Maintenance and Use

The maintenance of project roads may affect archaeological sites located adjacent to them or buried beneath them. Ditches excavated for roadway drainage may also affect archaeological sites. Depending on the condition of native soil roads, season, and vehicle type, vehicular traffic may damage archaeological sites, as well. Increased public accessibility to archaeological sites by roads may also increase the vulnerability of those resources.

Recreation

The project vicinity is a popular area for recreational activities including hiking, fishing, camping, picnicking, swimming, boating, hunting, and OHV use. There are four developed recreational areas within the project APE, the use of which has the potential to affect archaeological sites. These recreational areas include the following:

- McCloud reservoir boat ramp, also called the Tarantula Gulch boat launch, at McCloud reservoir;
- Deadlun campground;
- Hawkins Landing campground and Boat ramp at Iron Canyon reservoir; and
- Fenders Flat unimproved boat ramp at Pit 7 afterbay dam.

The Ash Camp campground and the Ah-Di-Na campground are located outside of the project boundary, but are partially located within the McCloud River expanded APE. Both campgrounds are Forest Service recreation developments that predate the project, and are connected by the Pacific Crest National Scenic Trial as it parallels the McCloud River. Dispersed recreational use also occurs in this area. Other areas where dispersed recreational use occurs are located within the project's APE. User-created roads leading from improved roads to the shoreline can be found in many areas.

Vandalism

Collection of artifacts or the intentional disturbance of cultural materials by unauthorized persons (from people accessing roads and recreational sites within the FERC project boundary) can adversely archaeological sites and associated TCPs. Archaeological sites that contain human remains and burials are particularly susceptible to vandalism and looting.

Vegetation Management

Project-related vegetation management around project-related hydroelectric features may include spraying, burning, and mechanical removal. All of these activities have the potential to adversely affect or destroy areas currently utilized by the Pit River Tribe and Winnemem Wintu Tribe to gather culturally significant plant spices.

Proposed Project

PG&E proposes to construct a new powerhouse at the base of McCloud dam and a powerhouse at Pit 7 afterbay dam, along with associated transmission facilities. In addition, PG&E proposes the creation of new recreational facilities at McCloud dam, Battle Creek, East and West McCloud dams, Red Banks, Star City, Tarantula Gulch, at the intersection of Tarantula Gulch access road and Forest Road (FR) 11, a floating dock on McCloud reservoir with an associated trail, Iron Canyon, Deadlun, Campground, Hawkins Landing Campground, three areas along FR 37N38, Iron Canyon dam, Montgomery Creek, the upper end of Pit & reservoir, Fenders Flat, and Pit 7 powerhouse.

Future project-related effects to cultural resources within the project's APE that are likely to occur under these proposed project facilities would be nearly identical to those generated under the existing project in regard to project operation and maintenance, use and maintenance of project roads (including associated drainage ditches), recreation, vandalism, and repairs to project facilities. The addition of new recreational facilities would increase and exacerbate potential effects related to inadvertent destruction of

archaeological sites, unauthorized collection of artifacts, and vandalism. Finally, ground-disturbing activities involving the construction phases associated with the new proposed facilities would have the potential to directly or indirectly affect archaeological sites and TCPs.

Archaeological Resources

PG&E identified project-related effects for 14 out of the 55 archaeological sites located and evaluated during field survey. During archival research, 14 additional resources were identified on McCloud River Club lands; however, these sites were not relocated during field survey due to lack of access, and were consequently not evaluated for project-related effects. Project effects for these 14 resources are unknown, and therefore PG&E has not proposed management for these resources.

Site-specific project-related effects for the identified 14 archaeological sites are listed in table 3-33. Eight of these sites are being affected by a combination of erosion, dispersed recreational use, and vandalism; and a ninth site is being affected by these three effects in addition to road maintenance use. Another site is being affected by erosion alone. Another site is being affected by dispersed recreational use and vandalism. The three remaining sites could potentially be affected by vegetation management or new construction activities.

PG&E-proposed management for archaeological sites that may be affected by erosion, road maintenance and use, dispersed recreational use, or vandalism includes blocking vehicular access to these sites, posting restrictive signage, closing of user-created roads, and conducting annual monitoring of erosion. In addition, PG&E proposes notifying transmission managers and educating employees about sites that may be affected by vegetation management or new transmission line construction. PG&E currently implements an employee environmental and sensitivity training program and proposes to continue this program. PG&E also proposes public education of the cultural significance of the area, as well as use restriction for the protection of resources, through interpretive signage, brochures, or other similarly appropriate media. Appropriate representatives from the Pit River Tribe, the Winnemem Wintu Tribe, and the Forest Service will be asked to participate in the creation of interpretive materials.

Historic Buildings and Structures

PG&E has identified only three historic structures within the APE, all of which are located on McCloud River Club lands. As access to these lands was not available for field survey, National Register-eligibility, as well as project-related effects on these resources, is unknown; therefore, no management procedures for these resources are proposed by PG&E. The existing project facilities were constructed in 1965, and PG&E has proposed that when the project facilities reach 50 years of age (in 2015) they will be evaluated for National Register eligibility.

Traditional Cultural Properties

Upon completion of the Winnemem Wintu TCP report, and in combination with existing the Pit River TCP report (completed in September 2009), PG&E proposes that it would add an amendment to their HPMP that would address what management measures it would incorporate to protect identified TCPs.

Populations of culturally significant plants were also identified in Study Description BR-S2, *Special-Status and Special-Interest Plant, Lichen, and Fungi Species* (PG&E, 2009d). The Pit River TCP report also contains names and location information of significant plant types important to the Pit River Tribe. PG&E proposes to add an amendment to the HPMP to manage and protect these ethnobotanical resources.

Our Analysis

Archaeological Resources and National Register-eligibility

Archaeological sites along the shorelines of the project reservoirs (as well those presently inundated) are subject to project-related effects due to erosion from fluctuation in the water level, as well as accidental disturbance from recreational use and vandalism. Project-related road maintenance and use, vegetation management, and recreation all have the potential to affect these sites through direct or indirect effects. Of the archaeological sites identified by PG&E as being subject to project-related effects, one is pending consultation concerning National Register-eligibility, while the eligibility of the remaining 13 is listed as undetermined. In additional information requests, dated May 26, 2009, and August 14, 2009, the Commission expressed the need for National Register determinations to be presented in the HPMP. These National Register-eligibility determinations remain outstanding, but are necessary for compliance with section 106. Requiring PG&E to make these determinations for the 14 archaeological sites that are being affected by the project, in consultation with the California SHPO, would ensure that these 14 archaeological sites are protected.

Historic Buildings and Structures

No project facilities are over 50 years of age; therefore, PG&E did not evaluate them for National Register-eligibility. Instead, PG&E proposes to evaluate the existing project facilities when they reach 50 years of age. Waiting until existing project facilities reach 50 years of age would allow for appropriate evaluation of the structures under the National Historic Preservation Act and any project effects could them be determined based on the facilities eligibility for the National Register.

Project-related effects on the historic structures located on McCloud River Club lands cannot be determined until access is granted by the landowner. Until such a time, nothing can be done to evaluate or protect these sites.

Traditional Cultural Properties

At this time, only the TCP report for the Pit River Tribe has been completed. Upon review of the TCP report, we conclude that there is enough information to

determine that four resources (three sacred areas and one resource procurement gathering site) within the project's APE can be considered as National Register-eligible TCPs, and that nine other resources (namely resource procurement gathering fishing sites and several other habitation areas and a trail) are potentially eligible TCPs. Other important gathering areas involving culturally important plants to the Native Americans have also been identified by the Pit River Tribe and they should be recognized as significant locations and protected by PG&E.[22] PG&E proposes to include measures for the protection of culturally-sensitive plants in the Vegetation Management Plan, which is discussed in greater detail in section 3.3.3 *Terrestrial Resources*.

Providing an amendment to the HPMP, as proposed by PG&E, on the types of management measures to incorporate for the protection of TCPs, both those important to the Pit River Tribe and Winnemem Wintu, would allow any TCP sites to be protected once they have been identified.

[22] Although many significant plant collecting areas may not qualify as National Register-eligible TCPs, they still need to be protected by other statutes such as NEPA and several executive orders protecting sacred Native American areas. Along with section 106, the Commission needs to insure that PG&E takes steps to protect such resources under a new license.

Table 3-33 Site-specific potential effects for archaeological and historic-era resources. (Source: PG&E, 2009d)

Resource Number	Location	Potential Effects[a]						PG&E Proposed Management
		1	2	3	4	5	6	
ALB-5	McCloud Reservoir	X		X	X			Block vehicular access; post restrictive signage; monitor erosion annually
ALB-3 (FS 05-14-58-424)	Iron Canyon Reservoir	X	X	X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
ABL-4 (FS 05-14-58-425)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-498 (FS 05-14-58-42)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-664 (FS 05-14-58-53)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-665 (FS 05-14-58-54)	Iron Canyon Reservoir			X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage

Resource Number	Location	Potential Effects[a]						PG&E Proposed Management
		1	2	3	4	5	6	
CA-SHA-666 (FS 05-14-58-55)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-667/H (ALB-1; FS 05-14-58-56)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-668 (ALB-2; FA 05-14-58-57)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-1623 (FS 05-14-58-228)	Iron Canyon Reservoir			X	X			Post restrictive signage (with Shasta-Trinity National Forest approval)
CA-SHA-2109 (FS 05-14-58-365)	Iron Canyon Reservoir	X		X	X			Block vehicular access (with Shasta-Trinity National Forest approval); post restrictive signage; monitor erosion annually
CA-SHA-252	Pit River	X						Monitor erosion annually
ALB-6H	Pit 6 Transmission Line					X	X	Notify vegetation and transmission managers; post signage on transmission towers; employee education

Resource Number	Location	Potential Effects[a]						PG&E Proposed Management
		1	2	3	4	5	6	
ALB-7	Pit 7 Transmission Line					X	X	Notify vegetation and transmission managers; post signage on transmission towers; employee education

a.
1. Project Operations (Erosion)
2. Road Maintenance and Use
3. Dispersed Recreational Use
4. Vandalism
5. Vegetation Management
6. New Construction

Cultural Resource Management

PG&E prepared and filed a draft HPMP (dated July 2009) with its license application. Preparation of the HPMP was undertaken by PG&E in anticipation of a Programmatic Agreement (PA) to be executed between the Commission and the California SHPO, and with other concurring parties, for the management of historic properties that may be affected by a new license for the project. The HPMP is designed to avoid, reduce, or mitigate (i.e., resolve) existing or potential project-related adverse effects to historic properties within the project's APE for the term of a new license.

Although the HPMP does not include site-specific measures for TCPs, some or all of the following procedures for archaeological and historic era sites may also be applicable to the management of TCPs. Currently included in the HPMP are procedures for:

- Continued adherence to federal and state laws and regulations, as well regular communication with other agencies, the Pit River Tribe, and the Winnemem Wintu Tribe regarding the management of historic properties associated with project APEs;
- General treatment measures for O&M (including road maintenance), and the management of ethnobotanical resources;
- Avoidance, monitoring, stabilization, data recovery, curation, and other treatment measures pertaining to historic properties as well as accidental discovery of archaeological sites or human remains;
- The use of qualified Tribal Cultural Monitors during archaeological surveys, site testing, and data recovery, non-emergency construction and maintenance activities requiring ground disturbance that would create a reasonable effect to historic properties, and during long-term historic properties monitoring;
- Site-specific treatment of known archaeological and historic-era properties;
- Signage, including interpretive and display signs, as well as regulatory and warning signs;
- Closure of user-created roads to minimize or prevent artifact collection;
- Public interpretation and education of cultural resource values;
- Continuation of the cultural resource employee education program; and
- Implementation of cost-effective protection measures for historic properties in consideration of project needs, public interests, and other resource areas.
- Other protocols and procedures are also provided in the HPMP involving educating the public and PG&E staff on protecting cultural resources, inadvertent discoveries, emergency situations, curation of recovered cultural materials, activities that do not require California SHPO involvement, future

project studies, and project patrolling, monitoring of cultural resources, and general consultation.

Forest Service condition 34 specifies that within one year of license issuance, PG&E file with the Commission an HPMP that is approved by the Forest Service. According to Forest Service condition 34, the HPMP should include:

> Complete integration of CR-S1 and CR-S2 study results (including the currently incomplete CR-S2 TCP study for the Winnemem Wintu Tribe), detailed site monitoring and schedule, National Register determinations of eligibility for sites periodically inundated by reservoir fluctuations in Iron Canyon Reservoir, expected and potential effects of current or proposed project operation effects on historic properties including specific detailed mitigation for those effects, and a study/evaluation of whether there is compelling evidence for a historic archaeological and ethnographic district on the lower McCloud River within the project's expanded APE.

In response to Forest Service condition 34, PG&E alternative condition 34 proposes that PG&E would file a final HPMP within one year of license issuance and that the HPMP would include (italics represent PG&E's added modifications to the Forest Service's):

> *Complete integration of the CR-S1 and CR-S2 study results (*if the CR-S2 TCP study is not complete when the HPMP is finalized, the HPMP will be revised or amended if necessary to reflect the results of the CR-S2 when it is completed*)* and *detailed site monitoring and schedule.* The HPMP shall call for *National Register determinations of eligibility for sites periodically inundated by reservoir fluctuations in Iron Canyon* Reservoir where erosion and/or siltation have been found to potentially affect sites, and where consultation with the Commission, California SHPO, Forest Service, and tribes have determined that evaluation (which may include test excavations) is appropriate. The HPMP shall also contain a discussion of the *expected and potential effects of current or proposed project operations on historic properties, including specific detailed mitigation* measures *for effects* that have been determined by the California SHPO to be adverse. If adverse effects to sites will not be known until after the HPMP has been approved by the Commission, the HPMP shall instead contain a process for determining appropriate mitigation in the future in consultation with the SHPO, Commission, Forest Service, and Tribes. *Additionally the final HPMP* shall discuss *whether there is compelling evidence for a historic archaeological and ethnographic district on the lower McCloud River within the project expanded APE.*

Forest Service condition 34 and PG&E alternative condition 34 are very similar in regards to actions to be taken to protect cultural resources in the event of ground disturbing activities, or prior to such activities, or as a result of project operations:

Upon discovery of cultural resources on Forest Service lands that PG&E shall immediately cease work in the affected area and shall then notify the Forest Service and shall not resume work on ground disturbing activities unit it receives written approval from the Forest Service. If deemed necessary the Forest Service may require PG&E to perform recovery excavations and preservation of the discovered cultural resource—if it is an archaeological site--and associated artifacts at PG&E's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service. PG&E shall implement the Plan upon approval by the Commission. The one distinction between the Forest Service's and PG&E's discovery clause is that the Forest Service wants PG&E to account for any paleontological resources that may be discovered on Forest Service lands. PG&E alternative condition 34 disputes this by proposing that paleontological resources are not cultural and are not subject to section 106 compliance and as a result, should not be addressed in the HPMP.

Our Analysis

The draft HPMP filed by PG&E, and specified by Forest Service condition 34, contains a number of measures to manage and protect historic properties. The avoidance strategies, public and employee training proposals, signage plans, transportation plans, monitoring, and consultation proposals are all measures that would ensure cultural resources and historic properties within the project's APE are protected and maintained throughout the term of any license issued for the project. Very little difference exists between Forest Service condition 34 and PG&E alternative condition 34, other than PG&E adding some additional language clarifying that: (1) if a TCP report from the Winnemem Wintu is completed after a final HPMP is filed, then the final HPMP will need to be amended; (2) National Register eligibilities will be applied to sites periodically inundated that are being affected by project-related effects; (3) and that mitigation measures will be applied to those affected sites after the California SHPO has determined that those project-related affects are adverse, and that such measures may need to be addresses after a final HPMP has been submitted to the Commission; and (4) determining a historic district involving archaeological and ethnographic sites will be done if there is compelling evidence to support such a historic district.

Forest Service condition 34 also specifies that the HPMP should include the process detailing the measures to be taken in the event of discovery of cultural resources on NFS lands. Setting forth this process within the HPMP would further complete the cultural resource record and ensure newly discovered sites on NFS lands are properly identified and any effects are mitigated.

PG&E's draft HPMP does not include any details regarding the handling of newly discovered paleontological resources. While section 106 includes no provisions for protecting paleontological resources, due to the recent paleontological law enacted by

Congress in March 2009 that requires all federal land managers to manage and protect paleontological resources discovered on their lands,[23] the protection of such resources should be considered and the HPMP would be an appropriate document in which to reference the protection of such resources, as they are similar in nature to archaeological resources.

Prior to license issuance, the Commission will issue a PA to be executed between the Commission and the California SHPO. The PA will require PG&E to implement the HPMP, along with any required modifications, and include a dispute resolution clause and request for the Forest Service, Pit River Tribe, and Winnemem Wintu Tribe to be concurring parties. The final PA will be incorporated into any new license by reference. Execution of the PA and implementation of the HPMP, as proposed by PG&E and specified by Forest Service condition 34, would ensure that adverse effects of the project on cultural resources would be appropriately mitigated. We analyze the costs of measures proposed or recommended for cultural resources in section 4.0, *Developmental Analysis*, and make our final recommendations in section 5.0, *Comprehensive Development and Recommended Alternative*.

3.3.7 Land Use and Aesthetic Resources

3.3.7.1 Affected Environment

Land Use Resources

The existing project features are entirely located in Shasta County near the communities of McCloud, Hillcrest, Big Bend, and Montgomery Creek. The proposed McCloud transmission line route is partially located within Siskiyou County. The existing project boundary, which includes portions of the McCloud River and Pit River watersheds, encompasses 3,707.6 acres of land. Of the lands within the project boundary, 1,239.4 acres are owned by PG&E, 1,621.9 acres are federally owned lands administered by the Forest Service, 29.5 acres are federally owned lands administered by BLM, and the remaining 816.8 acres are privately owned (PG&E, 2009a).

The project boundary around McCloud reservoir is described by a metes and bounds survey that generally follows a contour line about 200 ft above the high water line of the reservoir. The project boundary also encompasses: (1) McCloud dam, spillway and outlet; (2) the project road to the base of the dam; (3) the project road between

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[23] See Omnibus Public Land Management Act (OPLMA) of 2009, Public Law 111-011. P.L. 111-011, Title VI, Subtitle D on Paleontological Resources Preservation (OPLMA-PRP) (123 Stat. 1172; 16 U.S.C. 470aaa). This statute requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The OPLMA-PRP includes specific provisions addressing management of these resources by the BLM, Park Service, Bureau of Reclamation, FWS, and Forest Service.

McCloud dam and Star City Creek; (4) the existing Tarantula Gulch day-use area and boat launch; and (5) all proposed recreation developments at McCloud reservoir. A 100-ft-wide corridor for McCloud tunnel extends southeast for about 7.2 miles between McCloud and Iron Canyon reservoirs. Where the tunnel crosses Hawkins Creek, there is also a 100-ft-wide corridor for the project access road that is about 0.25 mile long (PG&E, 2009b).

The project boundary around Iron Canyon reservoir also is described by a metes and bounds survey and generally follows a contour line about 100 to 200 ft above the high water line of the reservoir, and in some places extends beyond this distance to include the existing recreation facilities. The project boundary also encompasses: (1) Iron Canyon dam, spillway, and outlet; (2) stream gage MC-10 (including the project access road); (3) the existing Hawkins Landing day-use area and boat launch (including a 40-ft-wide corridor for the access road); (4) the existing Deadlun Campground; and (5) areas where recreation developments at Iron Canyon reservoir are proposed. A 100-ft-wide corridor for Iron Canyon tunnel extends from near the dam to about 2.9 miles south where the tunnel joins James B. Black penstock. There is a 300-ft-wide corridor along the 1,194-ft-long James B. Black penstock that enters James B. Black powerhouse. At James B. Black powerhouse, the project boundary encompasses the: (1) powerhouse; (2) switchyard; (3) 0.5-mile-long Black Tap transmission line from James B. Black powerhouse to Pit 5 switchyard; and (4) beginning of the 40-ft-wide corridor for the 12-kV distribution line that extends to Iron Canyon reservoir. Oak Mountain Road (FR 37N34), a project road between Pit 5 bridge and FR 38N11, has a 100-ft-wide corridor with a few 66-ft-wide segments (PG&E, 2009b).

Downstream of James B. Black powerhouse, the project boundary encompasses Pit 6 reservoir. The boundary is described by a metes and bounds survey that generally follows a contour 100 to 200 ft above the high water line of the reservoir. At the downstream end of the reservoir, the project boundary widens to include the Pit 6 dam, powerhouse, and switchyard. The 100-ft-wide corridor for the Pit 6 transmission line begins at Pit 6 switchyard and extends about 3.3 miles to the east where it terminates at a non-project transmission line. Pit 6 Road, a project road, has a 100-ft-wide corridor and extends from the powerhouse to Big Bend Road. Downstream of Pit 6 dam, the project boundary encompasses Pit 7 reservoir, Pit 7 dam, Pit 7 powerhouse, Pit 7 afterbay dam, and Pit 7 afterbay. The boundary is described by a metes and bound survey that generally follows a contour 100 to 200 ft above the high water line of the impoundments. At its most downstream point, the project boundary crosses the Pit River just upstream of Fenders Ferry Bridge and widens to include the recreation area at Fenders Flat. The 100-ft-wide corridor for the Pit 7 transmission line begins at Pit 7 switchyard and extends about 3.5 miles to the east where it terminates at a non-project transmission line. Pit 7 Road, a project road, has a 100-ft-wide corridor and extends from Pit 7 powerhouse to Fenders Ferry Road (PG&E, 2009b).

The proposed McCloud powerhouse would be constructed within the existing project boundary at McCloud dam. Beginning at the proposed powerhouse at the base of

the dam, PG&E proposes to construct the McCloud transmission line within a 25-ft-wide corridor that follows the right-of-way of FR 38N11 north to State Highway 89 where it travels east then north, ending at the Pacific Power and Light switchyard in the town of McCloud. The transmission line corridor is about 14 miles long. The proposed Pit 7 afterbay powerhouse would be constructed within the existing project boundary at Pit 7 afterbay dam. A new project road would be constructed just west of Fenders Ferry Bridge within a proposed 40-ft-wide corridor. Beginning at the dam, PG&E proposes to construct Pit 7 afterbay transmission line within a 40-ft-wide corridor that crosses the Pit River near Fenders Flat recreation site and then generally follows Pit 7 Road to Pit 7 switchyard. The proposed project boundary includes the area necessary for proposed recreation development associated with the generation addition (PG&E, 2009b).

No large-scale industrial or commercial developments are located in the project vicinity. PG&E's land use in the project area primarily consists of structures and activities associated with its hydroelectric facilities. The Commission's standard land use article (license article 56) regulates land use activities within the project boundary. Land management planning documents that pertain to land use activities in the area surrounding the project include the Shasta County general plan (County of Shasta, 2005 as cited in PG&E, 2009a); the Shasta-Trinity National Forest LRMP, as amended (Shasta-Trinity National Forest, 1995 as cited in PG&E, 2009a); BLM's resource management plan (BLM, 1993 as cited in PG&E, 2009a); and the McCloud River CRMP (Bollibokka Land Company et al., 2001 as cited in PG&E, 2009a). For the proposed McCloud transmission line, land use activities would be reviewed for consistency with the Siskiyou County general plan (County of Siskiyou, 1993, 1980 as cited in PG&E, 2009a). In addition, Shasta County boating ordinances prohibit: (1) boating within 500 ft of project dams, (2) operating a motorboat at a speed in excess of 5 miles per hour upstream from the road bridge at the north end of the McCloud River arm of McCloud reservoir, and (3) swimming within 200 ft of any boat launching ramp or dock open to the public. Summaries of each of these plans are provided below.

Shasta County General Plan and Zoning Ordinance

Shasta County regulates private land uses in accordance with the Shasta County general plan (adopted in 1984) and the Shasta County Zoning Ordinance (title 17 of the Shasta County Code, as amended through July 2003). The Shasta County general plan is a tool to guide long-term development planning decisions for public and privately owned lands in Shasta County. The plan is delineated into three core subject areas: public safety, resources, and community development. A majority of the privately owned lands in the project vicinity are designated "Timberland." A few small parcels designated as "Natural Resource-Open Space" are scattered around the project area with private lands adjacent to Iron Canyon reservoir being the most notable. Regarding the timberland designation, the Shasta County general plan notes the following:

> While the Shasta County general plan provides the overall development goals for the County, title 17 of the Shasta County Code defines the various zoning districts

within the County, as well as identifying the primary and permitted uses within each zoning district. The County has not yet adopted a zoning map for the areas in the project vicinity. They are considered "Unclassified" and are part of the Special Zone District.

Shasta Trinity National Forest Land and Resource Management Plan

The project area lies within the Shasta-McCloud Management Unit of the Shasta-Trinity National Forest. Land use policies and standards for this national forest are guided by Shasta-Trinity National Forest's LRMP (Shasta-Trinity National Forest, 1995 as cited in PG&E, 2009a). The LRMP contains details regarding Late Successional Reserves (LSRs) that are based on the "Record of Decision on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl" (ROD). The LSRs are intended to provide old-growth forest habitat for populations of species that depend on late successional forests and conserve late-successional species diversity. NFS lands near Iron Canyon reservoir are designated as LSR. NFS lands near the Pit River are designated as "Limited Roaded Motorized Recreation." A small area adjacent to the northwestern portion of the upper Pit 6 reservoir is designated as "Threatened Species – Eagles" (PG&E, 2009a).

BLM Resource Management Plan

The BLM administers three parcels of land near the Pit River between the James B. Black powerhouse and Pit 7 dam. Two of these parcels are in the project area and the third is nearby. About 29 acres of the project area occupy BLM land. BLM lands in the project vicinity fall within BLM's Redding Resource Area, which encompasses about 247,500 acres of public land within Butte, Shasta, Siskiyou, Tehama, and Trinity Counties (BLM, 1993 as cited in PG&E, 2009a). The 1993 Redding resource management plan (RRMP) divides the resource area into seven management units, and the project is located in the Ishi Management Unit. BLM lands in the project vicinity are located within the "Remainder of the Management Area sub-area," and consist of "scattered BLM lands."

The RRMP indicates that BLM does not propose to retain these parcels over the long-term and may exchange or sell them in accordance with federal laws. In the interim, BLM manages the land on a custodial basis. Examples of custodial management include protecting human health and safety (law enforcement, cleaning up illegally dumped waste, vegetation management to abate wildfire danger). Additionally, rights-of-way, permits, and other authorizations may be granted as appropriate (PG&E, 2009a).

The McCloud River Consolidated Resource Management Plan

The McCloud River consolidated resource management plan (Bollibokka Land Company et al., 2001 as cited in PG&E, 2009a) was adopted on July 23, 1991, for the purposes of assisting in the coordination of land and resource management activities between private landowners and federal, state, and local agencies that have jurisdiction in the area. The primary objective of the plan is to improve the management of the area's

resources to allow for multiple uses while simultaneously protecting the natural environment and private property rights. Signatories to the plan include the Shasta-Trinity National Forest, Bollibokka Land Company, Crane Mills, McCloud Fly Fishing Club, Sierra Pacific Industries, California Fish and Game, The Hearst Corporation, The Nature Conservancy, California Trout, and PG&E. The plan outlines the ecological, economic, social, and cultural considerations that must be factored into land use and development decisions through coordinated planning efforts. With respect to project operations, the plan states:

> The operation of McCloud reservoir dam has direct influence on the McCloud River Basin. Any changes in the operation of the dam will be a subject for study by the CRMP coordinating group.

Current land use activities are consistent with the existing plans and ordinances for the project area. Issues identified by neighboring landowners were related to recreation use effects on private lands, including public trespassing, privacy, risks associated with wildland fire, and natural resource protection (PG&E, 2009a).

Public Safety and Law Enforcement

The Shasta County Sheriff and the Forest Service are responsible for public safety and law enforcement on lands in the project area. All existing project lands are within the jurisdiction of the Shasta County Sheriff. The Forest Service law enforcement officials from the McCloud Ranger District are responsible for McCloud reservoir, and officials at the Forest Service Shasta Lake Ranger District are responsible for Iron Canyon reservoir and the Pit River side of the project.

Project Roads

Within the project vicinity, 21 road segments, about 54 miles, are used by PG&E or recreationists to access project facilities or project recreation opportunities. Based on the results of traffic count records, 14 of the 21 road segments are either project roads (defined by the Commission as roads used primarily for project purposes) or roads used to access project recreation areas (table 3-34). The majority of these segments are gravel- or dirt-surfaced roads. The other six roads are paved with asphalt, concrete, or bituminous surfaces, or they contain portions of both paved and unpaved segments. A road condition inventory performed on these sections indicates that most of the roads are maintained to the maintenance level definition for vehicular travel (PG&E, 2009a)[24].

In general, PG&E maintains project-related roads in accordance with easements and use agreements between PG&E, Forest Service, or the private land owner. Road

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[24] In a study plan determination letter dated October 3, 2008, the Commission determined, based on information contained in technical memo 22, submitted as part of the license application, that FR 38N11 (segments 1 and 2) and FR 38N53 do not meet the Commission's criteria for project roads used primarily for project purposes.

surfaces were qualitatively characterized using good, fair, and poor ratings to describe the overall condition for vehicular travel. These condition assessments also considered the Forest Service management objective for the particular segment. Of the 14 segments in table 3-34, eight were in fair condition, three were in poor condition, one was in fair/poor condition, and two were characterized as having multiple conditions depending on the segment. None of the roads were impassable for normal passenger vehicles; however, fewer of these types of vehicles were observed except on the paved roads surrounding McCloud reservoir and Iron Canyon reservoir. Road segments designated as being in poor condition exhibited generally passable conditions; however, localized damage to the road, such as a series of potholes or washboard conditions, warranted the poor rating. Vehicles can access project reservoirs or features for most of the year, but road closures due to snow periodically preclude access during the winter months. However, PG&E maintains Oak Mountain Road so that it is free of snow to access project facilities at Iron Canyon dam (PG&E, 2009a).

Table 3-34. Project roads.

Road Number	Name	Start	End	Length (mi)	Maintenance Responsibility	Surface Type	Comments
38N81	Brown Trout	38N11	Boat Ramp	0.3	Shared	Asphalt Concrete	Tarantula Gulch-road access to boat ramp recreation site
38N04Y	Star City	38N11	Bridge	5	Shared	Native	Access to intake; access for recreation on shoreline
U38N11X	Dam Road	38N11	Base of McCloud Dam	0.26	Licensee	Native	Road to base of McCloud dam
37N78	Iron Canyon Loop	38N11	Iron Canyon Dam	0.7 (estimated)	Forest Service	Bituminous Aggregate Native	Road around Iron Canyon reservoir-access to Iron Canyon dam and structures, recreational access to shoreline areas
37N27Y	Deadlun Creek Campground	37N78	Campground	0.34	Forest Service	Native	Access to campground − project recreation feature
37N66Y	Hawkins Landing	38N11	Ramp	0.56	Licensee	Native	Access to campground and boat ramp − project recreation feature
37N78A	MC-10 Gage Road	37N78	NEW Sec. 28	0.28	Licensee	Native	Road to MC-10 stream gage

Road Number	Name	Start	End	Length (mi)	Maintenance Responsibility	Surface Type	Comments
37N34	Oak Mountain 12-kV line	38N11	Pit 5 Bridge	7.71	Licensee	Native	Access to pipeline, 12-kV powerline
37N93	Ridge Iron Canyon	Junction with 37N93A & C	Oak Mountain Road	0.3	Licensee	Native	To pipeline off Oak Mountain Road
37N93A	Ridge	37N93	SESE Section 28	0.6	Licensee	Native	Off Oak Mountain Road
37N33C	Willow	37N93	SESE Section 28	0.5	Licensee	Native	Off Oak Mountain Road
	Pit 6 Powerhouse Road	Cove Road	Pit 6 Powerhouse	6.0	Licensee	Asphalt Concrete	Road to Pit 6 Powerhouse
35N23	Pit 7	34N17	Pit 7 Dam and Powerhouse	1.79	Licensee	Asphalt Concrete	Road to Pit 7 Dam and Powerhouse
35N66	Fenders Flat	35N23	Afterbay Dam	0.57	Licensee	Native	Road to Pit 7 Afterbay

Recreational OHV use is an activity that occurs within the project area, and although it is not concentrated on project roads, the activity results in road and resource damage not typically identified as part of traditional road inventories. OHV use is concentrated at Iron Canyon reservoir resulting in dispersed shoreline access, as well as concentrated uses within and adjacent to the Hawkins Landing and Deadlun campgrounds. OHV use is also popular with visitors to Fenders Flat near the Pit 7 afterbay. Multiple user-created OHV roads exist in these areas, including roads from campsites to the Iron Canyon reservoir shoreline, roads along the shoreline, and roads from FR 35N66 to project lands near the Pit 7 afterbay, which are not open to public use (PG&E, 2009a).

Fire Events and Existing Wildland Fire Prevention Measures

The project is situated in a fairly remote and sparsely populated area of the state, which has vast natural forest resources prone to dramatic fire events with the potential (under certain conditions) for tremendous amounts of destruction. Fire suppression is a shared responsibility between the Forest Service, state of California, and the county. Fire stations and fire suppression equipment is generally housed near populated areas with concentrations of fire-fighting equipment in Redding, McCloud, Burney, and Big Bend, all located at a considerable distance from the project area with notably long travel times. Between 1960 and 2007, four wildland fires either occurred or spread to within 1 mile of the project area, but no fires were reported within the project boundary and these fires did not threaten any project structures (PG&E, 2009a).

The measures taken by PG&E to reduce fire risk at project features under the existing license include actively maintaining vegetation in proximity to project features (e.g., transmission lines) and keeping hand tools (e.g., shovels, mattocks, McLeods) available to suppress fires. Certain laws and regulations[25] also prescribe how PG&E must manage vegetation associated with the project transmission lines.

In addition to existing license requirements, the Forest Service-issued special use permits for the construction of the road and campground at Hawkins Landing and Deadlun areas require PG&E to keep tools for fire suppression onsite or readily available, including shovels, picks, pulaskis, McLeods, and mattocks. In addition to the tools, equipment and vehicles will have spark arrestors to prevent the unintended ignition of fires due to sparks from work requirements (PG&E, 2009a).

Aesthetic Resources

Area around McCloud Reservoir

McCloud reservoir is located in Northern California situated within the forested mountain terrain of the western slope of the Cascade Range just south of Mount Shasta.

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[25] These laws and regulations include Public Resource Code sections 4292 and 4293, General Order 95 Rule 35, and NERC standard FAC-003-1.

The landscape character consists of evergreen forested mountain slopes in a remote, scenic setting. The visual character of the area around McCloud reservoir consists of a narrow, winding reservoir surrounded by steep forested hillsides. FR 11, a paved road, traverses the shoreline of the southern half of the reservoir, providing the public with views dominated by the blue water of the reservoir and surrounding evergreen forest. The northern end of the reservoir is private land with no public road access. FR 11 sits on a bank cut out of the steep hill slopes and follows the contours around the shoreline. Vegetation and topography often obstruct views of the reservoir. Conversely, the public can view the project area from the reservoir surface. The natural landscape dominates the views throughout the area, with human-made facilities limited to the earth-filled McCloud dam, the Tarantula Gulch boat ramp recreation area, the McCloud tunnel intake, and public and private roads. Minimum flow releases to the Lower McCloud River are made at the base of McCloud dam from a Howell-Bunger valve that sprays water about 100 ft away from the outlet into a pool at the base of McCloud dam, where it enters the river. The visual resources associated with the area around McCloud reservoir are captured in photographs from key observation points (KOPs) and presented in volume III, TM-57, *Aesthetic Resources Assessment* (PG&E, 2009a).

Area around Iron Canyon Reservoir

Iron Canyon reservoir is situated at the confluence of five small creek tributaries, creating a relatively shallow, five-fingered-shaped reservoir with waters extending into the narrow coves created by the stream channels. Dense evergreen forests, which cover the surrounding hill slopes, obscure most views of the reservoir from nearby roads; however, some open views of the water occur. Below the high-water mark, slopes are moderate and characterized by exposed (unvegetated or sparsely vegetated) soils, as expected with a storage reservoir. Open landscape-scale views are provided at both developed and dispersed recreation areas located around the perimeter of the reservoir, from the dam, and from the water surface. The visual resources of the area around Iron Canyon reservoir are captured in photographs of KOPs and presented in volume III, TM-57, *Aesthetic Resources Assessment* (PG&E, 2009a).

Pit River (James B. Black Powerhouse, Pit 6 and Pit 7 Reservoirs, and Pit 7 Afterbay)

James B. Black powerhouse is located on the north bank of the Pit River less than 3 miles downstream from the town of Big Bend, California. Views of the powerhouse are possible from points along the Pit River in proximity to the powerhouse, as well as from a small portion of Oak Mountain Road, a Forest Service road that provides access between Iron Canyon reservoir, the Pit River and James B. Black powerhouse. Vegetation and topography screen views of the powerhouse from any considerable distance. Transmission lines leaving the powerhouse and the penstock that supplies water to the powerhouse are visible from nearby locations.

Pit 6 reservoir is long, narrow, and confined within the walls of the Pit River Canyon, which is at most 500 ft wide. Views of the reservoir are limited to locations

along the top of Pit 6 dam. The reservoir can only be accessed by foot from the dam, or potentially by boat from the Pit River, but to protect the public, PG&E discourages such boat access. Dense tree cover and steep topography preclude views of the reservoir from other locations, and the lack of public access limits viewing opportunities. The Pit 6 dam and powerhouse are visible from points along the last mile or so of Pit 6 Road as it descends into the Pit River Canyon.

Pit 7 reservoir is similar to Pit 6 reservoir in that it is long, narrow, and confined within the walls of the Pit River Canyon with dense vegetation and steep topography obscuring the reservoir from view. Views of Pit 7 reservoir from publicly accessible land are very limited and only available from the Pit 6 Road and the area around Pit 6 dam or along the section of Pit 7 Road that is open to foot travel beyond a locked gate. The Pit 7 afterbay, the most visible water feature within the Pit River portion of the project, is visible from Fenders Ferry Road (FR 34N17) where it crosses the Pit River arm of Shasta Lake and from the car-top boat launch area at Fenders Ferry. Uplands surrounding the river are heavily forested with evergreen oak woodland and pine vegetation. From the bridge, the rock-filled afterbay dam is visible in the mid-ground of the landscape. Flows from Pit 7 reservoir are regulated with the V-notch weir in Pit 7 afterbay dam. Water flowing out of the afterbay appears riverine as water flows through the weir when Shasta Lake levels are low. When Shasta Lake is at full pool, the reservoir overtops the dam, changing the character of the area to one of flat water as opposed to a flowing river. Security fencing, signs, and safety chains that warn visitors about the danger associated with the Pit 7 afterbay dam are visible.

Photos of visual resources associated with components of the project infrastructure located in the Pit River drainage, including James B. Black powerhouse, Pit 6 reservoir, Pit 7 reservoir, and Pit 7 afterbay, are captured in photographs of KOPs and presented in volume III, TM-57 (PG&E, 2009a).

Forest Service Visual Quality Objectives

The Shasta-Trinity National Forest LRMP (Shasta-Trinity National Forest, 1995 as cited in PG&E, 2009a) provides preferred VQOs for lands within the Shasta-Trinity National Forest boundary. VQOs for project lands within the Shasta-Trinity National Forest are classified as either Retention or Partial Retention. Retention VQOs promote landscapes that, when viewed by the public, have an intact natural or natural-looking character. Human-made alterations to these landscapes should not create changes in form, color, or texture from those naturally occurring in the viewshed. Partial Retention VQOs allow for more alteration of the landscape, but new forms, colors, or textures added to the landscape should be dominated and subdued by the natural character of the area (PG&E, 2009a). Table 3-35 summarizes the VQO designations by general project area.

Table 3-35. Summary of Shasta-Trinity National Forest VQO classifications and guidelines for National Forest System lands within the project area or influenced by project operations. (Source: PG&E, 2009a)

National Forest System Lands Surrounding	VQO Designation
McCloud reservoir	Retention
Spoil piles and tunnel crossing	Partial Retention
Iron Canyon reservoir	Retention
James B. Black penstock	Retention and Partial Retention for the Willow Creek siphon and surge chamber
Pit 6 and Pit 7 reservoirs	Retention
Pit 7 afterbay	Retention

3.3.7.2 Environmental Effects

Land Use Resources

Road and Transportation Facilities Management Plan

Some of the roads used by PG&E to access project facilities are Forest Service roads or roads owned by The Hearst Corporation. While some of these roads are used primarily for project purposes, others are not. Roads in the project vicinity may be used by the Forest Service for land management or by the public for recreation unrelated to the project.

PG&E proposes to prepare a road and transportation facilities management plan for the 14 road segments listed in table 3-34 within one year of license issuance. The plan would include, among other things, a road inventory and condition assessment, maps, a discussion of soil protection and erosion control measures, and a traffic safety plan. The plan would incorporate Forest Service standards for design, construction, operation, and maintenance and would be approved by the Forest Service. Upon Commission approval, PG&E would implement the plan and actions specified therein.

Forest Service condition 29 specifies that PG&E file with the Commission, within one year of license issuance, a road and transportation facility management plan, approved by the Forest Service, for protection and maintenance of project and project-affected roads that are on or affect NFS lands. The Forest Service proposes to include three additional road segments in the plan, not covered by PG&E's proposed measure: FR 38N11 (Hawkins Creek segments 1 and 2) and FR 38N53 (Ah-Di-Na). The Forest Service specifies that the plan should address: planning and inventory; operation, maintenance, and road-associated debris; construction and reconstruction; monitoring; general road use; and road use by government. PG&E should take appropriate measures to meet Forest Service maintenance level, traffic service level, and road management

objectives (RMOs). PG&E should consult with the Forest Service and other affected parties in the development of this plan. Upon Commission approval, PG&E should implement the plan and actions specified therein.

Forest Service condition 29 also specifies that PG&E develop a memorandum of understanding (MOU) with the Forest Service and other affected parties to address shared road management responsibilities (e.g., costs, public safety needs, resource protection, and erosion control mitigations). Upon Commission approval, PG&E should implement the MOU.

PG&E alternative condition 29 proposes revisions to subheadings to remove ambiguous wording that could lead to differences of opinion as to which roads are covered by Forest Service condition 29. PG&E alternative condition 29 proposes clarifications to which road segments would be covered by the plan and which road segments would be included in a separate MOU with the Forest Service.[26] PG&E disagrees with the Forest Service's designation of FR 38N11 (segment 1) and FR 37N78 (Iron Canyon Loop Road) as project roads for which PG&E would be responsible under the license. PG&E's alternative revises the extent of FR 38N11 based on an understanding that its responsibility for shared maintenance of FR 38N11 terminates on the west side of Kosk Creek Bridge. Further, PG&E does not agree that FR 35N93 and FR 35N46 should be included in the MOU.

PG&E alternative condition 29 revises the text to add language to clarify the road reconstruction implementation schedule. PG&E alternative condition 29 also revises Forest Service condition 29 condition by proposal to remove references to bridges and road spoil piles because none of these features associated with the project are located on NFS lands or could directly affect NFS lands.

The Hearst Corporation owns certain roads within the project area and has existing construction and easement agreements with PG&E and the Forest Service for maintenance and use of these roads. While The Hearst Corporation supports the idea of an MOU, it does not support the Forest Service's proposed expansion of the project boundary.

Our Analysis

PG&E is responsible for the maintenance of all project roads within the project boundary (table 3-34). Consistent with the Commission's October 3, 2008, study plan determination letter and based on information contained in technical memo 22, submitted as part of PG&E's license application, FR 38N11 (segments 1 and 2) and FR 38N53 do not meet the Commission's criteria for project roads used primarily for project purposes.

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[26] PG&E proposes to provide for its commensurate share of responsibility for maintenance of certain non-project roads through an MOU with the Forest Service.

A road and transportation facilities management plan would establish a forum for coordination of road maintenance activities among PG&E, the Forest Service, and other affected parties, such as The Hearst Corporation. A plan would help to clarify and memorialize PG&E's road management responsibilities within the project boundary. Specifically, the plan would address operations, maintenance, construction and reconstruction, monitoring, and road use. The development and implementation of a road and transportation facilities management plan would improve road management and ensure public access to project lands and waters and the adequate protection of natural and environmental resources in the project area.

A separate MOU with the Forest Service and other affected parties would address shared road (non-project) management responsibilities; specifically, proportionate road share costs, public safety needs, resource protection, and erosion control mitigations. However, roads located outside of the project boundary are not subject to Commission jurisdiction or the terms and conditions of the project license, and therefore are also outside the scope of 4(e) conditions.

Fire Prevention and Response Plan

Steep topography, heavy vegetation, land use, and limited access make the project area susceptible to wildfires. For these same reasons, fire fighting near the project is challenging and there exists the potential for small fires to grow into large and very destructive fires. The threat and potential damage from wildfires in the project area would remain an issue under a new project license.

PG&E proposes to prepare a fire prevention and response plan in consultation with the Forest Service, California Department of Forestry and Fire Protection, and Big Bend Volunteer Fire Department within one year after license issuance. At a minimum the plan would address fuels treatment/vegetation management; fire prevention and control; emergency response preparedness; and reporting requirements. Additionally, the plan would ensure that fire prevention measures meet water quality BMPs. Upon Commission approval, PG&E would implement the plan.

Forest Service condition 33 specifies that PG&E develop a fire and fuels plan in consultation with the Forest Service and appropriate state and local fire agencies and file the plan with the Commission within one year of license issuance. The specified components of this plan would include fuels treatment; fire prevention and response; emergency response preparedness; and reporting. Additionally, the Forest Service specifies that PG&E would cooperate fully with the Forest Service on all fire investigations and would produce upon request all materials and witnesses not subject to the attorney-client or attorney work product privileges, over which PG&E has control, related to the fire and its investigation.

Forest Service condition 33 also specifies that PG&E would preserve all physical evidence, and give custody to the Forest Service of all physical evidence requested. Similarly, the Forest Service would provide PG&E with reasonable access to the physical

evidence and documents PG&E needs to defend any and all claims, which may arise from a fire resulting from project operations, to the extent such access is not precluded by ongoing criminal or civil litigation.

PG&E alternative condition 33 proposes a few minor revisions intended to improve comprehension, but does not materially change Forest Service condition 33.

Our Analysis

The development and implementation of a fire prevention and response plan in consultation with the Forest Service, the California Department of Forestry and Fire Protection, the Big Bend Volunteer Fire Department, and others, as appropriate, that incorporates both the measures proposed by PG&E and specified by the Forest Service would improve planning, management, and coordination of wildfire protection and prevention measures, as well as lead to a reduction in the occurrence and suppression of wildfires in the project area.

Hazardous Substance Management Plan

Forest Service condition 28 specifies that PG&E will file, for Commission approval, a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup. The plan would be filed within one year of license issuance, and at least 60 days before the initiation of any activities that the Forest Service determines to be of a land-disturbing nature on NFS lands. At a minimum, the plan would require PG&E to:

- Maintain in the project area, a cache of spill cleanup equipment suitable to contain any spill from the project;
- Periodically inform the Forest Service of the location of the spill cleanup equipment on NFS lands and the location, type, and quantity of oil and hazardous substances stored in the project area; and
- Inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affecting NFS lands.

PG&E alternative condition 28 proposes to provide the Forest Service copies of PG&E's existing SPCC plans and HMBPs for the project.

Our Analysis

To meet the regulatory requirements for handling, storage, and emergency response related to hazardous materials, PG&E has SPCC plans and HMBPs in place. The content of these existing plans includes the information specified in Forest Service condition 28, and both plans must be reviewed or updated, as necessary, every three years. Consequently, there is no need for PG&E to develop an additional plan. The provision of copies of the existing SPCC plan and HMBP to the Commission and the Forest Service within 30 days of license issuance and the continued implementation of

these plans would ensure that spills of hazardous substances are promptly contained and cleaned up to avoid/minimize the potential extent of adverse environmental effects.

Project Boundary

While the proposed McCloud powerhouse and Pit 7 afterbay dam would be constructed within the existing project boundary at McCloud dam and Pit 7 afterbay dam, respectively, the proposed new transmission line corridors associated with the new powerhouses and certain proposed new recreation facilities would be constructed outside of the existing project boundary. PG&E proposes to include the existing access road to Hawkins Landing Campground and boat ramp, the Fenders Flat recreation site (both are existing project recreation facilities), and lands necessary for the proposed generation additions within the project boundary.

The Forest Service recommends under 10(a) that the following project-related facilities, not currently included within the project boundary, be added to the project boundary. Specific sites include:

- Segment 1 of FR 38N11 (Hawkins Creek Road);
- FR 37N78 around Iron Canyon reservoir;
- The area between the McCloud reservoir high waterline (elevation 2,680 ft msl) and the outside right-of-way of FR 38N11 (Hawkins Creek, segment 1), and FR 38N04Y (Star City Road); and
- All new project recreational facilities.

The Hearst Corporation does not support the proposed expansion of the project boundary to the outside edge of the road system.

Our Analysis

As discussed previously, the Commission has determined that FR 38N11 (Hawkins Creek segments 1 and 2) does not meet the Commission's criteria for project roads used primarily for project purposes and should not be included in the project boundary. A 0.7-mile (estimated) portion of FR 37N78 (Iron Canyon Loop) is necessary to access project infrastructure and therefore meets the Commission's criteria for project roads. Oak Mountain Road (FR 37N34), a designated project road, provides access to project infrastructure at Iron Canyon reservoir; therefore, the entire length of FR 37N78 (Iron Canyon Loop) is not necessary for access to project infrastructure. Additionally, FR 37N78 (Iron Canyon Loop) provides access for non-project users and private landowners.

The Forest Service's rationale for including the area between the full pool reservoir elevation of McCloud reservoir and the outside right-of-way of FR 38N11 and FR 38N04Y in the project boundary is to ensure that all new project recreation sites and the parking areas and access roads that serve them are included within the project boundary. The Forest Service also recommends that all new project recreational facilities

be included within the project boundary. Since the Commission will have responsibility to ensure compliance at the project's existing and proposed recreation areas, these areas must be included within the project boundary and be within the Commission's jurisdiction. By requiring PG&E to include all project recreation sites (existing and proposed) within the project boundary, the Commission would have the authority to ensure that PG&E maintains adequate and safe public access to project lands and waters for recreational purposes.

In section 2.3, *Staff Alternative*, staff proposes to modify the Forest Service's recommendation to require PG&E to include all existing (at license issuance) project roads and recreation sites and facilities within the project boundary and to file a revised exhibit G within one year of license issuance. Staff also recommends PG&E file a revised exhibit G with the Commission subsequent to completing construction of new project generating and transmission facilities or recreation sites and facilities, which shall also be included within the project boundary. The staff proposed modification would not require PG&E to include segment 1 of FR 38N11 (Hawkins Creek) and FR 37N78 (Iron Canyon Loop), with the exception of a 0.7-mile segment, in the project boundary. Staff's proposal to require PG&E to include all new recreation sites and facilities within the project boundary and to file a revised exhibit E would include the area between McCloud reservoir and FR 38N11 and FR 38N04Y if PG&E constructs new recreational facilities in this area.

Aesthetic Resources

Visual Quality Management Plan

Forest Service condition 32 specifies that PG&E develop, for Forest Service approval and filing with the Commission, procedures or a timeline to ensure implementation of certain mitigation measures to provide for visual quality of project and project-related NFS lands. These mitigation measures would include, but not be limited to, painting or reconstructing project facilities with natural looking materials and colors, planting vegetation to screen project facilities; maintaining reservoir elevations during the peak recreation season; developing an education plan and providing interpretive information; and disposing of debris piles.

PG&E alternative condition 32 proposes to define the applicability of Forest Service condition 32 to existing and proposed project facilities (i.e., generation additions) and clarifies certain terminology. PG&E alternative condition 32 also accounts for an apparent inconsistency between the assigned VQO and the appearance of the area, including existing project facilities. The existing Iron Canyon, Pit 6 and 7 dams, roads, intakes, penstocks, transmission lines, and recreational facilities are not inconsistent with the Retention VQO because these project facilities predated the Forest Service establishment of VQOs for this area. Further, PG&E alternative condition 32 removes text from Forest Service condition 32 that requires modification of existing project facilities for visual quality purposes because studies conducted during relicensing did not identify any needed modifications. PG&E alternative condition 32 appropriately

proposes provisions for visual screening, painting, and other necessary mitigation measures for any new project facilities. PG&E alternative condition 32 also reflects PG&E's willingness to apply mitigation measures to attempt to meet VQOs when existing project facilities are modified. Finally, PG&E alternative condition 32 limits future mitigation to any new spoil or debris piles created by the project (i.e., mitigation for existing piles would not be required).

In section 2.3, *Staff Alternative*, staff proposes to modify the Forest Service's recommendation to require PG&E to develop a visual quality management plan, in consultation with the Forest Service and others, as appropriate, to protect the visual quality of lands in the project area within one year of license issuance. At a minimum this plan should address the impact of any proposed project facilities, including but not limited to generating facilities, recreation sites and facilities, and spoil piles, on the aesthetics in the project area.

The development and implementation of a visual quality management plan would help to ensure that new project facilities are consistent with the Forest Service's VQOs for the project area. The mitigations contemplated by both PG&E and the Forest Service, such as visual screening, painting, providing interpretive information, and maintaining reservoir water levels during the peak recreation season would collectively reduce the impacts on aesthetic resources in the project area.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate as it has in the past. None of the licensee's proposed measures or the resource agencies' recommendations and mandatory conditions would be required, and the existing trout populations would not be enhanced as a result of increased minimum flows. The continued operation of the existing McCloud-Pit facilities would continue to be of importance to water supply, recreation, generation of renewable energy, and minimization of atmospheric pollutants. The continued operation of the existing facilities under the no-action alternative would, on average, result in the annual generation of 1,542.2 GWh of clean energy.

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4.0 DEVELOPMENTAL ANALYSIS

In this section, we estimate the economic benefits of how the McCloud-Pit facilities now operate, the cost of various environmental measures, and the effects of these measures on project operation under a new license. We also analyze PG&E's proposal to install new units at the project.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

4.1.1 Economic Assumptions

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995) (Mead), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

For our economic analysis of the PG&E's proposed project and alternatives, we used the assumptions, values, and sources shown in table 4-1.

Table 4-1. Staff assumptions for economic analysis of the McCloud-Pit Hydroelectric Project. (Source: Staff)

Assumption	Value	Source
Base year for costs and benefits	2009	PG&E, 2009a
Peak/Off-peak energy value (mills/kWh)[a]	87.5	PG&E, 2009a
Dependable capacity value ($/kW-yr)[a]	0	PG&E, 2009a
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	40.75%	PG&E, 2009a
2009 to 2010 inflation for most final license applications costs	0%	Staff
Insurance rate	1.2%	PG&E, 2009a
Discount rate	8.8%	PG&E, 2009a
Interest rate	8.8%	PG&E, 2009a

[a] Based on exhibit H of the application, we assumed the energy values reflect a capacity component.

4.1.2 Current Annual Costs and Future Capital Costs Under the No-Action Alternative

Total annualized costs for the no-action alternative for the McCloud-Pit Hydroelectric Project amounts to $23,102,533 as table 4-2 shows.

Table 4-2. Summary of current annual costs and future costs under the no-action alternative for the McCloud Pit Hydroelectric Project. (Source: PG&E, 2009a, staff)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment [a]	$44,700,000		$7,667,033
Total relicensing cost [a]	$26,400,000		$4,528,181
Subtotal	$71,100,000		$12,195,214
O&M including insurance		$4,853,200	$4,853,200
Taxes and fees		$1,674,119	$1,674,119
Commission fees		$880,000	$880,000
Future capital additions [a]		$3,500,000	$3,500,000
Subtotal annual costs		$10,907,319	$10,907,319
Total	$71,100,000		$23,102,533

[a] PG&E (2009) exhibit D, page D-3, table D.4.3–1

4.2 COMPARISON OF ALTERNATIVES

Table 4-3 compares the power value, annual costs, and net benefits of the no-action alternative, PG&E's proposed action, the staff alternative, and the staff alternative with mandatory conditions. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the staff alternative, and explain why we conclude the environmental benefits are worth the cost increases and benefit reductions.

Table 4-3. Summary of annual net benefits for the no-action, proposed action, staff alternative, and staff alternative with mandatory conditions for the McCloud-Pit Hydroelectric Project. (Source: Staff)

	No Action	**PG&E's Proposed Action**	**Staff Alternative**	**Staff Alternative With Mandatory Conditions**
Annual power value ($)	$134,942,500	$133,376,250	$131,442,500	$131,442,500
Annual power value ($/MWh)	$87.50	$87.50	$87.50	$87.50
Annualized cost of plant and current environmental measures ($)	$23,102,533	$23,102,533	$23,102,533	$23,102,533
Annualized cost of new environmental measures (including energy losses contained in the power values above) ($)	$0	$11,818,570	$14,082,303	$14,709,494
Annualized cost of new environmental measures (excluding energy losses contained in the power values above) ($)	$0	$10,252,320	$10,582,303	$11,209,494
Annual cost ($)	$23,102,533	$33,354,853	$33,684,836	$34,312,027
Annual cost ($/MWh)	$14.98	$21.88	$22.42	$22.84
Annual net benefit ($)	$111,839,967	$100,021,397	$97,757,664	$97,130,473
Annual net benefit ($/MWh)	$72.52	$65.62	$65.08	$64.66

4.2.1 No-Action Alternative

PG&E provided an estimate of average annual output of the project under the no-action alternative (current conditions) of 1,542.2 GWh, which would provide annual power benefits of $134,942,500. Subtracting the current costs of $23,102,533 (see table 4-2) yields an annual net benefit of $111,839,967.

4.2.2 PG&E's Proposed Action

The measures that PG&E proposes, summarized in table 4-4, increase the annualized costs from $23,102,533 to $33,354,853 relative to the no-action alternative. PG&E proposes some operational changes which would reduce annual generation by 17.9 GWh, resulting in annual power benefits of $133,376,250 and an annual net benefit of $100,021,397. This equals an overall reduction in annual net benefits of $11,818,570 relative to the no-action alternative. The decrease in net benefits from $72.52/MWh under the no-action alternative to $65.62/MWh for the proposed action represents a decrease of 9.5 percent.

4.2.3 Staff Alternative

The measures included in the staff alternative, summarized in table 4-4, would increase annualized costs from $23,102,533 to $33,684,836 relative to the no-action alternative. Operational changes would reduce annual generation from 1,542,200 MWh to 1,502,200 MWh. The staff alternative would provide annual power benefits of $131,442,500 and an annual net benefit of $97,757,664. This represents an overall reduction in annual net benefits of $14,082,303 relative to the no-action alternative. The decrease in net benefits from $72.52/MWh under the no-action alternative to $65.08/MWh for the proposed action represents a decrease of 10.3 percent.

4.2.4 Staff Alternative with Mandatory Conditions

The measures included in the staff alternative with mandatory conditions, summarized in table 4-4, would increase annualized costs from $23,102,533 to $34,312,027 relative to the no-action alternative. Operational changes would reduce annual generation from 1,542,200 MWh to 1,502,200 MWh. The staff alternative with mandatory conditions would provide annual power benefits of $131,442,500 and an annual net benefit of $97,130,473. This represents an overall reduction in annual net benefits of $14,709,494 relative to the no-action alternative. The decrease in net benefits from $72.52/MWh under the no-action alternative to $64.66/MWh for the staff alternative with mandatory conditions represents a decrease of 10.8 percent.

4.3 COST OF ENVIRONMENTAL MEASURES

4.3.1 Cost of Environmental Measures for the McCloud-Pit Hydroelectric Project

PG&E provided costs for environmental measures in current dollars. Costs are taken from the final license application filed in 2009, and the PG&E reply comments on comments, recommendations, terms, and conditions (PG&E, 2010). Table 4-4 summarizes the capital and O&M costs by major resource area. Proposed environmental measures that are directly associated with the proposed powerhouses at McCloud and Pit 7 afterbay are included separately in table 4-5. Changes in power benefits are addressed in section 4.2.

Appendix B includes capital and O&M costs for individual measures proposed by PG&E and included in terms, conditions, and recommendations received from agencies and other interested parties.

Table 4-4. Summary of annualized costs by resource area for measures included in the proposed action and proposed action with staff modifications for the McCloud-Pit Hydroelectric Project.[a] (Source: Staff)

	PG&E's Proposed Action			Staff Alternative			Staff Alternative with Mandatory Conditions		
Resource Area	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**
General	$0	$90,000	$90,000	$0	$90,000	$90,000	$0	$90,000	$90,000
Geology and soils	$390,192	$182,000	$572,192	$393,998	$257,000	$650,998	$399,708	$257,000	$656,708
Aquatic resources	$75,754	$70,000	$145,754	$111,348	$355,000	$466,348	$112,395	$358,500	$470,895
Terrestrial resources	$139,518	$562,000	$701,518	$109,485	$495,000	$604,485	$109,485	$495,000	$604,485
Threatened and endangered species	$0	$0	$0	$0	$0	$0	$0	$0	$0
Recreation resources	$3,230,976	$1,011,000	$4,241,976	$3,475,655	$1,036,000	$4,511,655	$3,500,589	$1,365,000	$4,865,589
Cultural resources	$83,748	$200,000	$283,748	$83,748	$200,000	$283,748	$83,748	$200,000	$283,748
Land use and aesthetic resources	$2,952,132	$1,265,000	$4,217,132	$2,973,069	$1,002,000	$3,975,069	$2,973,069	$1,265,000	$4,238,069
Total	$6,872,320	$3,380,000	$10,252,320	$7,147,303	$3,435,000	$10,582,303	$7,178,994	$4,030,500	$11,209,494

[a] This summary does not include mitigation measures that are directly associated with the construction of a proposed powerhouse.

Table 4-5. Summary of annualized costs by resource area for measures included in the proposed action and proposed action with staff modifications for the McCloud-Pit Hydroelectric Project. This summary includes only measures that are directly associated with construction of a proposed powerhouse. (Source: Staff)

	PG&E's Proposed Action			**Staff Alternative**			**Staff Alternative with Mandatory Conditions**		
Resource Area	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**	**Annualized Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost (excluding energy)**
General	$0	$0	$0	$31,025	$16,500	$47,525	$31,025	$16,500	$47,525
Geology and soils	$0	$0	$0	$0	$0	$0	$0	$0	$0
Aquatic resources	$0	$0	$0	$0	$0	$0	$0	$0	$0
Terrestrial resources	$0	$0	$0	$59,005	$287,000	$346,005	$59,005	$287,000	$346,005
Threatened and endangered species	$0	$0	$0	$0	$0	$0	$0	$0	$0
Recreation resources	$26,838	$11,000	$37,838	$26,838	$11,000	$37,838	$26,838	$11,000	$37,838
Cultural resources	$0	$0	$0	$0	$0	$0	$0	$0	$0
Land use and aesthetic resources	$0	$0	$$0	$0	$0	$0	$0	$0	$0
Total	$26,838	$11,000	$37,838	$116,868	$314,500	$431,368	$116,868	$314,500	$431,368

4.3.2 Effect of Environmental Measures on Energy Generation

Several measures proposed by PG&E or included in the terms and conditions filed by the agencies and other parties would affect energy generation. For the McCloud-Pit Hydroelectric Project, increased minimum flows proposed for the McCloud river reaches are the only measures that would have a substantive effect on energy generation. Estimates of the power benefits under PG&E's proposed action, the staff alternative (which includes California Trout, Trout Unlimited, and the McCloud River Club's proposed flow regime), and the staff alternative with mandatory conditions (which includes Forest Service condition 19 flows) are shown in table 4-6.

Table 4-6. Summary of the effect of environmental measures on energy for the no-action, proposed action, staff alternative, and staff alternative with mandatory conditions for the McCloud-Pit Project. (Source: Staff)

	No Action	**PG&E's Proposed Action**	**Staff Alternative**	**Staff Alternative With Mandatory Conditions**
Total power (MWh)	1,542,200	1,524,300	1,502,200	1,502,200
Total power value ($)	$134,942,500	$133,376,250	$131,442,500	$131,442,500
Power lost relative to no action (MWh)	0	17,900	40,000	40,000
Reduction in power value relative to no action ($)	$0	$1,556,250	$3,500,000	$3,500,000

4.4 COMPARISON OF ALTERNATIVES FOR PG&E'S PROPOSED POWERHOUSES

To develop the hydro potential from higher instream flows required in a new license, PG&E proposed to install new units at both the Pit 7 afterbay and the McCloud powerhouses. For Pit 7 afterbay, PG&E estimates a 5-MW powerhouse would produce 25 GWH and a 10-MW powerhouse would produce 50 GWh. For the McCloud project, installing a 5-MW powerhouse would produce 30 GWh and installing an 8-MW powerhouse would produce 40 GWh. In the final license application, PG&E says it will determine the final size of the units and their hydraulic capacity based on instream flow requirements of the new project license. In table 4-7, we compare our estimate of the power value, annual costs, and net benefits of the powerhouse alternatives PG&E's presents in the license application.

Table 4-7. Summary of annual net benefits for the proposed powerhouses of the McCloud-Pit Hydroelectric Project. (Source: Staff)

	Pit 7 Afterbay 5 MW	**Pit 7 Afterbay 10 MW**	**McCloud 5 MW**	**McCloud 8 MW**
Annual power value ($)	$2,187,500	$4,410,000	$2,625,000	$3,500,000
Annual power value ($/MWh)	$87.50	$87.50	$87.50	$87.50
Annualized cost of plant and environmental measures ($)	$11,876,628	$17,269,763	$6,390,817	$8,597,123
Annual cost ($/MWh)	$475.07	$342.65	$213.03	$214.93
Annual net benefit ($)	($9,689,128)	($12,859,763)	($3,765,817)	($5,097,123)
Annual net benefit ($/MWh)	($387.57)	($255.15)	($125.53)	($127.43)

As table 4-7 shows, the four alternatives that PG&E is considering would have initial annual costs that far exceed the current power value. Although Commission staff does not explicitly account for the effects inflation may have on the future cost of electricity, the fact that hydropower generation is relatively insensitive to inflation compared to fossil-fueled generators is an important economic consideration for power producers and the consumers they serve. PG&E must also consider whether these hydro proposals would qualify as part of its state requirement to develop renewable resources. Based on the Commission's policy under the Mead decision, it is the applicant who must decide whether to accept any license and the financial risk that entails.

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5.0 STAFF'S CONCLUSIONS

5.1 COMPARISON OF EFFECTS OF PROPOSED ACTION AND ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of PG&E's proposal, PG&E's proposal as modified by staff (staff alternative), and the no-action alternative.

We estimate the annual net benefits of operating and maintaining the McCloud-Pit Project under the three alternatives identified above. Our analysis shows that the annual net benefit would be $100,021,397 for the proposed action; $97,757,664 for the staff alternative; and $111,839,967 for the no-action alternative.

We summarize the environmental effects of the different alternatives in table 5-1.

Table 5-1. Comparison of alternatives for the McCloud-Pit Hydroelectric Project. (Source: Staff)

Resource	No-action Alternative	Proposed Action	Staff Alternative
Generation	1,542.2 GWh	1524.3 GWh	1,502.2 GWh
Geology and Soils	Continued removal of LWD behind McCloud dam	Prepare an LWD management plan to facilitate the placing of LWD downstream of McCloud dam	Same as proposed action
	Continue to maintain roadways and implement BMPs to reduce sediment input to project waters	Implement erosion and sediment monitoring and control plan to minimize erosion	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Monitor gravel and coarse sediment that could benefit downstream aquatic habitat	The proposed action plus implement a gravel and coarse sediment management plan to add 150 to 600 tons of gravel and coarse sediment, from Star City Creek or other potential sites, to the Lower McCloud River periodically for protection of geology and soil resources
Aquatic Resources	Provide existing minimum flows in all stream reaches	Higher minimum instream flows below McCloud and Iron Canyon dams	Higher minimum instream flows below McCloud and Iron Canyon dams consistent with a more natural spring hydrograph
		No ramping rates for seasonal minimum flow changes, but upramping at 100 cfs per hour prior to uncontrollable spills	Downramping at 150 cfs each 48 hours at McCloud dam during spills controllable by valve Maximum upramping during controllable spills at 200 cfs each 24 hours; implement water quality and temperature monitoring plan
		Move streamflow measurements for McCloud dam from gage MC-1 to MC-7	Measure streamflow compliance at two compliance points (MC-7 and MC-1)

Resource	No-action Alternative	Proposed Action	Staff Alternative
		No aquatic biological monitoring plan	Implement an aquatic biological monitoring plan
		Implement water quality monitoring plan	Same as proposed action
Terrestrial Resources	Continue to implement vegetation management programs around project facilities	Implement vegetation management plan to guide restoration using native plants and manage invasive plants Implement BMPs to protect wetlands during construction of McCloud transmission line Use native vegetation during restoration of areas disturbed by project-related activities	Implement the vegetation management plan as proposed under Forest Service condition 25 with modifications to include language from the licensee's alternative condition and the use of BMPs and native vegetation during restoration activities

Resource	No-action Alternative	Proposed Action	Staff Alternative
	Monitor bald eagle territories	Implement wildlife management plan	Implement the terrestrial biological management plan as proposed under Forest Service condition 26 with modifications to include language from the licensee's alternative condition Monitor known bat habitat annually for five years after plan approval, then once every five years Prepare biological evaluations for special-status species prior to new construction within the project boundary
		Implement APLIC standards for transmission lines to minimize avian collision and electrocution hazards	Same as proposed action
Threatened and Endangered Species	Implement Valley Elderberry Longhorn Beetle Conservation Program	Same as no-action plus conduct preconstruction surveys for Pacific fisher and to minimize effects on northern spotted owl	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff Alternative
Recreation Resources	Fund California Fish and Game trout stocking program	Continue funding to California Fish and Game for stocking trout annually and to evaluate fish stocking program	Stock 60,000 pounds of trout annually at the project and develop and implement a fish stocking plan
	Continue to operate and maintain existing recreational facilities at the project	Implement recreation development and management plan to include rehabilitation and upgrades to existing recreation facilities, reservoir water surface management, recreation monitoring, and a signage and education plan, providing streamflow information to the public via the internet	Evaluation of fish stocking at the project and monitoring of boat use at the reservoirs as a part of the recreation monitoring
		Construct new day-use area at McCloud reservoir, include fish/swimming platform, reconstruct and extend existing boat ramp, and add parking at Tarantula Gulch	Same as proposed but add lighting at Tarantula Gulch boat ramp
		Provide a formal campground at McCloud reservoir at Star City	Same as proposed
		Conduct a feasibility study to find a suitable location for a floating dock or pier and trail at McCloud reservoir	Construct a floating dock or pier and trail at McCloud reservoir

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Construct a day-use site and access trail along the Lower McCloud River, at the base of McCloud dam	Same as proposed
		Reconstruct Hawkins Landing boat ramp and campground and provide additional parking, restroom facilities, and conduct a site evaluation to provide three paved parking areas with shoreline access points	Same as proposed with the inclusion of three paved parking areas with shoreline access points at Iron Canyon reservoir
		Construct new boat ramp and shoreline access at Iron Canyon reservoir	Same as proposed with the inclusion of adding lighting at the boat ramp
		Relocate (if feasible) and reconstruct Deadlun Campground if a suitable location is found	Same as proposed action with the exception of reconstructing, not relocating Deadlun Campground
		Remove snow at Iron Canyon dam boat ramp and access road when project operations require snow removal from Oak Mountain Road	Same as proposed

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Evaluate the feasibility of constructing a pedestrian shoreline access trail at the upper end of Pit 7 reservoir, downstream of Pit 6 powerhouse tailrace, and	Construct the shoreline access trail
		Conduct feasibility assessment for providing boat put-in or boat hand- launch at Montgomery Creek, near the lower end of Pit 7 reservoir, if not feasible construct a fishing access trail with boat hand-launch	Conduct a site evaluation to determine the location of a pedestrian shoreline access trail at the lower end of Pit 7 reservoir with paved parking. Once a suitable location is found, construct this facility within five years of license issuance
		Reconstruct Fenders Flat day-use area (above Pit 7 afterbay dam) and provide access near the proposed Pit 7 afterbay powerhouse, and provide parking at the end of the powerhouse access road	Same as proposed
		Conduct a site evaluation to determine the location of three paved parking areas along FR 37N78	Construct three paved parking areas along FR 37N78

Resource	No-action Alternative	Proposed Action	Staff Alternative
		Provide project patrols	No requirement for project patrol plan, patrols, or funding for law enforcement position
Cultural Resources		Finalize and implement Historic Properties Management Plan (HPMP)	Implement HPMP with some additional measures
	Continue employee environmental training and sensitivity program	Continue employee environmental training and sensitivity program as part of the HPMP	Same as proposed action
		Provide program to educate public about cultural significance of area (with assistance from Pit River Tribe, Winnemem Wintu Tribe, and Forest Service)	Same as proposed action
Land Use and Aesthetics	Continue to maintain all project roads and facilities	Develop and implement a road and transportation facility management plan for project roads	Same as proposed action plus revise project boundary to include all project roads and existing recreational facilities
		Execute a separate MOU with the Forest Service for areas with shared responsibility	Outside of licensing processing

Resource	No-action Alternative	Proposed Action	Staff Alternative
	Continue to implement the Spill Prevention Control and Countermeasure (SPCC) Plan and the Hazardous Materials Business Plan (HMBP)	Same as No-action, but provide the Forest Service with copies of the current SPCC plans and HMBPs	Same as proposed action
		Develop and implement visual quality management plan	Same as proposed action
		Develop and implement a fire response plan	Same as proposed action

Under the no-action alternative, environmental conditions would remain the same and no enhancement of environmental resources would occur.

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreation opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the McCloud-Pit Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed action, the staff alternative, and no-action, we recommend the staff alternative as the preferred alternative for the McCloud-Pit project.

We recommend this alternative because: (1) issuing a new license would allow PG&E to continue operating the project as a beneficial, dependable source of water and electric energy; (2) the project, with a total installed capacity of 368 MW may eliminate

the need for an equivalent amount of fossil fuel-produced energy, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) our recommended environmental measures would protect water quality and quantity, enhance fish and wildlife resources, protect cultural resources; and improve public use of the project's recreational facilities and resources; and (4) the public benefit of these measures would exceed those of the other alternatives. Although we did not adopt all of the Forest Service's 4(e) conditions, or adopted them with modifications, we recognize that the Commission must include these conditions in their entirety, without modification in any license it may issue, due to their mandatory nature.

In the staff alternative, we include the following environmental measures proposed by PG&E, based on our analyses included in sections 3 and 4. In some cases, we modified or supplemented PG&E's proposed measures and these modifications are indicated in *italic* text.

Geology and Soils

- Prepare an LWD management plan.
- Prepare an erosion and sediment monitoring and control plan.

Aquatic Resources

- Continue to implement the current minimum flow release schedule for the Pit 7 afterbay reach.
- Implement upramping rates of no more than 100 cfs per hour prior to the start of an uncontrolled spill event at McCloud dam.
- Develop and implement a water quality monitoring plan.

Recreation Resources

- *Implement* a recreation development and management plan that would include: location, conceptual designs, and schedules for upgrading existing recreation facilities and constructing new recreation facilities; plans using Forest Service design standards (including applicable standards for providing access to users with disabilities); and details regarding O&M activities at *all recreation facilities including existing and new project recreation facilities. The plan also should incorporate the following components:*
    - *A project sign plan that includes an interpretive and education component;*
    - Monitoring, visitor surveys, and use estimation concurrent with the recreation Form 80 reporting. This measure also should include details addressing collection of annual use data at facilities where passes/fees are collected; consult with Forest Service on the survey methods for the Recreational Resource Survey and consult every six years (concurrent with the FERC Form 80) with the Forest Service, appropriate agencies, and

interested parties to review and adjust project-wide recreation management objective, if needed; and

- A water surface management plan to manage reservoir use at McCloud reservoir. This plan component would include installing speed limit signs in the northern end of the reservoir, LWD removal from the reservoir, points of public access to the shoreline, and boating speeds. This measure would also include details addressing monitoring and management of recreation user safety, including developing protocols for all project reservoirs for preventing/removing unapproved buoy courses, approved use of docks, and measures to prevent unauthorized access to project lands and waters; *annual* surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps to remove logs and other debris; *monitoring boat use on McCloud and Iron Canyon reservoirs every six years coinciding with the Commission recreation Form 80 schedule*; and reassessing water surface management mitigations every six years.

- Provide real-time stream flow (gage MC-1) and drawdown information to the public via PG&E's webpage on the internet.
- At McCloud and Iron Canyon reservoirs, assess and implement closures of user-created roads, *trails, and dispersed use sites* leading to the shoreline of McCloud and Iron Canyon reservoirs, in coordination with the Forest Service.

<u>McCloud Reservoir</u>

- Within five years of Commission approval of the recreation plan, if feasible within site constraint limitations, reconstruct the Tarantula Gulch boat ramp to California Boating standards, provide a boarding dock, and extend the launch ramp to 3 ft (vertical) below the minimum operating pool elevation, including the specifications for reconstructing the boat ramp to California Boating standards to provide one-lane ramp with boarding dock and sidewalk; redesigning the parking lot to maximize parking spaces; developing a paved parking area and turnaround; designating parking spaces; and maintaining or relocating and maintaining a vault restroom.
- Within five years of Commission approval of the recreation plan, provide access points (paved parking and shoreline access trail) at Battle Creek, West dam, and East dam. *This measure is modified to include details for picnic tables and the number of vehicles that can be accommodated at the parking areas (three).*
- Within five years of Commission approval of the recreation plan, develop a formal campground at Star City with walk-in sites (estimate six sites), paved parking, vault restroom, potable water, tables, fire rings/grills, trash receptacles/removal, and host site. *This measure is modified to include*

specifications for the camping area, including campsites, restroom, and potable water.

Lower McCloud River

- Within five years of Commission approval of the recreation plan, provide a *day-use facility* at the base of McCloud dam and provide parking, vault restroom, trash receptacle/removal, and shoreline pedestrian access trail on river left to the pool below the spillway. *This measure is modified to include details for a day-use area with paved parking for a minimum of three vehicles, signage, and a shoreline access trail from the base of the dam to splash pool below the spillway that accommodates fishing and boating access and an access road.*

Iron Canyon Reservoir

- Within five years of Commission approval of the recreation plan, reconstruct Hawkins Landing Campground to Forest Service standards and provide potable water and reconstruct or resurface the access road to allow all-season use. *This measure is modified to include details for the campground including an entrance gate with signing; surfaced loop road; parking spurs; site posts; picnic tables; anima- resistant food boxes; fire rings; vault restrooms; animal-resistant trash receptacles; and developed trail from the campground to the adjacent boat ramp and shoreline for pedestrian fishing access.*
- Within five years of Commission approval of the recreation plan, retain concrete ramp surface at Hawkins Landing Boat Launch and replace or repair the surfacing that connects to the concrete ramp. *This measure is modified to include specifications for reconstruction of boat ramp surface (length and width) to meet California Boating standards for one lane, and to specify a surfaced and striped parking lot above high water level for a minimum of 10 vehicles with a single-vault toilet, animal-resistant trash receptacle, and an information sign.*
- Within five years of Commission approval of the recreation plan, reconstruct Deadlun Campground to Forest Service standards and increase capacity by about 10 sites to provide about 37 sites and provide potable water a shoreline access trail. *This measure is modified to include details for campsites and campground including specifications for parking spurs, site posts, picnic tables, animal-resistant food lockers, fire rings, two 2-vault restrooms, and animal-resistant trash receptacles.*
- Within five years of Commission approval of the recreation plan, construct a new boat launch at the east end of Iron Canyon dam that meets California Boating standards and provide vault restroom, picnic tables, potable water, and trash receptacles/removal. *This measure is modified to include specifications for the boat ramp to be operable at minimum operating pool, for snow removal*

for parking area and ramp when project operations require snow removal from Oak Mountain Road, and one-lane ramp placement should include option for two lanes if needed during mid-license review, and details for the parking area capacity, number of picnic tables.

- Conduct a site evaluation to determine the location of three paved parking areas along FR 37N78, each with a capacity of up to three vehicle parking spaces and a pedestrian shoreline access trail. *Once three suitable locations are identified, design and construct these project facilities*. *This measure is modified to specify the evaluation would be completed within two years of license issuance.*
- Allow public use of at least one campground year-round. This measure is modified to specify that a schedule for implementation would be included in the recreation plan.

<u>Pit 7 Reservoir</u>

- *Conduct a site evaluation to determine the location* of a pedestrian shoreline access trail at the upper end of Pit 7 reservoir, downstream of Pit 6 powerhouse tailrace. *This measure is modified to include specifications for conducting the site evaluation within two years of license issuance, consultation with the Forest Service, and once a suitable location is found, constructing this facility within five years of Commission approval of the recreation plan. The facility would include a trailhead, parking for up to three vehicles, and hand-launch boating access.*

<u>Pit 7 afterbay</u>

- Within two years of Commission approval of the recreation plan, grade and maintain FR 35N66 from its intersection with FR 37N78 to the car-top boat launch. Provide a vault restroom near the car-top boat launch.
- Continue to prohibit public access to Pit 7 afterbay water surface and shoreline by maintaining fencing, signage, and patrols.
- If the Pit 7 afterbay powerhouse is constructed, provide a paved parking area for two to three vehicles at the end of the powerhouse access road or along Fenders Ferry Road and provide a vault restroom, trash receptacle/removal, and pedestrian access to the shoreline between the powerhouse and Fenders Ferry Bridge. *This measure is modified to include specifications for the restroom and to condition the day-use area on public safety and homeland security needs.*
- Within five years of Commission approval of the recreation plan, provide a day-use site at Fenders Flat with a capacity five sites, parking, vault restroom, tables, fire grills, and trash receptacles/removal, and coordinate with the Forest Service to develop and implement a plan to revegetate disturbed areas and

prevent vehicle access beyond the access road and parking area. *This measure is modified to include specifications for the parking area.*

Land Use and Aesthetic Resources

- Develop, file, and implement, within one year of license issuance, a road and transportation facilities management plan for all project roads.
- Develop, file, and implement, within one year of license issuance, a fire prevention and response plan.
- File copies of the existing SPCC plan and HMBP with the Commission and provide copies to the Forest Service within 30 days of license issuance and continue to implement these plans.
- Include all project roads and recreation sites within the project boundary and file a revised exhibit G with the Commission within one year of license issuance.
- Develop, file, and implement, within one year of license issuance, a visual quality management plan.

Additional Measures Identified by Staff

In addition to PG&E's proposed measures listed above (and modified as indicated), the staff alternative also includes the following additional measures identified by staff based on agency, tribal, and non-governmental organization specifications, recommendations, and our analysis.

Geology and Soils

- Within 12 months of license issuance, develop and implement a gravel and coarse sediment management plan in consultation with agencies and approved by the Forest Service. Augment gravel and coarse sediment periodically. Evaluate Star City Creek as a primary source of gravel, and evaluate other potential alternate local sites.

Aquatic Resources

- Implement a minimum flow release schedule for the McCloud dam reach, as follows:

Month	Lower McCloud River Flows (cfs) by Water Year[a]	
May – June	200	
July– February 14	175[1]	
February 15-29	0-75% RO[b]	No flow change
	76-89% RO[b]	No flow change
	90-99% RO[b]	Increase flow by 75 cfs
	100-119% RO[b]	Increase flow by 125 cfs
	≥120% RO[b]	Increase flow by 175 cfs
March 1-15	0-75% RO[b]	No flow change
	76-89% RO[b]	Increase flow by 50 cfs
	90-99% RO[b]	Increase flow by 50 cfs
	100-119% RO[b]	Increase flow by 100 cfs
	≥120% RO[b]	Increase flow by 150 cfs
March 16-31	0-75% RO[c]	No flow change
	76-89% RO[c]	No flow change
	90-99% RO[c]	No flow change
	100-119% RO[c]	Increase flow by 50 cfs
	≥120% RO[c]	Increase flow by 150 cfs
April 1-15	0-75% RO[c]	No flow change
	76-89% RO[c]	No flow change
	90-99% RO[c]	No flow change
	100-119% RO[c]	No flow change
	≥120% RO[c]	Increase flow by 50 cfs
April 16 – April 30	April 15 MC-7 Release ≥ 200 cfs	Decrease flow by 50 cfs each Friday after April 15 (if 0-99%RO) and by 75 cfs per week (if ≥ 100% RO) until flow is 200 cfs. Decrease flow by 50 cfs each Friday after May 1 until flow is 200 cfs. Maintain 200 cfs release at gage MC-7 through June 30.
	April 15 MC-7 Release <200 cfs	175 cfs at MC-7; maintain at least 200 cfs at Ah-Di-Na (MC-1)

[1] Mean daily flow at USGS Gage 11367800 (MC-1) at Ah-Di-Na should be at least 200 cfs.

- Implement a minimum flow release schedule for the Iron Canyon dam reach, as follows:

	Release from Iron Canyon Dam (cfs) by Water Year-type		
Month	**Wet**	**Above Normal**	**Below Normal, Dry, Critically Dry**
October	10	7	7
November	10	7	7
December	15	10	7
January	15	10	7
February	15	10	7
March	>20[b]	15	10
April	>20[b]	15	10
May	15	10	7
June	15	10	7
July	10	7	7
August	10	7	7
September	10	7	7

- Downramp all spill events controllable at McCloud dam by valve operation at a maximum rate of 150 cfs per 48 hour until the prescribed minimum instream flow value is reached and upramp operational controllable spills at McCloud dam at a maximum rate of 200 cfs per 24 hour period.
- Determine water year type based on the forecast of unimpaired runoff of the Sacramento River near Redding as provided by DWR Bulletin 120 or its successor.
- Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflow and measure and document all instream flow releases in publicly available formats.
- Develop and implement an aquatic biological monitoring plan within 12 months of license issuance and for Commission approval, after consultation with interested parties and approved by the Forest Service, for fish, benthic macroinvertebrates, special-status aquatic mollusks, other special-status species, and invasive aquatic species in the McCloud River and Iron Canyon Creek. Periodic sampling of fish, benthic macroinvertebrates, and special-status mollusks would occur once every three years for the first nine years, and

then once every five years thereafter. The number of sites, site locations, sampling methods, and data protocols should be consistent with relicensing studies.

Terrestrial Resources and Threatened and Endangered Species

- Implement a vegetation and invasive weed management and monitoring plan, as specified by Forest Service condition 25, with the inclusion of the species-specific monitoring schedule proposed in PG&E alternative condition 25; BMPs to avoid/minimize effects on wetlands; and restoration of native vegetation in relevant areas disturbed as a result of project activities will also be included in this plan.
- Implement a TBMP as specified by Forest Service condition 26, with the inclusion of the species-specific monitoring schedule proposed in PG&E alternative condition 26. The special-status species section of the TBMP also should incorporate a foothill yellow-legged frog monitoring plan.
- Exclude the use of pesticides and herbicides on NFS land, unless prior written approval is received first from the Forest Service, as specified by Forest Service condition 15.

Recreation Resources

- Stock 60,000 pounds of trout annually at the project and develop (for Commission approval) and implement a fish stocking plan in consultation with California Fish and Game within two years of license issuance and evaluate and monitor the amount of fish to be stocked every six years.
- Construct, within two years of license issuance, a floating dock or pier and trail (away from Tarantula Gulch boat launch) at McCloud reservoir.
- Provide lighting at both the Tarantula Gulch and Iron Canyon boat launches.
- Conduct a site evaluation to determine the location of a pedestrian shoreline access trail at the lower end of Pit 7 reservoir, with paved parking. Once a suitable location is found, construct this facility within five years of Commission approval of the recreation plan.

Cultural Resources

- Implement the final HPMP prior to license issuance, as proposed by PG&E and specified by Forest Service condition 34. Include additional staff modifications, including inclusion of treatment measures for site CA-SHA-252 and National Register evaluations for all adversely effected sites.

5.2.1 Discussion of Key Issues

The following paragraphs describe the basis for staff-recommended measures as well as for not recommending measures recommended by other entities. Under each major issue, we discuss our recommendations for the McCloud-Pit Project.

Geology and Soils

Large Woody Debris

LWD in the project streams functions primarily as: (1) aquatic habitat along the channel margins, (2) riparian habitat where it rafts up onto surfaces above the low-flow channel, and (3) in rare cases, as aquatic habitat where wood is retained in the active portion of side channels. As LWD breaks apart and decays, it may also increase the supply of organic material to the river channel, benefiting benthic macroinvertebrates and other components of the aquatic food web.

In Iron Canyon Creek, LWD is abundant and project operations appear to have little or no effect on LWD supply. In the Lower McCloud River, however, the large channel width, high stream power, and normally low amount of LWD that passes the McCloud dam limit the availability of downstream LWD. PG&E proposes to prepare an LWD management plan after consultation with the Forest Service. The plan would provide an operating procedure to facilitate the placing of woody debris downstream of McCloud dam. The plan would specify size criteria, placement and storage sites, volume and frequency of placement, and monitoring procedures.

Forest Service condition 21 is consistent with PG&E's proposal and specifies that monitoring procedures included in the plan should assess the effectiveness of LWD mobilization and dispersal in the Lower McCloud River.

We recommend PG&E's proposal to prepare an LWD management plan. Monitoring procedures included in the plan would assess the effectiveness of LWD mobilization and dispersal in the Lower McCloud River. These specific procedures would provide information necessary to assess the location, timing, and quantity of LWD appropriate to achieve the stated objectives. We estimate that the annualized cost of this plan would be $452,506. Because LWD contributes to productive aquatic ecosystems, is an important component in the formation of complex aquatic habitat units and channel maintenance, and increasing the amount of LWD in downstream reaches could provide a substantial benefit to fish habitat at a reasonable cost, we recommend adopting this measure.

Gravel and Coarse Sediment

As a result of project operations and the resultant trapped sediment behind McCloud dam, the reach from about 5 to 8 kilometers downstream of McCloud dam is the most likely to exhibit degraded habitat through coarsening of the bed surface in addition to reduction in the frequency and quantity of mobile sediment deposits. Project

operations could result in long-term adverse impacts on aquatic substrate habitat. PG&E did not propose to augment gravel and coarse sediment in the Lower McCloud River.

Forest Service condition 23 specifies that PG&E should develop and implement a gravel and coarse sediment management plan within one year of license issuance, after consultation with the Forest Service, California Fish and Game, the California Water Board, and other interested parties, and with approval of the Commission and the Forest Service. The plan would require the annual addition of 150 to 600 tons of gravel and coarse sediment to the Lower McCloud River, with inputs specifically within the reach between the McCloud dam spillway and the Hawkins Creek confluence. The Forest Service specifies that PG&E consider using sorted gravel and coarse sediment from the Star City Creek inlet in McCloud reservoir as the source of material for the plan. Furthermore, Forest Service condition 24 specifies that PG&E prepare a reservoir dredging plan in consultation with the Forest Service and approved by the Commission and the Forest Service, if required for the purposes of increasing gravel and sediment supply or for removing sediment from reservoirs to accomplish project management objectives. The plan would also include a monitoring component for the Lower McCloud River between the McCloud dam and Bald Mountain Creek confluence that is integrated into the biological monitoring plan.

California Fish and Game's 10(j) recommendation 2 recommends that PG&E prepare a gravel and sediment management plan requiring the annual addition of 150 tons of gravel and sediment to the McCloud River, between the dam spillway and the confluence with Hawkins Creek. California Fish and Game also recommends that PG&E consider using the Star City Creek inlet as a material source. As part of the long-term monitoring component of this plan, California Fish and Game's recommendation incorporates amphibians as an indicator species for assessing ecosystem health.

PG&E alternative condition 23 proposes to revise the time to develop the gravel and coarse sediment management plan to two years, which PG&E states would allow for receipt of license articles from the Commission and collaborative plan development, and proposes that gravel and coarse sediment introductions occur periodically rather than annually. The licensee specifies that the source of the coarse sediment will be the delta deposit at the head of the Star City Creek arm of McCloud reservoir, where the coarse sediment could be excavated "in the dry" and not dredged. The licensee recommends that the monitoring component of the plan cover the Lower McCloud River between McCloud dam and Ladybug Creek rather than Bald Mountain Creek, located approximately 1.5 miles downstream of Ladybug Creek, as specified by the Forest Service.

PG&E alternative condition 24 proposes that PG&E does not anticipate a need for dredging during the license term, as PG&E alternative condition 23 for the gravel and coarse sediment management plan would eliminate the need for dredging within McCloud reservoir as a gravel source to support downstream gravel augmentation.

Given the adverse impacts with regard to gravel and coarse sediment noted above, we recommend Forest Service condition 23, under which PG&E would develop and implement a gravel and coarse sediment management plan, and monitoring and adaptive management of gravel and coarse sediment augmentation. We further recommend modification of Forest Service condition 23 according to PG&E alternative condition 23, to specify that gravel augmentation should occur based on monitoring results, rather than annually. Periodic gravel augmentation would provide a more flexible mechanism for determining the volume and frequency of sediment introduction necessary to maintain aquatic habitat, given that high spill flows capable of mobilizing sediment occur in approximately 4 out of 10 years. To provide more options and greater flexibility in implementing the gravel and coarse sediment program, we also recommend that multiple sources of material be evaluated, to identify the volume, physical and chemical characteristics, logistics for collection and transport of material, and range of costs. While we recommend that Star City Creek be evaluated as a primary source of gravel, PG&E should also evaluate other potential alternate local sites, such as other tributaries to McCloud reservoir, Shasta Lake, or upland sites in the development of the coarse sediment management plan. With respect to reservoir dredging, however, which is costly and poses the threat for additional environmental risks, we find that the costs and risks outweigh any potential environmental benefit; therefore, we do not recommend a dredging plan as specified in Forest Service condition 24. Despite PG&E's assertions otherwise, we expect that one year is adequate time to produce the gravel and coarse sediment management plan.

As previously indicated, we recommend PG&E employ an adaptive management approach with monitoring for augmenting gravel and coarse sediments in the Lower McCloud River as specified by the Forest Service. The monitoring plan will provide data on progress of the augmentation program and improvements in the gravel substrate through the reach downstream of the McCloud dam. These data will form the scientific basis for judgments on the success of the program and adjustments to the source of material, as well as its timing and placement, which may be necessary to support the fish and invertebrate community utilizing this reach. We also recommend that Bald Mountain Creek serve as the downstream terminus for the monitoring program, as specified by the Forest Service. Although studies indicate suitable amounts of gravel and coarse sediment in the reach between Ladybug Creek and Bald Mountain Creek, we note that this reach could serve as an important comparative baseline for determining the success of the proposed augmentation program. Finally, we note that foothill yellow-legged frog is the only amphibian species in the project area that could benefit from the gravel augmentation program. However, studies indicate that no foothill yellow-legged frogs are present in the proposed augmentation reach, and furthermore, the species is excluded from the reach due to cold water temperatures. Because amphibians are not effective for assessments of sediment augmentation plan success in the proposed augmentation reach, we do not recommend that PG&E include such assessments in their monitoring plan.

We consider the proposed staff alternative measure to develop a plan for gravel and coarse sediment management to represent an effective approach for improving instream aquatic habitat. We estimate that California Fish and Game's plan would have an annualized cost of $75,000, the Forest Service plan would have an annualized cost of $84,517, and that our recommended approach would have an annualized cost of $78,807. Given the benefits of implementing the staff-recommended alternative as described above, we consider this cost to be warranted.

Erosion and Sediment Control

Fine sediment from reduction of seasonal high flow events, surface erosion, increased overland flow, and mass wasting as a result of project operations can adversely affect environmental resources through increased turbidity and degraded spawning substrate. In order to manage existing erosion and reduce future erosion and sediment delivery to stream channels, PG&E proposes to prepare an erosion and sediment monitoring and control plan within one year after license issuance. The plan would guide management of erosion and sediment control during the term of the new license and would include the following elements:

- Methods for ongoing inventory of project-related erosion and sedimentation;
- A schedule for periodic monitoring;
- An inventory of erosion sites identified by periodic monitoring;
- Criteria for treating erosion sites;
- Protocols for emergency erosion and sediment control; and
- A process and schedule for reporting monitoring results, including periodic plan review and revision.

Initial priority would be placed on the 56 sites identified during pre-filing studies, ranked as having high erosion potential. Sites would be monitored for five years to assess erosion activity and associated causes. Annual monitoring reports would include a Forest Service-compatible database of erosion sites and detailed site-specific erosion and sediment control measures where necessary and appropriate.

Forest Service condition 22 supports PG&E's proposal and specifies that the plan should provide direction for managing erosion and controlling sediment during the term of the new license. Furthermore, Forest Service condition 22 specifies that during planning, and before any new construction or non-routine maintenance projects with the potential for causing erosion or stream sedimentation on or affecting Forest Service lands, PG&E should develop site-specific erosion control plans. The plans would include measures to control erosion, stream sedimentation, dust, and soil mass movement.

We recommend PG&E's proposal for erosion and sediment control. We estimate that the cost of this plan would be $119,686. Because the plan would help determine and

develop the success of effective erosion and sediment control procedures, and would protect aquatic habitat, we consider this cost warranted.

Aquatic Resources

Instream Flows

Flow regulation at McCloud and Iron Canyon dams and diversion of water to the project powerhouses affect both habitat for aquatic biota and recreational opportunities in downstream reaches. These reaches include Iron Canyon Creek below Iron Canyon dam (4.6-mile bypassed reach), the Pit River below Pit 7 dam, and the Lower McCloud River below McCloud dam (24-mile bypassed reach). As we discussed in section 3.3.2, many participants, including PG&E, recommend raising minimum flows in these affected reaches and we analyzed these recommended flow regimes in section 3.3.2.2. In section 4.1, we show how the proposed and recommended minimum flows decrease the project's power generation. Here we consider both the cost of raising instream flows and how the recommended minimum flows affect other competing flow uses, including aquatic habitat and recreational resources, such as angling and boating, and we then make our final minimum flow recommendation for the Lower McCloud River.

PG&E proposes minimum flow regimes for each of its project reaches to protect aquatic resources. For the reaches below McCloud and Iron Canyon dams, the minimum flows would vary by month and water year type (tables 3-21 and 3-22). For the Pit River below Pit 7 dam, the minimum flow would be the same year-round (150 cfs) whenever the water surface elevation at Shasta Lake is below 1,055 ft msl. To determine appropriate flows for aquatic and terrestrial biota, PG&E used both incremental flow methods and resource studies. In all cases, PG&E's proposed flows are equal to or greater than the flows required in the current project license and would provide more trout habitat in most months.

As we discuss in section 3.3.2.2, several participants recommended alternatives to PG&E's minimum flow regime proposals for the project's reaches. Forest Service condition 19 specifies seasonal flow regimes for each reach (tables 3-21, 3-22, and 3-23). Filed pursuant to the Energy Policy Act of 2005, PG&E alternative condition 19 proposes a minimum flow regime that differs slightly from the flow regime proposed in its license application (tables 3-21 and 3-22). California Trout, Trout Unlimited, and the McCloud River Club; American Whitewater; and McCloud RiverKeepers alternative condition 19, similar to PG&E alternative condition 19, recommends minimum flow regimes (table 3-24) that are equal to or greater than the flows required in the current project license and would provide more trout habitat in most months.

<u>Iron Canyon Creek Below Iron Canyon Dam</u>

Because of the steep canyons and private property restrictions, angling pressure on the Iron Canyon Creek fishery is less than on the McCloud River and the project reservoirs. PG&E now releases a year-round minimum flow of 3 cfs to the 4.6-mile Iron Canyon Creek reach. We note that surveys of Iron Canyon Creek found a self-sustaining

rainbow trout population in good condition. However, the results of the PHABSIM model show that increasing the minimum instream flow during all months would likely benefit resident rainbow trout by increasing the usable habitat for juvenile and adult life stages. Except for some small differences (2 cfs) during dry water years, PG&E's minimum flow regime for this reach and the minimum flow regimes filed by both the Forest Service and California Fish and Game are very similar. In fact, PG&E alternative condition 19 proposes a minimum flow regime that is now identical to the Forest Service flow regime. All proposals would set minimum flows in the creek so that the monthly minimum flows vary seasonally to mimic natural hydrologic conditions.

To enhance trout populations in Iron Canyon Creek, we recommend the PG&E / Forest Service condition 19 minimum flow regime. Raising the minimum flows in this manner would reduce the project's average annual generation, at a cost of about $422,000 annually. While raising the minimum flow in this reach would enhance conditions for the rainbow trout population, we acknowledge the loss in generation due to the increased flows but conclude that the enhancement justifies this cost. To provide additional public benefit as a result of this aquatic enhancement, we also recommend that PG&E provide more angling access to the creek. Therefore, we recommend that PG&E file a plan for enhancing angling access to Iron Canyon Creek.

Pit River Below Pit 7 dam

PG&E proposes, the Forest Service specifies, and California Fish and Game recommends a continuation of the 150-cfs minimum flow in the Pit River below Pit 7 dam. Current project flows provide for a range of aquatic flow-habitat transitioning from the riverine upstream conditions to broad, shallow lacustrine habitat near the afterbay dam. This habitat supports a diverse fish assemblage, dominated by native hardhead and Sacramento suckers. Furthermore, the fish populations in the reach have a recurrent seasonal exchange with the fish community in the Pit River Arm of Shasta Lake. Continuation of this minimum flow will ensure adequate flow-habitat in the reach, while also ensuring continuity with the Pit River arm of Shasta Lake even when the water surface elevation of Shasta Lake is below 1,055 ft msl. The proposed minimum flow of 150 cfs, consistent with current project operation, would not alter the project's average annual generation and would protect aquatic habitat and fish populations; therefore, we recommend a minimum flow of 150 cfs in the Pit River below Pit 7 dam.

Lower McCloud River Below McCloud dam

PG&E proposes a minimum flow regime for the Lower McCloud River reach that results in a low flow season from May to November of 150 cfs, and a high flow season of 200-220 cfs from December to April. Forest Service condition 19 specifies a higher minimum baseflow (175 cfs) for the Lower McCloud River than was originally proposed by PG&E, and a minimum flow regime that varies by month and water year type. The Forest Service flow regime would create a spring pulse flow condition which more closely reflects a natural hydrograph. PG&E alternative condition 19 baseflows are 25 cfs higher (175 cfs) than its proposed baseflows. PG&E's alternative also

incorporates a minimum flow regime that varies by month and water year type and is identical to the Forest Service condition 19 flows.[27] California Fish and Game's recommended baseflows are slightly higher at 200 cfs. American Whitewater's alternative baseflows were the same as the Forest Service condition 19 flows, but American Whitewater added seasonal peak flows for whitewater boating. Due to angler safety concerns, McCloud RiverKeepers' proposed alternative flows were substantially lower (100 cfs) than the Forest Service / PG&E flows, with flows varying by month from 160 to 210 cfs (table 3-25).

The Lower McCloud River's trout fishery is highly regarded in terms of aesthetics and biological productivity;[28] however, this fishery can be enhanced even further. The results of aquatic flow-habitat studies generally predicted that increasing minimum instream base flows from the current 40-50 cfs to between 175 and 200 cfs in summer and fall would provide the greatest abundance and highest habitat values for resident trout species. While PG&E and the Forest Service agree on a baseflow of 175 cfs, California Fish and Game determined that PG&E should implement a baseflow of 200 cfs. Modeling results indicated a negligible difference in the amount of aquatic habitat available with a 200-cfs baseflow, as compared to a 175-cfs baseflow. For this reason, coupled with the loss of generation associated with a 200-cfs flow, we do not recommend the California Fish and Game minimum flow regime.

Most flow recommendations from licensing participants are designed to create a seasonal hydrograph that is more typical of natural patterns for the lower McCloud River by increasing flows from the minimum baseflow during late winter and early spring followed by decreasing flows through late spring returning to the baseflow through the summer and fall. Specifically, the Forest Service and PG&E recommend increasing flow twice a month beginning in mid-February, depending on the relative rate of runoff in a given year as determined by the water year (as described in DWR Bulletin 120), reaching a peak of 550 cfs in normal water years. Studies predicted that the maximal trout spawning occurs between 300 and 400 cfs. Under the current license, the flow regime does not provide for these high late winter − spring flows that mimic the natural hydrograph.

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[27] We now refer to Forest Service condition 19 minimum flows and the identical PG&E alternative minimum flows as "Forest Service / PG&E minimum flow regime."

[28] California Fish and Game designates the Lower McCloud River a "Wild Trout Water," defined as: "aesthetically pleasing and environmentally productive streams … managed exclusively for wild trout, where the trout populations are managed with appropriate regulations to be largely unaffected by the angling process." This designation is similar to the "blue ribbon" designation used in other states.

California Trout's minimum flow recommendations[29] (table 3-24) differ slightly from the Forest Service / PG&E flow regime, although it too attempts to mimic the natural hydrograph in the spring. Under California Trout's flow regime, flows would increase at a slower rate beginning March 16 during normal to dry years and decrease at a faster rate after April 15 during normal to wet years (table 3-24). As compared to the Forest Service / PG&E flow regime, these slight changes in the rate of increase and decrease in spring flows are not likely to have a significant effect on available habitat for various trout life stages, and would still provide some benefits to spawning rainbow trout. California Trout's lower late winter − spring flow recommendation may provide some additional benefits to anglers by allowing more wadeable conditions during the early trout fishing season, as discussed below. The McCloud RiverKeepers recommended that minimum flows be established at 100 cfs year-round at McCloud dam and flows varying by month ranging from 160 to 210 cfs (table 3-25). While this recommendation would increase minimum flows compared to the current license, it would not create a more natural seasonally varying flow regime as offered by the other recommendations. Seasonal variation in flow typical of most streams in lower mountain and foothill landscapes helps create diverse aquatic habitat, promotes ecological diversity, and benefits wild and native species that have adapted to seasonally variable conditions. Because the McCloud RiverKeepers' recommended minimum flow regime does not include this seasonal variability, we do not recommend it.

Recreation Flows

PG&E proposed to provide a recreation flow event from McCloud dam if a natural spill flow event of at least 300 cfs for seven consecutive days during the period of April 1 through October 31 has not occurred at any time in the previous three calendar years. PG&E defined a recreation flow event as a minimum flow release of 300 cfs from McCloud dam, for 11 consecutive days during the period between May 15 and June 15. PG&E alternative condition 19 proposes flows different from PG&E's own proposed recreation flow event due to lack of support from stakeholders. While the Forest Service did not specify flows for recreational boating, it comments that its proposed flow regime would provide many more angling boating days than currently exist, especially in drier years, and that the flow regime is not significantly different than the current flow regime in terms of whitewater boating. Further, the Forest Service notes that a few more whitewater boating days actually would be provided in wetter years under the proposed flow regime.

American Whitewater recommends the release of elevated flows in April and May to provide whitewater boating opportunities in addition to ecological benefits. In wet and above normal water years, American Whitewater recommends peak flows of 600 cfs through April and a ramping down of flows through May. In below normal water years,

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[29] Trout Unlimited and the McCloud River Club filed minimum flow recommendations identical to California Trout's recommendation.

American Whitewater recommends flows of at least 400 cfs during the month of April. In dry and critically dry years, American Whitewater recommends flows of 300 cfs ramping down to 200 cfs base flows by the opening day of trout season.

As noted in section 3.3.2, *Aquatic Resources*, in the surveys conducted for the relicensing proceeding, anglers and guides indicated higher flows diminish fishing quality by decreasing the angler's ability to wade, cross the water, and cast, as well as decreasing fishable water and safety. Focus groups indicated that optimal angling flows existed between 200 and 300 cfs, while flows higher than 300 cfs were too stressful for all but the youngest and most aggressive waders. In addition, while higher flows still allow for some fishable locations, there are fewer of them and each has a smaller fishable area, creating the potential for overfishing. PG&E's controlled flow study also found that as flow increased, use levels decreased, with fewer anglers fishing for shorter durations.[30] Though all angling groups and Lower McCloud River users support enhancing aquatic habitat in the Lower McCloud River, most do not support flow releases for whitewater recreational boating in the Lower McCloud River. The groups oppose changes from the existing daily flow requirements in the Lower McCloud River due to concerns for angler safety and in order to preserve the high quality trout fishing for California licensed anglers. Fishing is open in the Lower McCloud River from the last Saturday in April through November 15. Under current conditions, after high spring flow conditions, the river is usually fishable by mid-May.

As previously stated, California Trout's spring pulse flow regime is slightly different than the Forest Service / PG&E's spring pulse flow regime. Under California Trout's flow regime, flows would increase at a slower rate at the beginning of the season during normal to dry years and decrease at a faster rate at the end of the season during normal to wet years. Additionally, during normal to dry years the spring pulse flow would peak at approximately 450 to 100 cfs lower than the peak flow under the Forest Service / PG&E's regime in similar conditions. Therefore, during normal to wet years, California Trout's regime would allow for optimal angling conditions, between 200 and 300 cfs, up to four weeks earlier in the fishing season than in the Forest Service / PG&E's regime. California Trout's recommendation would increase angling opportunities by allowing anglers to access the river earlier in the fishing season.

In comparison to existing flows at the project, the Forest Service and PG&E's minimum flow regime would likely result in an additional 100 cfs available in the reach in late March through mid-May in wet years and an additional 200 cfs in mid-April through early June in very wet years, therefore providing more opportunities for whitewater boating than currently exist during these water years. California Trout's recommended flow regime would likely provide for fewer days with flows greater than 300 cfs in wet years and fewer days with flows greater than 600 cfs in very wet years;

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[30] Technical Memorandum 58: Lower McCloud River Report on Flows and Fishing Conditions (RL-S3).

however, California Trout's proposal would still create more early spring whitewater opportunities than currently exist. Although American Whitewater's recommendation and PG&E's original proposal to release higher peak flows in April would create more opportunity for whitewater boating at the project overall, these higher flows would decrease the number of angling days at the project in all but critically dry water-years and potentially compromise the safety of those anglers who wade in the stream to fish.

Conclusion

In making a final minimum flow recommendation for the Lower McCloud River, in addition to power generation, we must weigh the needs of aquatic resources, anglers, and recreational boaters. Given the importance of the existing blue ribbon fishery in the Lower McCloud River, we give more weight to safe angling opportunities than to recreational boating. Therefore, for reasons noted above, we do not recommend American Whitewater's recreational spring boating releases.

We conclude that the minimum flow regime recommended by California Trout strikes the best balance between angling opportunities, aquatic resources, and recreational boating because this regime would provide more aquatic habitat and create some early spring whitewater opportunities while still making sure the river is accessible for fishing by mid-May. While the Forest Service / PG&E minimum flow regime would also provide these opportunities and enhancements, including more aquatic habitat and recreational boating, it would result in fewer angling opportunities early in the fishing season in a majority of water years. As such, and because the costs associated with both recommendations are similar, we do not recommend the Forest Service / PG&E's minimum flow regime. Instead, we recommend that PG&E implement the California Trout recommended flow regime (table 3-24). We estimate this flow regime would reduce the average annual power generation at the project by 40 GWh and would reduce the annual net benefit of the project by $3,500,000, compared to current operations. Given the enhancements noted above, however, we conclude that implementation of the minimum flow regime is worth the cost.

Flow Compliance and Monitoring

PG&E and Forest Service / California Fish and Game have proposed different methods to measure compliance with the proposed minimum flow releases, although the two approaches appear to accomplish essentially the same goal by requiring compensation for under-release of minimum flows.

PG&E proposes that the minimum flow requirements be met on the basis of the seven-day running average of mean daily flow. PG&E proposes the following: (1) individual mean daily flows may be less than the required minimum stream flow; (2) however, the instantaneous 15-minute stream flow should be at least 90 percent of the required minimum stream flow; and (3) the seven-day running average of the daily mean be equivalent to or greater than the required minimum flow. Therefore, any under-

release could be averaged out by over-releases on other days within each successive seven-day window (averaging period).

Under Forest Service condition 19 and the California Fish and Game recommendation, PG&E would release the equivalent under-released volume of water within seven days following the discovery of the under-release. Credit for such additional releases would not exceed 20 percent of the instantaneous flow amount, when used to attain the equivalent of the under-released volume. In addition to this provision, if PG&E finds that flow releases are non-compliant, it would be required to notify the Commission of the potential violation, and to take immediate action to return to compliance.

Both PG&E alternative condition 19 and Forest Service condition 19 / the California Fish and Game recommendation accomplish the same objective. However, PG&E's proposal to determine compliance via a seven-day running average provides a better defined and more reliable accounting mechanism that can be verified by any outside entity and is consistent with flow compliance mechanisms used at other Commission-licensed projects. Further, we note that if PG&E were found to be in non-compliance by the Commission, it would be required to take immediate action to return to compliance consistent with Forest Service condition19. Therefore, staff recommends PG&E's proposed method.

In its license application, PG&E proposed to change the compliance point for measuring instream flows below McCloud dam from gage MC-1 to gage MC-7, and provide real-time flow data on the internet from gage MC-1. California Fish and Game supported PG&E's proposal for a single compliance point near McCloud dam and NMFS also recommended a single compliance point at either MC-7 or MC-1. In contrast, Forest Service condition 19 specified flows be measured at two compliance points (MC-1 and near the dam) for McCloud dam. PG&E alternative condition 19 proposed the use of two compliance points below McCloud dam.

The Ah-Di-Nah gage (MC-1) captures flow augmentation from Hawkins Creek immediately upstream of the gage. Thus, under current conditions, the minimum flow between the dam and Hawkins Creek (gage MC-7) can be as low as 40 cfs, as long as flow from Hawkins Creek is adequate to augment flows to the required minimum at the MC-1 gage. In order to assure that flows are augmented below Hawkins Creek, even during dry periods and dry years when flows from Hawkins Creek could be minimal, PG&E and the Forest Service proposed increasing the minimum flow at McCloud dam if needed. Thus, at any time during the year, if discharge from Hawkins Creek is not adequate enough to augment flows in the lower McCloud River to meet the minimum instream flow requirement at MC-1, PG&E would be required to release additional flow from the dam. We find the Forest Service's specification to use two compliance points below McCloud dam to be reasonable because it would ensure minimum flows at the dam are adequate to provide sufficient habitat for fish and other aquatic biota throughout the entire reach between McCloud dam and Squaw Valley Creek.

The Forest Service also specified the use of existing compliance points for Iron Canyon dam and Pit 7 dam and that PG&E must provide flow values (generally 15-minute interval recordings) to resource agencies upon request. In addition, the Forest Service specified that PG&E operate, maintain, and, if necessary, modify under USGS supervision, all existing gages needed to determine the river stage and minimum instream flow in project-affected reaches, and the Forest Service specified the methodology that PG&E must utilize to determine water year type and guide implementation of minimum flows. The Forest Service specified the use of the DWR 120 Bulletin of the Sacramento River near Redding to determine water year type for the implementation of minimum flows. Addressing Forest Service condition 19, PG&E alternative condition 19 includes an alternative water year index, the DWR 120 Bulletin of the McCloud River above Shasta Lake, for implementing minimum flows as specified by the Forest Service, which is consistent with the water year type determination specified by the Forest Service for the Lower McCloud River. We recommend PG&E's alternative water year index as it provides a better representation of local hydrology and serves as a consistent methodology for implementing minimum flows on both the McCloud River and Iron Canyon Creek.

Continued operation of the USGS gages in each of the affected reaches, including any modifications that may be required to accurately measure minimum flows or ramping rates that are included in the new license, would help to ensure that these gages remain functional and can be used to effectively monitor compliance with flow-related measures included in the new license. The gages would also help to ensure that flow data continues to be available to other water users in the basin and to the general public. Provision of flow data recorded at 15-minute intervals to the agencies upon request would help to verify compliance with any instantaneous flows and ramping rates that are included in the license. We estimate that funding the continued operation of the USGS gages would have an annualized cost of $120,000. Because continued operation of these gages is needed to verify license compliance and to ensure that the benefits of implementing minimum flows to the project affected reaches are realized, we conclude that the benefits of this measure are worth its costs.

Ramping Rates

Under the existing license, there are no ramping rate requirements downstream of any project impoundments and no ramping is required when changing between seasonal required minimum flow rates. PG&E proposes to establish a good-faith effort to achieve a target maximum upramping rate of 100 cfs per hour for spill flows at McCloud dam prior to the start of an uncontrolled spill event. This upramping rate is consistent with current practice, although the existing project license does not require it. American Whitewater proposed alternative upramping rates at McCloud dam using stage rather than flow as a unit of measure for ramping operational controllable spills in order to provide flow rates that more closely mimic the natural hydrograph. Specifically, American Whitewater proposed maximum upramping rates based on river stage, 1-ft per 24 hours, as measured at gage MC-7.

Upramping of spill events, to the extent possible, allows aquatic organisms time to seek refuge before high flow events and prevents excessive scour and destruction of instream habitat structures. The relationship between flow and water depth (stage-discharge) varies along the stream channel depending on the complexity and configuration of the channel cross-section and in particular the dimensions of the floodplain; therefore, the gage location may not be indicative to the stage-discharge relationship throughout much of the reach that it represents. Therefore, it is appropriate to control ramping rates through changes in flow rather than American Whitewater's stage-discharge method. Because PG&E's proposed upramping procedure would help protect aquatic resources, we recommend it.

PG&E does not propose to downramp seasonal high flows. California Fish and Game recommended and the Forest Service specified that PG&E ramp down all McCloud dam spill events once the spill reaches 1,000 cfs at which point the control valve could be used to control the discharge. Downramping would proceed at a 150-cfs decrease every 48 hours until the prescribed minimum instream flow value is reached. Additionally, operational controllable spills would be upramped in increments not to exceed 200 cfs in a 24-hour period. In its alternative recommendation, PG&E incorporated the downramping schedule outlined by California Fish and Game and the Forest Service. American Whitewater proposed downramping rates of 0.2 ft per 48 hours until the prescribed minimum flow value is reached, as measured at MC-7.

Rapid changes in streamflow have the potential to strand and kill young fish and macroinvertebrates, and may also cause adverse effects on amphibians including the foothill yellow-legged frog. Our recommended ramping protocol would reduce the potential for fish stranding at times when flows are reduced following spill flows. As previously explained, we find that the existing gage provides an appropriate control cross section for determining the relationship between flow and stage. It is appropriate, therefore, to control ramping rates through changes in flow rather than stage. Implementing ramping rates would have a negligible cost; therefore, we conclude the benefits of this measure warrant the cost.

PG&E also did not propose flow ramping for annual dam safety valve testing at Iron Canyon Creek. California Fish and Game recommended and the Forest Service specified that valve testing for dam safety compliance at Iron Canyon dam be conducted between March 5 and March 15 when the highest instream flows are released, in order to minimize impacts to the reproductive success of breeding aquatic organisms, that these flows should be kept to the minimum level allowable (possibly in the range of 150 cfs) to minimize channel damage, and that upramping and downramping related to testing of the flow valve at Iron Canyon dam should occur in 20-cfs increments, assuming a 200-cfs maximum. PG&E proposed an alternative valve testing schedule of March 1 to March 31 to allow for potential winter access issues and associated safety risks. We recommend the inclusion of flow ramping procedures, as recommended by California Fish and Game and specified by the Forest Service for valve testing at McCloud dam and Iron Canyon dam. Implementing ramping rates would improve on existing conditions by providing a

clearly documented procedure for reducing high flows associated with operational testing to reduce effects on aquatic resources. Our recommended ramping protocol would reduce the potential for fish stranding at times when flows are reduced following proposed test valve flow releases, as well as minimize the impacts to spring breeding aquatic organisms. However, we recommend including PG&E's alternative schedule for the Iron Canyon safety valve testing for dam compliance in the staff alternative to ensure safety at the project. The timing, frequency, and magnitude of natural peak spring runoff events can be highly variable depending on storms and snowmelt; therefore, shifting the valve test one to two weeks earlier or later to accommodate safety and access is not likely to have adverse effects on aquatic resources.

Water Quality and Temperature Monitoring Plan

PG&E proposes to develop and implement a water quality and temperature monitoring plan in consultation with the California Water Board, the Forest Service, California Fish and Game, and other interested parties within one year of license issuance. Under the plan, PG&E would provide monitoring for temperature, turbidity, and contaminants in project affected reaches and reservoirs.

Forest Service condition 20 is similar to PG&E's proposed water quality plan, but includes a schedule and monitoring requirements for project affected reaches. The Forest Service specified that PG&E: conduct periodic monitoring of contaminants including *E. coli* in all project reservoirs once every five years for the term of the license; conduct periodic monitoring of dissolved oxygen at McCloud, Pit 6, and Pit 7 reservoirs for the term of the license; conduct annual monitoring of temperature for 10 years, with additional monitoring if temperatures exceed 20°C in reservoirs or downstream reaches; conduct continuous monitoring of turbidity in the Lower McCloud River during the fishing season and provide real-time turbidity information on PG&E's public project website; conduct turbidity monitoring for at least five years in Iron Canyon Creek at MC-10; and implement BMPs to satisfy Aquatic Conservation Strategy objectives.

In response, the water quality plan proposed in PG&E alternative condition 20 generally supported the Forest Service specifications but recommended the plan be filed within two years following issuance of the license. In addition, PG&E proposed an alternative schedule for deployment and maintenance of temperature and turbidity sensors because of potential access and safety issues resulting from inclement weather during the period specified by the Forest Service. PG&E also proposed a provision to terminate turbidity monitoring in Iron Canyon Creek if, at any time during the specified five-year period, the Forest Service determines that turbidity has been sufficiently reduced. Lastly, PG&E indicated that deployment of temperature and turbidity monitoring sensors in some areas may be subject to landowner permission.

We find that one year following issuance of the license is ample time to adequately develop all components and elements of the water quality temperature monitoring plan; however, we support providing PG&E with some flexibility in the specified schedule for deployment and maintenance of water quality and turbidity sensors

to ensure safety at the project and to address issues associated with access during inclement weather or to private land, if necessary. We recommend that PG&E consult with the Forest Service regarding the termination of turbidity monitoring in Iron Canyon Creek, as proposed. Monitoring of contaminants, including *E. coli*, in project reservoirs would provide information that could be used to ensure public health and determine potential impacts of project facilities or operations. Dissolved oxygen data collected periodically from McCloud, Pit 6, and Pit 7 reservoirs would ensure concentrations of dissolved oxygen in project reservoirs are sufficient to support aquatic life and to determine effects, if any, of changes to project operations resulting from the proposed operational changes under the new license. Temperature data collected from project reaches and reservoirs would ensure project operations are providing conditions supportive of resident fish populations. Continuous monitoring of turbidity in the Lower McCloud River during the fishing season and providing real-time turbidity on the licensee's public project website would provide valuable information to recreation users. Continuous monitoring of turbidity in Iron Canyon Creek for at least five years would provide information on the effectiveness of mitigation actions and ensure levels are reduced to at or below the basin plan levels. Implementing BMPs would be beneficial for minimizing any impacts to aquatic resources associated with O&M activities, recreation, land use, and other practices associated with the project. We estimate that developing the water quality and temperature monitoring plan specified by the Forest Service and modified by PG&E would have an annualized cost of $86,179. Given the benefits of water quality monitoring and temperature parameters, as described, we conclude that the benefits of this measure are worth the costs.

Fish Entrainment

Entrainment of fish into hydroelectric intakes typically causes injury or mortality to a portion of the fish that are entrained, with mortality rates tending to be lower for smaller fish and higher for turbines that operate under higher levels of head, with higher rotational speeds, and with smaller passageways. PG&E developed and implemented a study in consultation with the agencies to assess the potential for entrainment losses to affect fish populations in the project area. The results of PG&E's entrainment studies and literature review indicate that entrainment potential at the project intakes is negligible. Therefore, PG&E did not propose any measures to protect fish from entrainment.

NMFS recommends that PG&E construct effective screening facilities at project intakes following the return of listed salmonid species. No listed anadromous salmonids would be expected to have access to habitat in the lower McCloud River until upstream migration of listed species is implemented through Lake Shasta; therefore, at this time the screening facilities recommended by NMFS would provide no benefit for listed species. However, we recommend, at such time as fish passage facilities provide access to these reaches for listed salmonid species, the need for screening facilities can be re-evaluated based on fish population monitoring studies included in the new license.

Aquatic Biological Management and Monitoring Plan

Forest Service condition 20 specifies that PG&E develop and implement an aquatic biological monitoring plan within 1 year of license issuance, in consultation with interested parties and approved by the Forest Service, for fish, benthic macroinvertebrates, special-status aquatic mollusks, special-status species, and invasive aquatic species in the McCloud River and Iron Canyon Creek. The plan specifies periodic sampling of fish, benthic macroinvertebrates, and special-status mollusks once every three years for the first nine years, and then once every five years thereafter. The number of sites, site locations, sampling methods, and data protocols would be consistent with pre-filing relicensing studies and plans for PG&E's recently relicensed Pit 3, 4, 5 Project. In addition, the Forest Service specifies a reporting requirement for providing monitoring results.

PG&E generally supports the aquatic biological management plan specified by the Forest Service, but proposes clarification in PG&E alternative condition 20 to the wording, schedule, and consultation requirements of the plan. However, PG&E proposes that following license issuance, two years, rather than the one year specified by the Forest Service, would be more adequate to develop and finalize the aquatic biological management and monitoring plan. PG&E also proposes consultation with the Forest Service, and if necessary, other interested parties rather than the specific parties identified by the Forest Service. In addition, PG&E proposes monitoring of only stream fish populations rather than reservoir and stream fish populations recommended by the Forest Service.

We support the development and implementation of an aquatic biological management and monitoring plan specified by the Forest Service with the minor changes proposed by PG&E in its alternative. PG&E's proposed changes to the Forest Service plan provide clarification without substantially altering its intent. We expect that one year is adequate time to produce the aquatic biological management plan. Additionally, there should be adequate time to monitor benthic macroinvertebrates once within the first three years. For special-status aquatic mollusks, given that it could take PG&E up to 18 months following issuance of the license by the Commission to prepare the aquatic resources sampling plan, we agree that the first survey should be initiated no later than the third year following issuance of the license. This will allow three surveys to be completed within the first nine years of the license. Analysis of project reservoir fish population data obtained during project relicensing studies indicated that fish populations do not appear to be affected by project operations and are sustained by natural production and fish stocking. Therefore, monitoring of fish populations in project reservoirs would provide little additional useful information. Furthermore, we expect that monitoring and evaluation of fish populations in project reservoirs would be conducted, as needed, as part of PG&E's proposed fish stocking plan (discussed below under *Recreation*), and therefore do not support additional monitoring studies in project reservoirs specified by the Forest Service. We estimate that developing the aquatic biological management and monitoring plan specified by the Forest Service and modified

by PG&E would have an annualized cost of $195,169. Because biological monitoring would assist with determining the effects of any changes in operation or measures that are implemented in the new license to enhance resident fish populations, and with assessing whether any modifications or additional measures are needed, we conclude the benefits of the program are worth the costs.

Fish Passage

Forest Service condition 20 specifies that, within one year of license issuance, as a component of the aquatic biological management plan, PG&E develop specific management actions and schedule for providing fish passage and monitoring for affected reservoir streams, in consultation with the Forest Service, California Fish and Game, potentially affected tribes, and other interested parties.

These management actions specified by the Forest Service include:

- Constructing or correcting fish passage structures on Deadlun, McGill, Cedar Salt Log, Little Gap, and Gap Creek on Iron Canyon reservoir and Tarantula Gulch and Battle Creek on McCloud reservoir.
- Maintaining the fish passage structures on an annual basis, if needed, concurrent with road condition surveys.
- Monitoring each stream reach every three years to determine fish passage structure effectiveness.
- PG&E would provide the results of fish passage monitoring concurrently with aquatic monitoring reports.

PG&E alternative condition 20 proposes that roads impeding fish passage on tributaries to the project reservoirs are not project roads, and therefore PG&E is not responsible for maintaining fish passage structures associated with these roads. However, PG&E did indicate that it would provide compensation to the Forest Service for fish passage maintenance as part of an off-license road agreement.

We question the nexus of the Forest Service fish passage condition with effects from the project. We concur with PG&E that because the Forest Service roads are not project roads, PG&E is not responsible for maintaining fish passage. It is clear that these roads and any resulting impediments to fish passage would be manifested with or without the project. Subsequently, we have not included this provision in our staff alternative.

Listed Salmonid Technical Integration Committee

NMFS filed a recommendation that, as soon as listed salmonids are documented within the McCloud River and affected by the project, PG&E should, in consultation with the U.S. Bureau of Reclamation, NMFS, FWS, California Fish and Game, and the Commission, create and implement a Listed Salmonid Technical Integration Committee. According to the recommendation, the Listed Salmonid Technical Integration Committee would assess and mitigate the project's effects on listed salmonids and could be

integrated with the existing Fish Passage Steering Committee (or affiliated Technical Advisory Committees) to begin discussions of passage logistics at Shasta dam habitat assessments that include studies of McCloud River historic anadromous salmonid habitats.

No listed anadromous salmonids would be expected to have access to the lower McCloud River until upstream fish passage is implemented through the Keswick and Shasta dams, downstream of the project. In concert with continuing consultation, the adaptive nature of proposed and specified existing biological and habitat monitoring programs will allow for the re-evaluation of project mitigation and enhancement measures at such time as fish passage facilities provide access to project reaches for listed salmonid species. We estimate that, upon implementation, the annualized cost of this measure would be $20,000. Because proposed and specified biological and habitat monitoring programs will provide a mechanism for the continuing evaluation of project and mitigation and enhancement measures, including the evaluation of environmental requirements for listed salmonids, we do not recommend requiring PG&E to implement a Listed Salmonid Technical Integration Committee, as the measure is not worth the cost.

Terrestrial Resources

Vegetation and Invasive Weed Management Plan

Project operations may potentially affect vegetation through the introduction and spreading of invasive weed species. Any O&M activities that disturb soil or remove existing vegetation could increase the spread of invasive weeds and would have a direct effect on vegetation and associated wildlife species. Potential indirect project effects could come from recreational users that spread invasive weed seeds or other regenerative plant materials from colonized to non-colonized areas or whose activities disturb existing plant communities.

PG&E proposes a vegetation management plan that would minimize adverse effects on the environment, protect special-status species and culturally significant plants, control the spread of noxious weeds, and ensure revegetation of disturbed sites. Development and implementation of a vegetation management plan would provide guidance, methods, and protocols for management and monitoring of botanical resources, including special-status species, within the project area.

Forest Service condition 25 specifies that the licensee file a vegetation and invasive weed management plan within one year of license issuance that would include: treatment protocols and measures for removing or trimming vegetation within the project and project-affected area; specific conditions for the protection of special-status and culturally significant plants and populations; invasive species management and monitoring; and pesticide or herbicide use restrictions and prohibitions. The licensee would be required to consult with the Forest Service annually to review procedures for special-status species surveys. Forest Service condition 25 also specifies that periodic monitoring of special-status and culturally significant plants should occur every five

years at known locations and every 10 years for the entire project and project-affected area.

Forest Service condition 15 specifies that the licensee exclude the use of pesticides and herbicides on NFS lands unless prior written approval is received from the Forest Service. Materials used would be limited to those registered by U.S. EPA and consistent with those used by the Forest Service at Shasta-Trinity National Forest.

PG&E alternative condition 25 proposes revisions to the schedule for preparation and implementation of the vegetation and invasive weed management plan and the language of a few of the plan's elements. PG&E alternative condition 25 would provide a period of two years to develop the vegetation management plan, which is consistent with PG&E's original proposal. Additionally, PG&E would limit culturally significant plant species to those species associated with TCPs and limit special-status species to those on a list of high priority species, to be developed in consultation with the Forest Service, FWS, NMFS, and other agencies, as appropriate.

Although both PG&E and the Forest Service propose to develop a plan to manage vegetation within the project area, we have enough information now to recommend the implementation of Forest Service condition 25 with modifications to include language from PG&E alternative condition 25. We recommend several of the licensee's proposed modifications to the invasive weed monitoring strategy, including the alternative language regarding frequency and extent of the monitoring. Annual monitoring of ground or vegetation disturbance areas would be adequate in determining establishment of noxious weed populations and allow responsive management treatment to manage and control spread. Where high priority weed species are growing undisturbed, it would be adequate for the licensee to monitor every five years in conjunction with other noxious weed surveys and mapping. Should treatment or management be deemed necessary, those populations would revert to the proposed annual monitoring for three years. We also recommend that during the development of the vegetation management plan, the licensee, agencies, and interested parties reach consensus on the list of high-priority species of noxious weeds.

Additionally, we recommend inclusion of the licensee-provided alternative language in the vegetation and invasive weed management plan specifying that culturally significant plant species monitoring would be limited in scope to only those populations associated with TCPs and above a certain threshold size; currently there are no populations that fit this criterion. Surveys conducted every five years, concurrently with other vegetation monitoring, would determine the range and extent of culturally significant plant populations, and newly identified populations would be made known to tribal members and assessed under the National Historic Preservation Act. Pre-construction surveys for culturally significant plant species would be conducted concurrently with those for special-status plant species.

Furthermore, we recommend the inclusion of language to address the use of BMPs to avoid/minimize effects on wetlands and the use of native vegetation for restoration activities in areas disturbed by project activities, as originally proposed by PG&E.

Application of pesticides and herbicides on Forest Service lands within the project area may occur as treatment or control methods for invasive weed species, as contained within the proposed vegetation and invasive weed management plan. However, Forest Service condition 15 requires PG&E to exclude the use of pesticides and herbicides on NFS land, unless prior written approval is received first from the Forest Service.

We consider the proposed staff alternative measure for managing vegetation, controlling the spread of noxious weeds, monitoring and protecting culturally significant plant species, and limiting the use of pesticides and herbicides to represent an effective approach to minimizing and avoiding project-related effects on vegetation and the wildlife that depend on this vegetation for habitat. We estimate that the licensee's proposed plan would have an annualized cost of $332,101, and that our recommended approach would have an annualized cost of $336,901. Given the added benefits of implementing the staff recommended alternative as described above, we consider this cost to be warranted.

Terrestrial Biological Management Plan

PG&E proposes to develop a wildlife management plan that would provide protection and monitoring of special-status species, but also would protect the habitat and general wildlife populations that co-exist with special-status species. The licensee's proposed wildlife management plan would contain monitoring methodologies, preconstruction survey protocols, and avoidance and protection measures as appropriate for special-status species. The wildlife management plan proposed by the licensee also would include a process and schedule for reporting survey and monitoring results as well as a process for periodic plan review and revision. The licensee also proposes an avian hazard reduction measure to ensure transmission and distribution lines meet bird electrocution prevention standards as recommended by APLIC.

Forest Service condition 26 specifies development and implementation of a terrestrial biological management plan (TMBP)[31] that would include: (1) monitoring of populations and locations occupied by special-status species; (2) periodic surveys throughout the term of the license within the project and project-affected area to determine the location of any additional populations; and (3) reporting every five years (or at species-specific frequencies identified by the Forest Service) of terrestrial survey and monitoring results. Forest Service condition 26 also specifies pre- and post-

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[31] While PG&E proposes to develop a wildlife management plan and Forest Service condition 26 refers to a terrestrial biological management plan or TBMP, we note that these two plans are meant to address the same issues and the names are generally interchangeable.

construction surveys for Forest Service special-status species along with post-disturbance and construction monitoring to identify whether mitigation measures are necessary. The Forest Service specifies that the licensee conduct surveys for neotropical breeding birds within suitable habitat prior to disturbance activities or observe annual limited operating periods during April 1through August 30. Furthermore, within one year of license issuance, the licensee would be required to file with the Commission an avian collision and electrocution hazards plan approved by the Forest Service, in consultation with appropriate federal and state agencies, which minimizes adverse interactions between project transmission lines and avian species.

PG&E alternative condition 26 addresses the schedule for preparation and implementation of the TBMP and specific elements of the plan. PG&E alternative condition 26 would provide a period of two years to develop the TBMP, consistent with PG&E's original proposal. Additionally, survey areas where access is unsafe (steep terrain or high water flows) or private property for which the licensee does not have access would be excluded. Furthermore, instead of developing a plan, avian collision and electrocution hazards would be addressed by upgrading segments of existing distribution lines that do not currently meet the APLIC standards within three years of license issuance and ensuring that new lines would meet current APLIC standards. If existing and new poles are brought into compliance with APLIC standards, an avian hazard and electrocution plan would be unnecessary.

Although both PG&E and the Forest Service propose to develop a plan to manage wildlife within the project area, we have enough information now to recommend implementation of the TBMP with modifications to include language from PG&E alternative condition 26.

Regarding species-specific monitoring, we recommend that special-status amphibian and reptile monitoring surveys occur within one year of plan approval and every 10 years thereafter. Shasta salamanders are particularly susceptible to disturbance, and because construction is proposed within their known habitats, additional monitoring is justified. As such, we recommend the monitoring of Shasta salamander in known locations once per five years and suitable habitat monitoring once per 10 years, concurrent with other species surveys. Pre-construction monitoring would protect foothill yellow-legged frog and northwestern pond turtle within proposed disturbance activity and would preclude the need for surveys once every 10 years as specified by Forest Service condition 26. Northwestern pond turtle and foothill yellow-legged frog are adapted to conditions within the McCloud-Pit watershed under normal O&M and, therefore, a 10-year monitoring period as proposed by PG&E is acceptable for these species. Although, for the foothill yellow-legged frog, we recommend that specific suitable habitat in the project area be surveyed the first year after plan approval and every tenth year thereafter. We also recommend that the foothill yellow-legged frog monitoring plan, as proposed by the Forest Service in its 10(a) recommendation and with the modified time line as provided by the licensee, be incorporated into the TBMP under special-status species. Specific to northwestern pond turtle, the addition of

preconstruction surveys as proposed in PG&E alternative condition 26, in conjunction with implementation of a TBMP, would provide additional protection for the northwestern pond turtle.

For the bald eagle, American peregrine falcon, northern goshawk, and Southwestern willow flycatcher, we recommend, as proposed in PG&E alternative condition 26, that the following measures be incorporated into the TBMP:

- Pre-construction surveys for bald eagle would occur in suitable habitat within 1 mile of planned construction;
- Surveys for American peregrine falcon would occur within one year of plan approval and every fifth year thereafter at known nest sites and within suitable habitat specified by the presence of cliffs (Pit 6 and Pit 7 reaches of the Pit River Canyon, McCloud River downstream of McCloud dam, and Iron Canyon downstream of the Iron Canyon reservoir to the confluence with the Pit River), as an alternative to monitoring within 0.25 mile of known sites;
- Northern goshawk surveys would occur within 0.5 mile of proposed construction, as an alternative to monitoring within 0.25 mile once per five years; and
- Willow flycatcher surveys would begin the first year after plan approval and every fifth year thereafter, as alternative to once every five years, in contiguous suitable habitat within 300 ft (public lands) and 200 ft (on private lands with permission) from specific project features (Pit River from the James B. Black powerhouse tailrace to Lake Shasta, Iron Canyon Creek downstream of Iron Canyon dam, and the McCloud River from McCloud dam to Squaw Valley Creek, project water bodies including all reservoirs and the Pit 7 afterbay, and project-related recreation sites.

We recommend the inclusion of alternative language proposed by PG&E in the TBMP that clarifies the initiation of surveys and, in the case of American peregrine falcon and willow flycatcher, ensures that surveys are conducted in the habitat specifically available to the species within the project area. Details defining precise locations for surveys to occur should be a component of consultation with the Forest Service and other appropriate agencies and interested parties during the development of the TBMP. The language of PG&E alternative condition 25 identifying limits of disturbance also should be incorporated into the TBMP; however, we note that the application of specific survey distances could be limiting to the protective intent of the TBMP. As such, survey area designations should be coordinated with the Forest Service, FWS, NMFS, and other appropriate agencies during consultation and development of the plan.

We concur with the actions proposed by the licensee to bring existing transmission and distribution line poles into compliance with APLIC avian collision and electrocution hazard reduction standards and ensure future actions meet APLIC standards. We agree

with PG&E that implementation of these measures would negate the need for development of an avian hazard and electrocution plan.

We recommend the inclusion of alternative language in the TBMP clarifying that special-status bat species surveys would begin within the first year after plan approval and every fifth year thereafter. This clarified approach would be sufficient to assess the presence and roosting use of project facilities within the project area, and pre-construction surveys would provide the necessary interim prevention measure if disturbance from construction were probable. Sites would be identified in consultation with participating agencies, and this alternative language would provide a good mechanism for continued communication with agencies on the presence and status of bat species within the project area.

We consider the proposed staff alternative measure for monitoring and mitigating project effects on wildlife to represent an effective approach to minimize and avoid project-related effects on wildlife, including special-status species. We estimate that our recommended approach would have an annualized cost of $197,584. Given the benefits of implementing the staff recommended alternative as described above and the projected cost savings associated with the staff recommended alternative, we consider this cost to be warranted.

Threatened and Endangered Species

The VELB, Pacific fisher, and northern spotted owl are federally-listed threatened and endangered species that might occur within the project area and could potentially be affected by project O&M and any proposed construction measures. In order to protect threatened and endangered species, PG&E proposes a PM&E measure specifying that it would prepare a biological evaluation of the potential effects to Forest Service special-status species prior to any action to construct project features on NFS lands. In addition, specific measures for protection of elderberry are specified in the PG&E's programmatic biological opinion and incidental take permit (FWS, 2003); PG&E would apply these measures to routine O&M activities, including development and maintenance of recreational areas.

Forest Service condition 26 (the TBMP) includes components particular to the VELB, specifically that known suitable habitat should be monitored once every five years for VELB individuals, and if the species is detected, elderberry plants would be protected from disturbance. Regarding the northern spotted owl, Forest Service condition 26 would require monitoring for this species within 0.25 mile of suitable habitat in the project area once every five years. Surveys conducted once every 10 years in suitable habitat would identify new individuals, pairs, or nest sites. Surveys also would be conducted prior to any disturbance activities, or the licensee could schedule construction or disturbance activities outside of the limited operating period of February 1 through July 9. Regarding the Pacific fisher, Forest Service condition 26 specifies that the TBMP should provide for surveys to be conducted once every five years in suitable habitat within the project and project-affected areas.

Forest Service condition 11 specifies that the licensee prepare a biological evaluation prior to any proposed action to construct project features on NFS lands. This measure is consistent with PG&E's proposed measure. NMFS and FWS also recommend that PG&E prepare a biological evaluation prior to construction of new project features or non-routine maintenance activities that may affect special-status species or their habitats.

PG&E alternative condition 26 proposes alternative language that provides more specificity to the monitoring schedule and survey area designations specified by the Forest Service. PG&E alternative condition 26 proposes:

- Pre-construction surveys for the presence of elderberry shrubs would be conducted for construction proposed below 3,000 ft msl in the project area, and a 100-ft protective buffer would be provided around any identified VELB habitat during construction consistent with the FWS biological opinion for VELB. Monitoring surveys also would be conducted in areas of known VELB habitat every five years, concurrently with noxious weed and vegetation surveys.
- Pre-construction surveys for the presence of northern spotted owl would be conducted in suitable habitat within 1.3 miles of proposed construction. Surveys would follow standard protocols for the species. Alternatively, the licensee could schedule construction activity for outside of the limited operating period of February 1 to July 9.
- Pre-construction surveys for the presence of Pacific fisher would occur in areas of suitable habitat within 0.5 mile of any planned construction.

We recommend that PG&E alternative condition 26 language be adopted into the TBMP, as it provides more specifics and makes more efficient use of survey time within the project area. The range of elderberry growth is limited by elevation, so maintaining surveys below 3,000 ft msl is adequate for pre-construction surveys. Pre-construction surveys and avoidance, protection, or mitigation measures for construction consistent with those outlined in the VELB conservation program should be implemented to minimize effects from construction on the population of elderberry located along the proposed access road corridor for the construction of the Pit 7 afterbay powerhouse. Additional monitoring of known elderberry populations could be implemented concurrent with five-year monitoring conducted as part of the vegetation and invasive weed management plan. We expect that PG&E alternative condition 26 language, when implemented as proposed, would minimize any potential effects to elderberry populations within the project area from O&M activities and most construction activity. We also recommend implementing Forest Service condition 11, but modify it to include all project lands. Requiring biological evaluations for special-status species on all project lands when constructing new facilities, instead of just NFS lands as specified by the Forest Service, would allow for more comprehensive protection of the species.

Although potential habitat for the northern spotted owl exists, no individuals are known to be present within the project area and we expect that pre-construction surveys as proposed by the licensee would sufficiently minimize any potential construction-related effects from disturbance. Alternatively, avoidance of construction activity during the limited operation period also would protect any individuals within the project area from construction activity.

Potential habitat for the Pacific fisher exists within the project boundary and while no individuals were located during PG&E's relicensing surveys, the Forest Service and FWS have identified the Pacific fisher as potentially occurring in the project vicinity based on tracks reported in the project vicinity in 1982, and a Pacific fisher skull found on the ridge between Fisher Creek and Bald Mountain Creek in the mid-1970s. More recently, a wildlife biologist observed a Pacific fisher crossing FR 11 on the northeast side of Iron Canyon reservoir on April 25, 2007. As such, we conclude that the species most likely is present within the project area. Due to the lack of known individuals, it is unlikely that normal project O&M activity or proposed construction would have an effect on the Pacific fisher. For the construction associated with the proposed additional generation units, preconstruction surveys, as proposed by PG&E, will provide adequate protection for the potential habitat that may occur within the project area.

We consider the staff alternative measure, which recommends Forest Service condition 26 and aspects of PG&E alternative condition 26, for monitoring and mitigating project effects on federally-listed wildlife species to represent an effective approach to minimizing and avoiding project-related effects. Costs for the proposed plans described above are included in the estimates for the *Terrestrial Biological Management Plan*, in section 5.2.1, *Discussion of Key Issues, Terrestrial Resources*. Given the benefits of implementing the staff recommended alternative as described above, we consider this cost to be warranted.

Recreation Resources

Fish Stocking

One of the primary recreational activities associated with the project includes angling and, based on recreation studies completed during the relicensing process, the demand for angling at the project is projected to increase over the term of a new license. In addition, the numerous proposed recreation facility upgrades and construction of new recreation facilities have the potential to result in increased angling pressure at the project. PG&E proposed to continue funding California Fish and Game for the stocking of up to 38,800 pounds of trout and 500,000 kokanee per fiscal year (July 1 through June 30) in the drainages of the Pit and McCloud Rivers between the uppermost project reservoir and Shasta Lake. In contrast, California Fish and Game, in its 10(j) recommendation, recommends that PG&E reimburse California Fish and Game for stocking of up to 60,000 pounds of trout annually within the McCloud-Pit Project boundary and that costs would be assessed at the standard rate for catchable-sized hatchery grown trout in the year of stocking. In addition, California Fish and Game

recommends that PG&E, if requested by California Fish and Game, pay $5,000 annually for monitoring and evaluation of the fish stocking program or for mitigation of sturgeon reintroduction into Shasta Lake. In its response comments, PG&E states that is agrees with California Fish and Game's fish stocking 10(j) recommendation

In 1942, the construction of Shasta Dam isolated a population of white sturgeon; however, the population was self-sustaining in the Pit River arm of Shasta Lake, until experiencing a decline in the 1970s and 80s. California Fish and Game began an experimental sturgeon planting program early in 1988 to evaluate stocking as a means of restoring the sturgeon fishery; however, the program was discontinued later that year due to disease problems in the rearing facilities.[32] California Fish and Game states that 1.8 percent of the planted sturgeon were caught or observed from 13 months to 13 years after stocking, indicating that low natural recruitment may be the cause of the sturgeon population decline.[33] California Fish and Game further suggests that the construction of Pit 6 and 7 dams in the early 1960s, which eliminated access to 16 miles of stream likely utilized by white sturgeon during spawning, likely caused the decline. There is no conclusive evidence, however, that the loss of riverine habitat, or any project-related effects, is directly correlated to the low recruitment of white sturgeon.

Increasing the number of fish stocked at the project would help meet the estimated future demand for angling at the project. Furthermore, annual monitoring and evaluation of the fish stocking program would provide the means for coordinated development to allow for the flexibility to increase or decrease stocking numbers over the term of a new license in order to meet future demand for angling. However, consistent with Commission policy to recommend a specific environmental measure for inclusion in a license, we must be assured that the measure relates to project impacts or project purposes.[34] At this time, and given low natural recruitment and the problems associated with the previous sturgeon planting program, it is not clear how $5,000 would be used to implement a mitigation program that would successfully maintain a white sturgeon population in Shasta Lake. Furthermore, it also is not clear at this time how the $5,000 would be used to monitor and evaluate the fish stocking program and we have no way of knowing if these funds would be used solely to evaluate the program at the project.

While PG&E agrees to reimburse California Fish and Game for fish stocking, we note that PG&E is ultimately responsible for the management of all project reservoirs and project reaches. Instead of recommending funding for California Fish and Game, we recommend PG&E be responsible for stocking 60,000 pounds of trout annually within

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[32] Licensee's Pre-Application Document.

[33] California Department of Fish and Game. 10(j) Recommendations for the McCloud-Pit Hydroelectric Project. January 28, 2010.

[34] For more information regarding the Commission's policy, please see the Commission's Policy Statement on Hydroelectric Licensing Settlements, issued September 21, 2006.

the project boundary and develop a fish stocking plan to evaluate and monitor the amount of fish to be stocked every six years. Accordingly, the number of pounds of fish to be stocked could fluctuate up or down on a six-year cycle depending on monitoring results. We estimate that the annualized cost of developing and implementing this plan would be $117,000, and we conclude that the benefits of this measure warrant the cost.

Recreation Management Plan

PG&E proposes to finalize the recreation development and management plan (recreation plan) after consultation with the Forest Service, California Fish and Game, California Water Board, and other interested parties, within two years of license issuance. In addition, PG&E proposes to develop and implement site rehabilitation measures for each existing recreation facility within 25 years of license issuance. By upgrading or replacing recreation facilities within 25 years of license issuance, recreation facilities and infrastructure would continue to provide safe, reliable public access to recreational opportunities at the project and would address growing recreational demand over the term of the new license. PG&E's proposal would allow the Forest Service and other stakeholders to have input in the development of these plans and would ensure the proposed measures would be implemented in a manner consistent with the Forest Service's management goals and other resource management plans at the project. Although coordination among the licensee, governmental agencies, and interested stakeholders is encouraged in development and implementation of the proposed recreation measures, the licensee is ultimately responsible for the construction, operation, and maintenance of the project's recreation facilities. The specific measures are discussed in more detail below.

McCloud Reservoir

PG&E's proposal to construct a day-use area, including a floating fishing/swimming platform, reconstruct and extend the existing one-lane boat ramp to 3 ft (vertical) below the minimum operating pool elevation, and add more parking spaces at Tarantula Gulch would help relieve overcrowding and reduce user conflicts at McCloud reservoir. Demand for boating access coupled with crowding issues at McCloud reservoir demonstrates the need for improved recreational boating access at the project. Moreover, constructing a floating fishing/swimming platform away from Tarantula Gulch boat ramp might alleviate overcrowding and user conflicts even further. The Forest Service specifies that PG&E reconstruct the Tarantula Gulch boat ramp to provide two lanes, instead of one, and a minimum of 4-ft draft clearance below minimal pool level to further reduce crowding at the ramp and include 30-40 more parking spaces. However, PG&E states that site constraints may affect the amount and type of improvements that can be made to project recreation facilities. Currently the bottom of the boat ramp is 1 ft below the normal minimum operating reservoir level (elevation 2,634 ft msl) and typically provides boater access during most of the recreation season. Reconstructing the boat ramp to 3-ft draft clearance, as proposed by PG&E, would provide even greater access and extend the current recreation boating season. We

recommend that PG&E reconstruct the Tarantula Gulch boat ramp with the toe of the ramp extending to an elevation no less than three vertical feet below minimum pool and that the boat ramp remain one lane. We also recommend PG&E construct a fishing/swimming platform and additional parking spaces.

Forest Service condition 30 specifies that PG&E provide lighting and snow plowing during the winter at the Tarantula Gulch boat ramp to provide safety for anglers fishing early or late in the day and to improve access at the ramp. Lighting would improve safety at the boat ramp and allow anglers to fish longer during the recreation season; however, there is little evidence to support snow plowing the ramp in winter months. Although 10 percent of visitors reported use of the reservoir during the winter and expressed the need for a longer use season, there is not enough use at McCloud reservoir during the winter season to warrant the Forest Service's specified snow plowing. We recommend, however, that PG&E provide lighting at the Tarantula Gulch boat ramp, which will allow anglers to fish longer by providing light during longer periods of the day.

There are no existing campgrounds at McCloud reservoir to meet existing or projected demand for overnight use; however, regular dispersed camping is occurring at Star City. PG&E's suitability assessment shows the only potential site to accommodate camping at the reservoir is at Star City. Providing a formal campground at this location, as proposed by PG&E and specified by the Forest Service, would help manage the already existing use and reduce negative impacts on natural resources by eliminating erosion and soil compaction from user-created trails and vehicles from dispersed camping and provide for proper sanitation disposal and trash removal. We recommend PG&E develop a campground at Star City with the inclusion of fire rings.

We estimate that the annualized cost of implementing these recreation measures at McCloud reservoir would be $1,855,645 and we conclude that the benefits associated with maintaining existing recreation facilities and expanding recreational opportunities at McCloud reservoir would be worth this cost.

Lower McCloud River

Constructing a day-use site and designing an access trail to accommodate both fishing and boating access at the Lower McCloud River, as proposed by PG&E and specified by Forest Service condition 30, would facilitate the use of the area by both anglers and boaters. Additionally, the Forest Service specifies that PG&E upgrade the user-created river trail from Ash Camp Campground to Ah-Di-Na Campground and reconstruct and provide operation and maintenance over the term of the license for Ash Camp and Ah-Di-Na Campground. PG&E does not propose to upgrade and maintain the Lower McCloud river trail nor does PG&E propose to reconstruct, operate, and maintain the Ash Camp and Ah-Di-Na Campground because it does not believe these are project facilities. The Forest Service notes that should it not reach agreement with PG&E regarding these facilities outside of the license, mitigation at Ash Camp and Ah-Di-Na Campground would be included in its modified 4(e) conditions.

Although upgrading the existing trail along the Lower McCloud River from Ash Camp Campground at the Ash Camp bridge / PCT junction to Ah-Di-Na Campground would improve access, our review does not lead us to conclude that the existing user-created trail or the campgrounds have a nexus to the project. These facilities are located on the Lower McCloud River, below the confluence with Squaw Valley Creek, about 6 miles below McCloud dam outside the project boundary. This stretch of the McCloud River, until it flows into Shasta Lake, is reasonably free of project effects due to natural aggregation of flows. As such, any angling and associated trail access near this portion of the Lower McCloud River would exist irrespective of the project.

We recommend PG&E construct a day-use facility at the base of McCloud dam. We estimate that the annualized cost of implementing this recreation measure at this location would be $89,609, and we conclude that the benefits associated with expanding recreational opportunities below McCloud dam would be worth this cost. For reasons noted above, we are not recommending upgrading the trail from Ash Camp to Ah-Di-Na and the reconstruction, operation, and maintenance of the Ash Camp and Ah-Di-Na Campground.

Iron Canyon Reservoir

PG&E proposes to reconstruct Hawkins Landing boat ramp and campground, and provide additional parking and restroom facilities, which would enhance recreational opportunities at Iron Canyon reservoir and ensure that the project recreation facilities meet current and future demand over the term of a new license. In addition, constructing a new boat ramp at Iron Canyon reservoir and providing additional shoreline access areas, also proposed by PG&E and specified by Forest Service condition 30, would increase boating access at the reservoir and help alleviate dispersed recreation use occurring along the shoreline. Forest Service condition 30 further specifies that PG&E provide three paved parking areas for up to three vehicles. In PG&E alternative condition 30, PG&E proposes to study the feasibility of providing the paved parking areas with pedestrian shorelines access trails. Constructing the proposed shoreline access areas with the addition of the parking areas would provide developed access areas along the shoreline to help alleviate some of the dispersed recreation use occurring along the reservoir shoreline.

We recommend that PG&E reconstruct the existing Hawkins Landing boat ramp and construct a new boat ramp at Iron Canyon reservoir that is usable at the reservoir's minimum operating pool (2,593 ft msl). In addition, we recommend PG&E construct three shoreline access areas that include paved parking with pedestrian trails to the shoreline. Because the Forest Service has not provided suggested locations for feasible sites, we recommend PG&E conduct a site evaluation, as proposed, within 90 days of license issuance to determine the locations for the three shoreline access areas.

Forest Service condition 30 also specifies that, if possible under reservoir operations, the Hawkins Landing boat ramp should be operable a minimum of 155 days during the recreation season and the new Iron Canyon reservoir boat ramp be functional

at 90 percent of operational lake levels. PG&E's proposal to construct the new, additional Iron Canyon dam boat ramp so that it is usable at the reservoir's minimum operating pool (2,593 ft msl) would result in public boating access to Iron Canyon reservoir over the entire recreation season and should accomplish the level of use the Forest Service is seeking. Furthermore, this additional boat ramp would help to alleviate overcrowding of the existing Hawkins Landing boat ramp. As such, we recommend that PG&E reconstruct the Hawkins Landing boat ramp and construct a new boat ramp at Iron Canyon dam that is functional at the reservoir's minimum operational lake levels (2,593 ft msl) during the recreation season.

Forest Service condition 30 specifies that PG&E relocate Deadlun Campground to one or two Forest Service-approved locations around Iron Canyon reservoir. Because dispersed camping generally occurs along the main body of Iron Canyon reservoir and the campground is currently located in a creek off the main body of the reservoir, the Forest Service states that relocating Deadlun Campground to a more desirable location would likely increase the use of this facility. PG&E states that poor facility conditions and upkeep of the campground may contribute to the prevalence of dispersed sites around the reservoir. As a result, PG&E originally proposed to reconstruct Deadlun Campground. PG&E alternative condition 30, however, proposes conducting a site assessment to determine if there are one or more suitable sites to relocate the existing Deadlun Campground along the Iron Canyon reservoir shoreline. If agreement can be reached on alternate location(s), PG&E would construct a new campground at the new location. If a suitable location(s) does not exist, however, PG&E would reconstruct the campground in its current location.

Reconstruction of Deadlun Campground at its existing location would improve camping opportunities at the reservoir, improve facility conditions, and increase capacity at the campground. Further, providing formal access to Iron Canyon reservoir shoreline from its existing location would likely increase the use of this facility and therefore alleviate dispersed camping around the reservoir. We do not see a need to relocate the campground and therefore recommend PG&E reconstruct Deadlun Campground in its existing location and provide access to the shoreline at this site.

The Forest Service specified that PG&E provide lighting and snow removal during March-April and December at the new, additional Iron Canyon dam boat ramp to ensure safety for anglers fishing early or late in the day. Lighting would allow anglers to fish longer during the recreation season and increase safety at the boat ramp. Therefore, we recommend that PG&E provide lighting at the new boat ramp, as specified in Forest Service condition 30.

The Forest Service also specifies that PG&E provide snow removal at the Iron Canyon boat ramp during the shoulder season (March/April and December) at the new parking area when Oak Mountain access road and the new Iron Canyon boat ramp surfaces are passable. PG&E alternative condition 30 proposes that PG&E would remove snow from the access road to the boat ramp, the boat ramp, and parking area

when project operations require snow removal from Oak Mountain Road. Although winter use is minimal at this site, because PG&E would already be plowing Oak Mountain Road, plowing the short access road, boat ramp, and small parking area would not add much additional time or cost. In addition, it would allow access to the boat ramp during the winter season, therefore extending the regular recreation use season.

We estimate that the annualized cost of implementing these recreation measures at Iron Canyon reservoir would be $1,408,466, and we conclude that the benefits associated expanding recreational opportunities at Iron Canyon reservoir would be worth this cost.

Pit 6 and 7 Reservoir Recreation Facilities

Forest Service condition 30 specifies that PG&E develop a shoreline trail at Pit 6 reservoir if capacity or demand (based on six-year recreation use monitoring) indicates increased use of the reservoir for fishing or boating. Providing access to the river near Pit 6 and 7 reservoirs would improve recreational access at the project if there is an increase in recreation use at the Pit 6 reservoir. This measure could be considered in the future if the recreation use data collected every six years shows it is warranted.

Additionally, constructing the proposed river access trail at the upper end of Pit 7 reservoir and conducting a feasibility assessment for providing a boat put-in or a hand-carry launch, as proposed by PG&E and specified by the Forest Service, at Montgomery Creek near the lower end of Pit 7 reservoir, would enhance access to Pit 7 reservoir for existing pedestrian fishing and hand-launch boating. The Forest Service further specifies that if Montgomery Creek is not feasible, PG&E would construct a second trailhead with parking for a minimum of three vehicles and develop a river access trail along one side of the reservoir for pedestrian fishing, and hand-launch boat access from the lower end of Pit 7 reservoir. PG&E has expressed concern for public safety if boating access is provided at the upper and lower portions of Pit 7 reservoir due to riverine high flows from the Pit 6 powerhouse and riverine conditions at low reservoir levels (fast flowing water) that could increase the likelihood of boats overtopping the dam and prevent boaters from returning upstream to exit the reservoir. Boating is prohibited within 500 ft of the dam and PG&E is concerned that providing shoreline access may encourage boating use which would create a concern for public safety. Although constructing a boat put-in or a hand-carry launch where Montgomery Creek enters Pit 7 reservoir would increase boating and fishing access, due to PG&E's public safety concerns, it would not be appropriate to launch boats at this location. Therefore, we do not recommend PG&E conduct a feasibility assessment for providing a hand-launch or boat put-in where Montgomery Creek enters Pit 7 reservoir.

We recommend PG&E construct a river access trail at the upper end of Pit 7 reservoir and a river access trail with parking at the lower end of Pit 7 reservoir. We estimate that the annualized cost of implementing this recreation measure at Pit 7 reservoir would be $17,324, and we conclude that the benefits associated with providing additional pedestrian access at Pit 7 reservoir would be worth this cost.

Pit 7 Afterbay Recreation Facilities

PG&E does not propose any new recreation facilities at the Pit 7 afterbay. Public access to the Pit 7 afterbay is currently restricted by PG&E for public safety reasons due to the rapidly fluctuating water level and strong water current. Both fencing and warning signs have been posted to prohibit shoreline and boating access. However, PG&E's proposal to reconstruct Fenders Flat day-use area (above Pit 7 afterbay dam), provide access near the proposed Pit 7 afterbay powerhouse, and provide parking at the end of the powerhouse access road or along Fenders Ferry Road, subject to public safety, would enhance recreational opportunities in the vicinity of the afterbay by formalizing this existing dispersed recreation area. Moreover, reconstructing Fenders Flat car-top boat launch would provide boater access to the Pit arm of Shasta Lake during late winter and early spring when high lake levels allow boat launching.

PG&E's proposal to upgrade the existing recreation facilities at Pit 7 afterbay and continue prohibiting public access to Pit 7 afterbay water surface by maintaining fencing, signage, and patrols would help to ensure public safety at the project. We recommend PG&E reconstruct recreation Fenders Flat day-use area and car-top boat launch at Pit 7 afterbay and continue to prohibit public access to Pit 7 afterbay water surface. We estimate that the annualized cost of implementing the recreation measures at Pit 7 reservoir would be $436,863, and we conclude that the benefits would be worth this cost.

Recreation Monitoring

Recreation use at the project is expected to double over the next 50 years. The level and type of recreation use and recreation user preferences could change over the term of a new license. PG&E proposal of periodic monitoring of recreation use, user preference surveys, assessment of facility capacity and recreation demand, and inventorying areas used for dispersed recreation would help to determine if the project's recreation facilities provide adequate public recreation access and meet user demand over the term of the license. In addition to PG&E's proposal, the Forest Service specifies that PG&E include monitoring of boat use during the recreation season at both McCloud and Iron Canyon reservoirs as a part of recreation monitoring efforts every six years. Monitoring boat use would help to identify excessive use and potential user conflicts on the reservoirs. FERC Form 80 already requires facility capacity and demand to be reported every six years; however, the additional recreation report would provide more specific information such as changes in use patterns and whether or not resource damage is occurring. We recommend that PG&E implement recreation monitoring as a part of the recreation plan for all project recreation facilities and file a monitoring report concurrently with the FERC Form 80 schedule every six years after license issuance. We estimate that the annualized cost of this measure would be $300,000 and conclude that the benefits of this measure are worth the cost.

Reservoir Water Surface and Shoreline Management

PG&E originally proposed to clean debris from the McCloud reservoir boat ramp and Iron Canyon reservoir water surface annually, weather permitting, and as needed throughout the recreation season. Forest Service condition 30 specifies PG&E conduct annual surface sweeps prior to the start of the recreation season on both McCloud and Iron Canyon reservoirs and boat ramps to collect logs and debris from the lake surface with smaller debris and trash removed from NFS lands. PG&E alternative condition 30 proposes to conduct annual surface sweeps of the reservoirs, if needed, prior to the start of the recreation season and collect logs and other debris from the lakes' surfaces once every five years. Surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps would remove surface debris to reduce boating hazards and ensure that the boat ramps are not blocked by debris. The annual sweeps, as specified by the Forest Service, would ensure that winter storm debris that could accumulate seasonally is removed prior to the beginning of each recreation season.

Additionally, PG&E proposed to develop a surface water and shoreline management plan for McCloud reservoir that includes installing 5-mph signs on the bridge that spans the northern end of the reservoir, LWD removal from the reservoir, points of public access to the shoreline, and boating speeds. Developing protocols for preventing/removing unapproved buoy courses and approved use of docks would help prevent boating hazards and improve public recreational safety at the project reservoirs.

Forest Service condition 30 specifies that PG&E submit requests to the Shasta County Boating Unit of the Sheriff's office for the establishment of a 5-mph restriction on a portion of McCloud reservoir and for a buoy line near Huckleberry Creek on McCloud reservoir. Although speeding on the reservoirs has been identified as an issue by project users, enforcement of speed restrictions is not the responsibility of the Commission. PG&E is subject to local laws and ordinances as they pertain to reservoir speed limits.

Additionally, the Forest Service specifies PG&E implement measures to prevent trespass on private lands to protect public safety. The Commission does not have authority on private lands outside the project boundary; it is the responsibility of private landowners to clearly mark their property if trespassing is problematic.

We recommend PG&E implement a water surface management component of the recreation plan to include protocols for preventing/removing unapproved buoy courses and approved use of docks, surface sweeps of McCloud and Iron Canyon reservoirs and boat ramps, annually or as needed, and measures to prevent unauthorized access to project lands and waters, where necessary, to protect public safety. We estimate the annualized cost of the overall surface water management component would be $5,000 and conclude that the benefits of this measure are worth the cost.

Project Signage and Interpretative Information

The project currently does not have a coordinated and systematic process for the development of signage and interpretative information associated with the project. Development and implementation of a project sign plan with associated interpretive and educational measures for the project would provide the means for coordinated and systematic development of signage and interpretative information to ensure public safety and help the public get the most out of visits to the project. Furthermore, providing informational kiosks at developed project facilities and a public website to host recreation information would provide a source for visitors to locate recreation information about the project both on the internet and onsite. Therefore, we recommend the development of the project sign and education plan as a part of the recreation plan in consultation with the Forest Service and that PG&E be responsible for ensuring that public information required under the project sign and educations plan is available through the Internet, via PG&E's web site. We estimate that the annualized cost of the project sign plan would be $41,874 and the annualized cost of the interpretive and educational component would be $29,892 and conclude that the benefits of these measures are worth the cost.

Dispersed Use and OHV Use

PG&E's proposal to work with the Forest Service to discourage dispersed camping, littering, and OHV use through the assessment and evaluation of road closures, trail closures, and dispersed use closure would improve visitors' recreational experience at the project and enhance public safety. Further, by implementing measures to block vehicle access and discourage dispersed use and OHV use at the project, environmental resources be would further protected. Although not included in Forest Service condition 30 and PG&E alternative condition 30, including McCloud reservoir in the evaluation would address areas identified at both reservoirs where dispersed use occurs. Prohibiting dispersed camping and OHV use between the roads and reservoir shorelines would help eliminate this resource damage and improve the aesthetic quality of the area for visitors to the project. To discourage dispersed-use recreation, we recommend that PG&E evaluate and implement appropriate road closures and trail closures, in coordination with the Forest Service, for the area inside the project boundary around both McCloud and Iron Canyon reservoirs. We estimate the annualized cost of this measure would be $114,202 and conclude that the benefits of this measure would be worth the cost.

Project Patrol

PG&E proposes to prepare a project patrol plan in consultation with the Forest Service that would address patrol at the project, including NFS land within the project area. Similarly, Forest Service condition 30 specifies that, as part of the recreation management plan, PG&E develop and implement a project patrol component and coordinate annually with appropriate agencies and other interested parties to review information from the prior season and plan any adjustments for the next high-use season. Forest Service condition 30 also species that PG&E would employ a seasonal, part-time

(April-November) project patrol person or, alternately, provide funding to an appropriate federal, state, or local agency to provide that same. PG&E alternative condition 30 is generally the same, but limits some of the duty-area of the project patrol. Hearst Corporation filed comments supporting the concept of a host or project patrol person.

Although more visible patrol or law enforcement may help reduce conflicts between recreation users and improve visitor safety, the state and county are responsible for law enforcement activities at public recreation sites, including within the project area. Further, the Commission has no way of ensuring that the hiring of a patrol person or campground host paid for by the licensee (in this case staffing or funding a seasonal employee) would actually accomplish a project purpose or ameliorate a project effect. There would be no indication that existing recreation conflicts would be reduced through the proposed measure; therefore, we do not recommend that PG&E provide patrol (i.e., seasonal employee, campground host) or funding for a law enforcement position.

Provision of Stream Flow Information

Accurate and timely stream flow information and information about the usability of the project boat launches can assist recreationists in planning water-related visits to the project. PG&E's proposal to provide accurate and timely stream flow information to the public would provide the means for the public to gain information regarding stream flow and reservoir levels for specified stream reaches and reservoirs at the project. Therefore, we recommend PG&E provide stream flow and reservoir drawdown information to the public via its website on the Internet. We estimate the annualized cost of this measure to be $4,000, and conclude that the benefits outweigh the costs.

Cultural Resources

National Register of Historic Places Eligibility

As part of the required cultural resource surveys, PG&E surveyed all accessible project lands within the APE. Although requested, PG&E has not yet conducted evaluations to determine which, if any, of the identified sites are eligible for inclusion in the National Register. Based upon the information provided by PG&E, we find that one archaeological site (CA-SHA-252) currently adversely affected by the project is eligible for inclusion in the National Register. As discussed below, however, we continue to recommend that PG&E determine National Register-eligibilities on all remaining cultural resources that either currently or have the potential to be adversely affected by the project.

Cultural Resource Management

Continued operation of the project, along with construction of the proposed generation and recreation facilities, could adversely affect properties eligible for listing in the National Register. To protect and manage historic properties within the project APE, PG&E prepared and filed a draft HPMP and proposed to continue consultation to develop a final HPMP. In the HPMP, PG&E proposes to conduct monitoring of sites within the project area that are eligible for listing on the National Register. In addition, the HPMP

includes additional mitigation and management measures for historic properties affected by the project, as well as proposals for continuous cultural resource consultation with the Forest Service, the Pit River Tribe, and the Winnemem Wintu Tribe.

Forest Service condition 34 also specifies finalization and implementation of the HPMP and that the HPMP should: (1) fully integrate all cultural resource studies completed for the project relicensing, including each tribe's TCP studies; (2) take into account project effects on National Register-eligible properties that are being periodically inundated by Iron Canyon reservoir and elsewhere on NFS lands; (3) provide measures to mitigate effects on historic properties; (4) evaluate whether an archaeological or ethnographic historic district should be established on the lower McCloud River within the project's expanded APE; and (5) provide for a monitoring program and management protocols on NFS lands.

PG&E alternative condition 34 proposes slight modifications to Forest Service condition 34. PG&E proposed that: (1) if a TCP report from the Winnemem Wintu is completed after a final HPMP is filed, then the final HPMP would need to be amended; (2) National Register eligibilities would be applied to sites periodically inundated that are being affected by project-related effects; (3) mitigation measures would be applied after the California SHPO determined that those project-related affects are adverse, and such measures are necessary; and (4) determining a historic district involving archaeological and ethnographic sites would be done only if there is compelling evidence that supports such a historic district.

We have reviewed PG&E's HPMP and recommend that PG&E include the following additional measures within the HPMP:

- Treatment measures, to be conducted within one year of license issuance, that resolve project-related adverse effects on National Register-eligible archaeological site CA-SHA-252;
- National Register evaluations, to be completed within one year of license issuance, on all cultural resources that are currently, or in the future will be, adversely affected by the project;
- Site-specific protection measures, to be completed within two years of license issuance, to resolve project-related erosion effects on all National Register-eligible archaeological sites; and
- Measures for handling of newly discovered paleontological resources, due to the recent paleontological law enacted by Congress in March 2009 that

requires all federal land managers to manage and protect paleontological resources discovered on their lands.[35]

PG&E has not filed the results of its Winnemem Wintu TCP study. On April 23, 2010, and May 25, 2010, PG&E and the Winnemem Wintu Tribe (Tribe), respectively, filed letters with the Commission explaining the parties' disagreement about who can gain access to Tribe's TCP study.[36] The Commission is not the appropriate venue for resolving this issue.[37] The Commission's responsibilities under NEPA and section 106 of the NHPA necessitate that we receive all pertinent information concerning the Tribe's TCPs so that we may accurately determine how the relicensing of the McCloud-Pit Project affects the Tribe's cultural resources. Prior to issuance of a license, and pursuant to section 106, Commission staff needs to know whether any properties of religious or cultural significance to the Tribe could be affected by the project; therefore, we recommend that any license for the project include a provision requiring PG&E complete the Winnemem Wintu TCP study within 1 year of license issues.

Implementation of PG&E's proposal, along with staff's additional measures, would ensure that adverse effects on historic properties as a result of project operation, maintenance, recreation, vandalism, or other existing and future project-related activities would be addressed over the term of any new license issued for the project. In order to implement the protections provided by the HPMP, Commission staff would develop a Programmatic Agreement (PA), executed among the Commission, the California SHPO, and the Advisory Council, should the Council choose to participate. PG&E, the Forest Service, Pit River Tribe, and Winnemem Wintu Tribe would be invited to sign the PA as concurring parties. With the execution of the PA and implementation of a final HPMP, all anticipated effects on any historic properties within the project APE would be resolved. We estimate that implementation of the protective measures proposed in PG&E's final HPMP would have an annualized cost of $283,748. These costs would

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[35] See Omnibus Public Land Management Act (OPLMA) of 2009, Public Law 111-011. P.L. 111-011, Title VI, Subtitle D on Paleontological Resources Preservation (OPLMA-PRP) (123 Stat. 1172; 16 U.S.C. 470aaa). This statute requires the Secretaries of the Interior and Agriculture to manage and protect paleontological resources on federal land using scientific principles and expertise. The OPLMA-PRP includes specific provisions addressing management of these resources by the Forest Service and other agencies.

[36] Letter from Steve Nevares, PG&E, dated April 23, 2010, and letter from Stephen Volker, Attorney for Winnemem Wintu Tribe, dated May 25, 2010.

[37] As the MOU is a legal document between PG&E and the Tribe, the Commission cannot enforce any of the clauses contained within the document. While the Commission itself is not the appropriate venue for resolving these issues, we can refer the parties to the Commission's Dispute Resolution Service. If both parties feel facilitation could assist in resolving their dispute, please contact Commission staff.

include the modifications to the HPMP as specified by Forest Service condition 34, as well as staff's recommendations, and we conclude that the expected benefits of implementing the HPMP with the recommended modifications are worth the cost.

Land Use and Aesthetic Resources

Road and Transportation Facilities Management Plan

A road and transportation facilities management plan, as proposed by PG&E and specified by Forest Service condition 29, would establish a forum for coordination of road maintenance activities among PG&E, the Forest Service, and other affected parties. Specifically, the plan would address operations, maintenance, construction and reconstruction, monitoring, and road use within the project boundary (project roads are listed in table 3-40). A plan would help to clarify and memorialize PG&E's road management responsibilities within the project boundary, ensure safe public access to project lands and waters, and ensure the adequate protection of natural and environmental resources in the project area. We estimate that the annualized cost of developing and implementing this plan would be $3,950,229 and conclude that the benefits of this measure warrant the costs. We recommend the implementation of this measure.

Fire Prevention and Response Plan

The development and implementation of a fire prevention and response plan in consultation with the Forest Service, the California Department of Forestry and Fire Protection, the Big Bend Volunteer Fire Department, and others, as appropriate, that incorporates both the measures proposed by PG&E and specified by the Forest Service, would improve planning, management and coordination of wildfire protection and prevention measures, as well as lead to a reduction in the occurrence and suppression of wildfires in the project area. We estimate that the annualized cost of developing and implementing this plan would be $3,903. Given the benefits of improved public safety and reduced potential damage to property and natural resources, we conclude that the benefits of this measure are worth the cost and recommend the implementation of this measure.

Hazardous Substance Management Plan

Forest Service condition 28 specifies that PG&E file, for Commission approval, a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup. To meet the regulatory requirements for handling, storage, and emergency response related to hazardous materials PG&E has developed an SPCC plan and HMBP. The content of these existing plans includes the information specified in Forest Service condition 28. PG&E proposes to provide copies of these plans to the Forest Service. The continued implementation of these plans would ensure that spills of hazardous substances are promptly contained and cleaned up to avoid/minimize the potential extent of adverse environmental effects. We estimate that the annualized cost of filing the existing SPCC plan and HMBP with the Commission and providing copies to

the Forest Service would be minimal, and we recommend implementation of this measure.

Project Boundary

We have concluded that certain roads and dispersed areas recommended by the Forest Service to be included in the project boundary do not meet the Commission's criteria for roads used primarily for project purposes and should not be included in the project boundary.[38] The Forest Service further recommended that all new, proposed recreation facilities be included within the project boundary. By requiring PG&E to include all project recreation sites within the project boundary, the Commission would have the authority to ensure that PG&E maintains adequate and safe public access to project lands and waters for recreational purposes. If new recreation sites are included in a new project license, PG&E would be required to file a revised exhibit G that would include the new facilities. We estimate that the annualized cost of filing revised exhibit maps with the Commission would be $9,517 and conclude the benefits of this measure warrant the costs. We recommend the implementation of this measure.

Visual Quality Management Plan

Aesthetic resources can be affected by project facilities and operations. Project facilities, such as project powerhouses, transmission lines, and recreation facilities can dominate views, creating contrast with the natural landscape. Forest Service condition 32 specifies that PG&E develop procedures or a timeline to ensure implementation of certain mitigation measures to provide for visual quality of project and project-related NFS lands. PG&E alternative condition 32 proposes to include only existing and proposed project facilities (i.e., generation additions) and does not propose modifications to existing project facilities for visual quality purposes because studies conducted during relicensing did not identify any needed modifications.

The implementation of a visual quality management plan would help to ensure that new project facilities are consistent with the Forest Service's Visual Quality Objectives for the project area. The measures proposed by PG&E and specified by the Forest Service, such as visual screening, painting, providing interpretive information, and maintaining reservoir levels during the peak recreation season would collectively reduce the impacts on aesthetic resources in the project area. We recommend PG&E finalize and implement a visual quality management plan, in consultation with the Forest Service and stakeholders, as appropriate, to protect the visual quality of lands in the project area within one year of license issuance. At a minimum this plan should address the impact of any proposed project facilities on the aesthetics in the project area, including but not

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[38] For more information regarding the Commission's roads policy, please see the Commission's Policy Statement on Hydroelectric Licensing Settlements, issued September 21, 2006.

limited to generating facilities, recreation sites and facilities, and spoil piles. We estimate an annualized cost of $11,420 and recommend implementation of this measure.

Proposed Additional Generation Units

To develop the hydro potential from higher instream flows that may be required in a new license, PG&E studied the feasibility of installing new generation units at both the McCloud and Pit 7 afterbay dams. For McCloud dam, PG&E studied the feasibility of both a 5-MW powerhouse and an 8-MW powerhouse. For the Pit 7 afterbay development, PG&E analyzed both a 5-MW powerhouse a 10-MW powerhouse. In the final license application, PG&E says it will determine the final size of the units and their hydraulic capacity based on instream flow requirements of the new project license. In table 4-7 of section 4.4, *Comparison of Alternatives for PG&E's Proposed Powerhouses*, we compare our estimate of the power value, annual costs, and net benefits of the powerhouse alternatives presented by PG&E in the license application. As table 4-7 shows, the four alternatives that PG&E is considering would have initial annual costs that far exceed the current power value.

PG&E needs to decide whether to propose the new units at McCloud dam and the Pit 7 afterbay dam, and how to appropriately size them. Though our analysis shows that the cost of these new units could exceed the potential power benefits, PG&E might consider whether these hydro proposals would qualify as part of its state requirement to develop renewable resources and whether to accept the financial risk that entails from developing these units. Therefore, until PG&E decides on the final capacity of these minimum flow units, we make no recommendation at this time regarding the proposed additional generation units.

5.3 UNAVOIDABLE ADVERSE EFFECTS

The continued operation of the project would result in some minor unavoidable adverse effects on geologic, soil, and terrestrial resources. The geologic and soil resources effects could include some minor continued erosion associated with project operation and renovation of recreational facilities and interruption of sediment transport at project reservoirs. Most of these effects would be reduced by the proposed resources enhancement measures, including: (1) development and implementation of an erosion and sediment control plan; and (2) development and implementation of an LWD plan.

For terrestrial resources, these effects could include short-term loss of vegetation communities along the proposed transmission line. Most of these effects would be reduced by proposed resource enhancement measures, including the development and implementation of a VMP and implementation of vegetation management BMPs. Vegetation within the permanent corridor would re-establish; however, the vegetation within the corridor would be managed and maintained as necessary and in the long-term would be permanently altered from the original plant communities that existed prior to the construction of the new transmission lines.

We have identified no other unavoidable adverse effects on resources influenced by project operation.

5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS

5.4.1 Recommendations of Fish and Wildlife Agencies

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by state and federal fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA, or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission's Ready for Environmental Analysis notice, issued December 1, 2009, California Fish and Game (February 2, 2010) and NMFS (January 29, 2010) filed letters providing comments and terms and conditions for the McCloud-Pit Project, pursuant to section 10(j). Table 5-1 summarizes the agency recommendations made under section 10(j), as well as whether the recommendations are adopted under the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA and are addressed in the specific resource sections of this document and in section 5.2, *Comprehensive Development and Recommended Alternative*.

Of the 15 recommendations, we make a preliminary determination that 10 of the recommendations made by NMFS and two recommendations made by California Fish and Game are within the scope of section 10(j). Of those 12 recommendations filed by NMFS or California Fish and Game, we adopt three and partially adopt one. We do not adopt the remaining eight, recommended by NMFS, because they are inconsistent with the comprehensive planning standard of section 10(a) of the FPA, as well as the equal consideration provision of section 4(e) of the FPA.

NMFS provided eight 10(j) recommendations that include protection, mitigation, and enhancement measures to be implemented as soon as listed salmonids are documented within the McCloud River. We note, however, that no listed salmonids have been documented within the project area due to the barrier created by the Bureau of Reclamation's Shasta Dam and lack of fish passage facilities provided at that dam. As

such, it is premature to implement measures associated with the protection of these species. If and when listed salmonids are documented in the Lower McCloud River, the Commission's standard reopening procedure can be used, if necessary, to address a need for supportive habitat conditions in project reaches. Because there are no federally-listed salmon that are currently affected by the project, implementation of NMFS's recommended measures would not be worth any associated cost. Therefore, we find these nine measures inconsistent with the comprehensive planning standard of section 10(a) of the FPA, as well as the equal consideration provision of section 4(e) of the FPA.

While we recommend adopting the minimum instream flow regime recommended by California Fish and Game for Iron Canyon Creek and Pit 7 dam, we do not recommend adopting California Fish and Game's recommended minimum flow regimes for below McCloud dam. Our analysis in sections 3.3.2.2 and 5.2 indicates that the staff-recommend Lower McCloud River flow regime, as specified in Forest Service condition 19 and proposed in PG&E's alternative condition 19, would provide a similar level of increased trout habitat with less loss to generation. We estimate that the annualized cost of implementing the minimum flow regime recommended by California Fish and Game would be $12,035,673 per year, which is $1,945,056 more than the cost of the staff recommended flow regime and the added benefit is not worth the cost. Therefore, we find that California Fish and Game's recommended minimum flow regime for the Lower McCloud River is inconsistent with the comprehensive planning standard of section 10(a) of the FPA, as well as the equal consideration provision of section 4(e) of the FPA.

Table 5-2. Analysis of fish and wildlife agency section 10(j) recommendations for the McCloud-Pit Hydroelectric Project. (Source: Staff)

Recommendations	Agency	Within Scope of 10(j)?	Annualized Cost	Adopted?
1. Submit draft biological evaluation or assessment for special-status species protection and mitigation	NMFS	Yes	$0	Yes
2. Consult annually on newly added special-status species	NMFS	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$11,000	Yes
3. Provide access to suitable habitat for anadromous fish and restore fully functioning habitat conditions for spawning, rearing, migration, and adjoining habitats	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
4. Implement scheduled instream flows for McCloud River to the benefit of native anadromous fishes	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
5. Move instream flow compliance point from gage MC-1 to gage MC-7 or at McCloud dam	NMFS	Yes	$60,000	Yes

Recommendations	Agency	Within Scope of 10(j)?	Annualized Cost	Adopted?
6. Implement instream flow range estimates that meet the thermal summer spawning requirements for winter-run Chinook salmon	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
7. Implement ramping to minimize impacts of flows on listed salmonids	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
8. Augment gravel substrates for listed salmonids	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
9. Maintain channel to minimize impacts of project operations on habitat for listed salmonids	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
10. Protect and enhance riparian habitat and habitat function for listed salmonids	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River
11. Maintain water quality, including temperature, for the benefit of listed salmonids	NMFS	Yes	NA	Not adopted; premature given lack of anadromous fish on the McCloud River

Recommendations	Agency	Within Scope of 10(j)?	Annualized Cost	Adopted?
12. Create the Listed Salmonid Technical Integration Committee	NMFS	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$20,000	Not adopted
13. Implement minimum instream flows for Lower McCloud River, Iron Canyon Creek, and Pit River below Pit 7 dam	California Fish and Game	Yes	$12,035,673	Partially adopted: recommend implementation of Iron Canyon Creek and Pit 7 dam flow, but find Lower McCloud River flow recommendation inconsistent with the comprehensive planning standard of sections 4(e) and 10(a) of the FPA, because the loss of generation associated with the higher instream flows do outweigh the negligible benefits.
14. Prepare a gravel/sediment management plan, which includes requirement to add a minimum of 150 tons of gravel and associated sediment to the McCloud River annually	California Fish and Game	Yes	$75,000	Yes

Recommendations	Agency	Within Scope of 10(j)?	Annualized Cost	Adopted?
15. Reimburse California Fish and Game for increased stocking of trout annually, at levels above current levels in order to meet recreational needs. Licensee shall also pay California Fish and Game $5,000 annually for mitigation for white sturgeon.	California Fish and Game	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$952	Yes

5.4.2 Forest Service 4(e) Conditions

In section 2.2.5.3, *Section 4(e) Federal Land Management Conditions*, we note that section 4(e) of the FPA, 16 U.S.C. §797(e), provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. Thus, any condition that meets the requirements of the law may be included in a license issued by the Commission, regardless of whether we include the condition in our staff alternative.

In section 2.2.5.3, we identify that we consider 16 of the Forest Service conditions to be administrative or legal in nature and not specific environmental measures. We therefore do not analyze these 16 conditions in our draft EIS. Table 5-2 summarizes our staff conclusions with respect to the conditions that we consider to be environmental measures. Of the 21 Forest Service conditions that we do not consider administrative or legal in nature, we fully recommend six in the staff alternative, partially recommend 11, and do not recommend four. Our reasons for not including measures in the staff alternative are summarized in table 5-2 and are discussed in more detail in section 5.2.1, *Discussion of Key Issues*.

Table 5-3. Forest Service 4(e) conditions for the McCloud-Pit Hydroelectric Project. (Source: Forest Service, 2010a)

Condition	**Annualized Cost**	**Recommended?**
Condition 1: Consult with the Forest Service annually on project O&M activities. Shall include status reports on license condition implementation, results of monitoring studies, routine and non-routine maintenance, review of any necessary revisions or modifications of plans included in license, discussion of any measures that are needed to protect special-status species or changes to existing management plans, and any planned pesticide use.	$30,000	Yes
Condition 11: Submit a biological evaluation to the Forest Service before taking actions to construct new project features that may affect Forest Service special-status species or their critical habitat. This shall include procedures to minimize impacts to special-status species, adhere to restrictions in site management plans for special-status species, and develop monitoring to reduce effects to special-status species.	$0	Yes
Condition 15: Obtain prior written approval from the Forest Service for use of pesticides on NFS lands or in areas affecting NFS lands. Pesticide use will be excluded from NFS lands within 500 ft of known locations of Shasta salamanders, northwestern pond turtles, foothill yellow-legged frogs, or known locations of Forest Service special-status or culturally significant plant populations.	$0	Yes

Condition	Annualized Cost	Recommended?
Condition 19, Part 1b: Maintain specified minimum streamflows in project reaches in accordance with the provisions described in the Forest Service filing. The minimum instantaneous 15-minute streamflow shall be at least 80 percent of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cfs, and at least 90 percent of the streamflows required to be greater than 10 cfs. Should the mean daily flow as measured be less than the required mean daily flow but more than the instantaneous flow, licensee shall begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release.	$0	Yes, but with incorporation some of PG&E alternative condition 19 and a flow regime for the Lower McCloud River as recommend by California Trout, Trout Unlimited, and the McCloud River Club
Condition 19, Part 2: Determine the water year type for minimum flow compliance based on the DWR Bulletin 120 water year forecast of unimpaired runoff for the Sacramento River near Redding.	$5,000	No, instead recommend the use of DWR Bulletin 120 of the McCloud River above Shasta Lake
Condition 19, Part 3: Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflow and measure and document all instream flow releases in publicly available formats.	$120,000	Yes

Condition	Annualized Cost	Recommended?
Condition 20: Prepare a water quality and temperature monitoring plan in consultation with agencies and approved by the Forest Service. The plan shall include monitoring of all project reservoirs every 5 years for contaminants; monitoring of dissolved oxygen at McCloud, Pit 6, and Pit 7 reservoirs; annual monitoring during months of May through September, for 10 years, of potential water temperature effects to beneficial uses including recreation, aquatic habitats, and target species (i.e., foothill yellow-legged frogs, fish, benthic macroinvertebrates), as a result of modified in-stream flows and reservoir operations; continuous monitoring of turbidity for the term of the license in the Lower McCloud River during the fishing season, and periodically during construction or other soil disturbing activities; continuous monitoring of turbidity for 5 years after license issuance at Iron Canyon Creek to ensure that repairs have reduced sedimentation into the creek below the dam; implementation of best management practices (BMPs) to satisfy the Aquatic Conservation Strategy objectives from the Northwest Forest Planning area; and mitigation of impacts from project O&M, recreation, road use and maintenance, vegetation management, fire management, and watershed practices.	$86,179	Yes, with incorporation of some of PG&E alternative condition 20
Condition 21: Prepare an LWD management plan in consultation with agencies and approved by the Forest Service. The plan will specify size criteria, placement and storage sites, volume and frequency of placement, and monitoring procedures to assess the effectiveness of LWD mobilization and dispersal in the Lower McCloud River.	$452,506	Yes

Condition	Annualized Cost	Recommended?
Condition 22: Prepare an erosion and sediment control management and monitoring plan developed in consultation with agencies, and approved by the Forest Service. The plan shall include methods for inventorying and monitoring project-related erosion and sedimentation, inspection schedule, inventory of erosion sites, criteria for treating erosion sites, schedule for repair of erosion sites, protocols for emergency erosion and sediment control, a process and schedule for reporting monitoring results including plan review and revision, and BMPs for erosion control measures.	$119,686	Yes

Condition	Annualized Cost	Recommended?
Condition 23: Develop a gravel and coarse sediment management plan in consultation with agencies and approved by the Forest Service. The plan shall require the addition of 150-600 t of gravel and coarse sediment to the Lower McCloud River annually. The gravel shall be clean and range between 8 and 128 millimeters in size. It is recommended that the licensee use sorted gravel and coarse sediment in the Star City Creek inlet as the source of material. Inputs of gravel and coarse sediment will occur within the reach of the Lower McCloud River between the spillway and the Hawkins Creek confluence. The plan shall identify the source of materials, identify the locations for gravel introduction in the Lower McCloud River below McCloud dam, identify any facilities or improvements necessary for accessing the sites for gravel and coarse sediment placement, identify approved temporary or long-term stockpile sites, develop a schedule for placement, and include an adaptive management component to allow higher or lower quantities of gravel and coarse sediment to be delivered based upon spill and monitoring results. The plan shall also incorporate biological monitoring of species affected by gravel and coarse sediment, specifically trout and macroinvertebrates. Monitoring shall be conducted in the reach of the Lower McCloud River between McCloud dam and Bald Mountain Creek confluence.	$84,517	Yes, with incorporation of some of PG&E alternative condition 23

Condition	Annualized Cost	Recommended?
Condition 24: Prepare a reservoir dredging plan in consultation with and approved by the Forest Service not less than 90 days prior to any proposed reservoir dredging operations. The plan shall include the location, amount, and timing of dredging; the extent, amount, composition, and size of dredged materials; and identify approved stockpile sites, equipment, road access, storage locations of material, proposed start and end date of dredging, conditions to minimize ecological impacts of dredging, and public notification of the purpose, timing, and location of dredging.	$5,710	No
Condition 25: Develop a vegetation and invasive species management plan in consultation with agencies and approved by the Forest Service. The plan will address special-status species, aquatic and terrestrial invasive species, and culturally significant plants within the project boundary and adjacent to project features directly affecting NFS lands including roads and distribution and transmission lines. The plan shall address treatment protocols for removing vegetation, protection of special-status and culturally significant plants, invasive species management and monitoring, pesticide use restrictions.	$336,901	Yes, with incorporation of some of PG&E alternative condition 25

Condition	Annualized Cost	Recommended?
Condition 26: Develop a terrestrial biological management plan, including Forest Service special-status species potentially affected by the project on NFS lands. This plan should be consistent with the recent plans for the relicensing of the Pit 3, 4, 5 Project. The plan should include monitoring for the species listed in the Forest Service filing, periodic surveys of the project area to determine if additional populations develop, and reporting of survey results including suitable habitat, populations, individuals, pairs, and nest locations every 5 years. Mitigation measures include conducting pre-construction surveys for special-status species, observing limited operating periods where required, and using surveys to determine if additional mitigation measures are necessary to protect Forest Service special-status species. The licensee shall file an avian collision and electrocution hazards plan with the Commission, and all new or rebuilt power poles shall conform to APLIC guidelines.	$197,584	Yes, with incorporation of some of PG&E alternative condition 26
Condition 27: Develop an aquatic biological monitoring plan in consultation with agencies and approved by the Forest Service. The plan should be consistent with the recently relicensed Pit 3, 4, 5 Project plan. The plan should include population trends, age-class structure, and fish condition factors in the McCloud reservoir, Iron Canyon reservoir, Pit 6 reservoir, Pit 7 reservoir, Lower McCloud River, and Pit River; list of fish species to be monitored; surveys every 3 years for 9 years, then every 5 years for the term of the license; and report aquatic survey and monitoring results every 5 years. The plan will cover benthic macroinvertebrates, special-status aquatic mollusks, special-status species, and invasive aquatic species. The licensee will provide fish passage structures at stream crossings at listed streams.	$195,169	Yes, with incorporation of some of PG&E alternative condition 27

Condition	Annualized Cost	Recommended?
Condition 28: File a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup. The plan shall maintain in a cache of spill cleanup equipment suitable to contain any spill from the project; periodically inform the Forest Service of the location of the spill cleanup equipment on NFS lands and the location, type, and quantity of oil and hazardous substances stored in the project area; and inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affecting NFS lands.	$0	Yes, with incorporation of some of PG&E alternative condition 28
Condition 29: File a road and transportation facility management plan, approved by the Forest Service, for protection and maintenance of project and project-affected roads on or affecting NFS lands. The plan shall include the following components: planning and inventory; operation, maintenance, and road-associated debris; construction and reconstruction; monitoring; licensee road memorandum of understanding; road use by government; and road use. The Forest Service filing lists project and project-affected roads, and roads with high erosion potential requiring repair.	$3,950,229	Yes, with incorporation of some of PG&E alternative condition 29
Condition 30: Prepare a recreation development and management plan in consultation with agencies and approved by the Forest Service to address recreation resource needs associated with the project. All new and reconstructed project recreation facilities will comply with federal accessibility standards. The plan will address the following components (included below) and specify location, design, structures, and schedules for completion as appropriate: O&M; recreation survey and monitoring; project patrol; reservoir water surface management; and construction and reconstruction of project facilities.	$28,551	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30

Condition	Annualized Cost	Recommended?
Condition 30: Develop and implement recreation survey and monitoring component of recreation plan.	NA	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30
Condition 30: Develop and implement project patrol component of recreation plan.	NA	No
Condition 30: Develop and implement surface water management component of recreation plan.	NA	Yes, with staff modifications
Condition 30: Reconstruct Tarantula Gulch boat launch and provide day-use area.	NA	Yes, with incorporation of some of PG&E alternative condition 30
Condition 30: Develop Star City day-use area and campground.	NA	Yes, with staff modification and incorporation of PG&E alternative condition 30
Condition 30: Construct Red Banks day-use area.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Construct Tarantula Gulch inlet day-use area.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Provide West McCloud dam day-use area.	NA	Yes, with incorporation of PG&E alternative condition 30

Condition	Annualized Cost	Recommended?
Condition 30: Provide East McCloud dam day-use area.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Provide Battle Creek day-use area.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Provide McCloud dam angler recreation access.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Upgrade/relocate river access trail from Ash Camp to Ah-Di-Na.	NA	No, this facility does not have a project nexus
Condition 30: Conduct site evaluation and provide three day-use parking areas at Iron Canyon reservoir.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Evaluate closures of off-highway vehicle roads and dispersed use.	NA	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30
Condition 30: Design and construct Iron Canyon dam boat launch.	NA	Yes, with incorporation of some of PG&E alternative condition 30

Condition	Annualized Cost	Recommended?
Condition 30: Reconstruct Hawkins Landing Campground and boat launch.	NA	Yes, with incorporation of some of PG&E alternative condition 30
Condition 30: Reconstruct or Relocate Deadlun Campground.	NA	Yes, with staff modification and incorporation of some of PG&E alternative condition 30
Condition 30: Develop a shoreline trail at Pit 6 reservoir if determined necessary based on six-year recreation use monitoring.	NA	No, this is premature to include as condition
Condition 30: Construct shoreline access trail (upper end of Pit 7).	NA	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30
Condition 30: Evaluate feasibility and construct a boat put-in at Montgomery Creek (Pit 7 reservoir).	NA	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30
Condition 30: If Montgomery Creek is not feasible for a hand-launch boat put-in, develop a river access trail along one side of the Pit 7 reservoir for pedestrian fishing and hand-launch boat access.	NA	No

Condition	Annualized Cost	Recommended?
Condition 30: Reconstruct day-use site at Fenders Flat.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: Reconstruct the car-top boat launch near Fenders Flat and provide re-vegetation.	NA	Yes, with incorporation of PG&E alternative condition 30
Condition 30: If additional general is developed [Pit 7 afterbay powerhouse], provide Pit 7 afterbay powerhouse day-use area.	NA	Yes, with staff modifications and incorporation of some of PG&E alternative condition 30
Condition 30a: Specific recreation and road agreement. Ah-Di-Na Road (FS road 38N53): Currently, there is concurrence that road reconstruction, maintenance, and operation should be shared between the Forest Service, licensee, and other affected parties. The licensee has indicated they would prefer this agreement be outside of the license. This is acceptable with the Forest Service as long as agreement on the terms can be reached. Should agreement not be reached, it will be included within the memorandum of understanding (MOU) discussed in condition 29. Ash Camp and Ah-Di-Na campground: The concept of the licensee providing full reconstruction, operation, and maintenance of this facility outside of the license is acceptable in concept with the Forest Service as long as agreement on the terms can be reached. Should agreement not be reached, this mitigation will be included in modified 4(e) license conditions.	$0	No, a separate agreement for non-project roads or these campgrounds is not within the Commission's jurisdiction to enforce. Campgrounds do not have a project nexus.

Condition	Annualized Cost	Recommended?
Condition 31: Develop a project sign plan which includes road and trail safety, directional and traffic signs, and an interpretive and educational component. Sign locations and design elements will be collaboratively developed.	$71,766	Yes, with incorporation of some of PG&E alternative condition 31
Condition 32: Develop procedures and a timeline for mitigation measures to provide for visual quality of project and project-affected NFS lands. Specific measures are listed in the Forest Service filing.	$11,420	Yes, with staff modifications and incorporation of some of PG&E alternative condition 32
Condition 33: Develop a fire and fuels management plan in consultation with agencies and approved by the Forest Service. The plan shall set forth the licensee's responsibility for prevention, reporting, and emergency response to fires in the vicinity of the project resulting from project operations. The plan shall address fuels treatment, prevention and response, and investigation of project-related fires.	$3,903	Yes, with incorporation of PG&E alternative condition 33

Condition	Annualized Cost	Recommended?
Condition 34: File a historic properties management plan with the Commission, approved by the Forest Service. The plan is tiered to a programmatic agreement to which the Forest Service will be a signatory, as defined by 36 CFR 800, and implements regulations of the NHPA. The licensee shall consult with the SHPO, tribes, Forest Service, and other applicable agencies during preparation of the plan. The plan shall include the CR-S1 and CR-S2 study results, detailed site monitoring and schedule, National Register determinations of eligibility for sites periodically inundated by reservoir fluctuations in Iron Canyon reservoir, and potential effects of current or proposed project operations on historic properties including detailed mitigations. If items of potential cultural, historical, archaeological, or paleontological value are reported or discovered during ground disturbing activities or as a result of project operations, the licensee shall cease work immediately and notify the Forest Service.	$283,748	Yes, with staff modifications and incorporation of some of PG&E alternative condition 34

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by a project. Under this section, federal and state agencies filed numerous qualifying comprehensive plans, of which we identified 13 California and five federal plans that are applicable to the project. The continued operation of the McCloud-Pit project, as recommended in this draft EIS, is consistent with the 18 state and federal plans listed below.

Bureau of Land Management. June 1993. Redding resource management plan and Record of Decision. U.S. Department of the Interior, Redding, CA. 55 pp.

California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, CA. 84 pp.

California Department of Fish and Game. U.S. Fish and Wildlife Service. National Marine Fisheries Service. Bureau of Reclamation. 1988. Cooperative agreement

to implement actions to benefit winter-run Chinook salmon in the Sacramento River basin. Sacramento, CA. May 20. 10 pp. and exhibit.

California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February. 234 pp.

California Department of Fish and Game. 2004. Lower McCloud River wild trout area fishery management plan, 2004–2009. Redding, CA.

California Department of Parks and Recreation. 1998. Public opinions and attitudes on outdoor recreation in California. Sacramento, CA. March 1998.

California Department of Parks and Recreation. 2009. California outdoor recreation plan-2008. Sacramento, CA. 150 pp. and appendices.

California Department of Water Resources. 1983. The California water plan: projected use and available water supplies to 2010. Bulletin 160-83. Sacramento, CA. December. 268 pp. and attachments.

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Appendix A

McCloud-Pit Project
Mitigation and Monitoring Summary

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
General – Potential project-related impacts on Forest Service lands	Consult with the Forest Service to present project O&M activities planned for the next calendar year [Measure 1 and Forest Service condition 1]	**Ongoing:** Annually; the date of the consultation meeting will be mutually agreed to by PG&E and the Forest Service.	**Ongoing:** Meeting would include review of all monitoring activities as well as any additional information that has been compiled for the project area, including progress reports on other resource measures	PG&E	PG&E
General – Potential effect of project O&M on sensitive resources	Conduct annual employee awareness training [Measure 2 and Forest Service condition 1]	**Ongoing:** Annual employee awareness training to familiarize staff with local resource issues, special-status species, noxious weeds, procedures for reporting to the Forest Service, and applicable Forest Service orders, to allow avoidance/ minimization of impacts		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
General – Potential project-related impacts on Forest Service lands	Obtain Forest Service approval for all final design plans [Measure 3]	**Ongoing:** Prior to construction of any new project facilities on NFS lands, obtain prior written approval of the USFS for all final design plans			

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
General – Potential effect of project O&M on sensitive resources	Prepare and file a biological evaluation for newly added special status species [NMFS 10(j) recommendation 1B]	**Ongoing:** In consultation with the resource agencies, annually review the current list(s) of special status species that might occur in the project area directly affected by project operations. Prepare biological evaluation prior to construction of new project features or non-routine maintenance activities that may affect special status species or their habitats	**Ongoing:** Develop and implement a study plan in consultation with the resource agencies to assess the effects of the project on newly added special status species	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
General – Potential effect of project O&M on sensitive resources	Prepare and submit a biological evaluation for Forest Service special status species or their critical habitat [Measure 15 and Forest Service condition 11]	**Ongoing:** Before taking actions to construct new project features on NFS lands that may affect Forest Service special status species or their critical habitat, prepare and submit a biological evaluation for Forest Service approval		PG&E	
General – Altered seasonal geohydrology	Determine water year type annually and apply to appropriate minimum flow release schedule and other measures dependent on water year type [PG&E alternative condition 19, part 2]	**Ongoing:** Annual determination of water year type and application of appropriate minimum flow release schedule		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Geo/Soils – Blockage of downstream transport of LWD	Develop and implement an LWD management plan to facilitate placement of woody debris in Lower McCloud River downstream of McCloud dam [Measure 11 and Forest Service condition 21]	**One-time:** Within one year of license issuance, prepare LWD management plan **Ongoing:** Implement the approved plan through the term of the license	**Ongoing:** Monitor effectiveness of LWD mobilization and dispersal in the Lower McCloud River according to the frequency specified in the management plan	PG&E	PG&E
Geo/Soils – Potential effects of project operations on erosion sites/other sediment sources and related effects on project infrastructure and sediment delivery to project streams	Develop and implement an erosion and sediment control management and monitoring plan [Measure 12 and Forest Service condition 22]	**One-time:** Within one year of license issuance, develop and file erosion and sediment control management and monitoring plan **Ongoing:** Implement the approved plan through the term of the license	**Ongoing:** Monitor project and project-related erosion and sedimentation sites at least once every 10 years during the term of the license and for three years after treatment at high priority sites	PG&E	PG&E

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implemen-tation	Monitoring
Geo/Soils – Obstruction of downstream gravel and coarse sediment transport by project dam	Develop and implement a plan for gravel and coarse sediment management [Forest Service condition 23][a]	**One-time:** Within one year of license issuance, develop and file a gravel and coarse sediment management plan **Ongoing:** Implement the approved plan through the term of the license	**Ongoing:** Monitor trout and macroinvertebrates in the Lower McCloud River between the McCloud dam and Bald Mountain Creek confluence as part of the biological monitoring plan	PG&E	PG&E
Geo/Soils – Obstruction of downstream gravel and coarse sediment transport by project dam	Develop and implement a reservoir dredging plan [Forest Service condition 24 and PG&E alternative condition 24][a]	**Ongoing:** If required for increasing gravel and sediment supply or for removing sediment from reservoirs, prepare a reservoir dredging plan and file the approved plan not less than 90 days prior to any dredging operations		PG&E	

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implemen-tation	Monitoring
Water – Potential effects of project operations and maintenance on water quality	Develop and implement a water quality and temperature monitoring [Forest Service condition 20 and PG&E alternative condition 20][a]	**One-time:** Within one year of license issuance, develop and file water quality and temperature monitoring plan **Ongoing:** Implement the approved plan through the term of the license	**Ongoing:** Periodic monitoring of contaminants once every five years at all project reservoirs, periodic monitoring of dissolved oxygen at McCloud, Pit 6, and Pit 7 reservoirs, annual temperature monitoring for 10 years, continuous turbidity monitoring in the Lower McCloud River during fishing season, continuous monitoring of turbidity for a minimum of five years in Iron Canyon Creek, and for an additional five years thereafter, if turbidity issues persist.	PG&E	PG&E

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implemen-tation	Monitoring
Aquatic – Potential impact on fish and aquatic invertebrate populations in project affected reaches	Develop and implement an aquatic biological management and monitoring plan in consultation with Forest Service and other interested parties and approved by the Forest [Forest Service condition 27 and PG&E alternative condition 27][a]	**One-time:** Within one year of license issuance, develop and file an aquatic biological management and monitoring plan, to the extent possible, consistent with the plan filed for Pit 3, Pit 4, and Pit 5 relicensing. **Ongoing:** Implement plan through term of license	**Ongoing:** Monitor fish, benthic macroinvertebrates, and special status mollusks at number of sites and site locations previously established during the relicensing once every three years for the first nine years and once every five years thereafter. Annually review list of special status aquatic species. Assess threat of invasive mussels and implement prevention plan. Prepare and submit draft technical report of all aquatic biological monitoring results within one year following completion of monitoring efforts.	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Aquatic – Minimum flows downstream of McCloud dam	Implement minimum flows at McCloud dam[California Trout alternative condition 19]	**Ongoing:** Implement minimum flows at McCloud dam		PG&E	
Aquatic – Minimum flows downstream of Iron Canyon dam	Implement minimum flows at Iron Canyon dam [PG&E alternative condition 19]	**Ongoing:** Implement minimum flows at Iron Canyon dam		PG&E	
Aquatic – Potential effects of downramping operations during spill events	Downramp spill events controllable by valve operation at McCloud dam at a maximum rate of 150 cfs per 48 hours until the prescribed minimum instream flow is reached [Forest Service condition 19, part 1, subpart b and California Fish and Game 10(j) recommendation 1]	**Ongoing:** Implement downramping rates during spill events controllable by valve operation		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Aquatic – Potential effects of upramping during operational controllable spills	Upramp operational controllable spills at a maximum rate of 200 cfs per 24 hours [Forest Service condition 19, part 1, subpart b and California Fish and Game 10(j) recommendation 1]	**Ongoing:** Implement upramping rates during operational controllable spills		PG&E	
Aquatic – Potential effects of uncontrollable spill events	To extent possible, upramp water flows released at McCloud dam prior to the start of an uncontrolled spill event at a maximum target rate of 100 cfs per hour [Measure 9]	**Ongoing:** Implement upramping rate, if possible, prior to start of uncontrollable spill event		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implemen-tation**	**Monitoring**
Aquatic – Confirmation of compliance with minimum streamflows	Operate, maintain, and modify (if necessary) gages needed to determine river stage and minimum streamflows [Forest Service condition 19, part 3]		**Ongoing:** Maintain and operate gages for term of license		PG&E
Aquatic – Confirmation of compliance with minimum streamflows	Measure streamflow compliance at two points below McCloud dam [Forest Service condition 19, part 3]	**Ongoing:** Use two compliance points below McCloud dam (MC-1 and MC-7) to ensure stream flows meet minimum flow requirements	**Ongoing:** Monitor flow compliance below McCloud dam at two compliance points for term of license	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Aquatic – Confirmation of compliance with minimum streamflows	Measure and document all instream flow releases below McCloud dam, Pit 7 dam, and Iron Canyon dam in publicly available and accessible formats		**Ongoing:** Measure instream flows below project affected reaches and provide data in publically available and readily accessible format. Post real-time flow data for MC-1 online.		PG&E
Aquatic – Potential effect of project dams on fish passage	Reserve NMFS authority to prescribe fishways [NMFS 10(j)]			PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Terrestrial – Potential project construction-related impacts on upland vegetation and wetlands	Develop and implement a vegetation management plan [Forest Service condition 25 and PG&E alternative condition 25]	**One-time:** Within one years of license issuance, file a vegetation management plan	**Ongoing:** Monitor known populations special-status plant species beginning in the first year after plan approval and every five years thereafter; survey for new populations and new listings in the project area beginning in the first year after plan approval and every 10 years thereafter	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Terrestrial - Potential project related alteration of invasive plant populations	Develop and implement a vegetation management plan [Forest Service condition 25 and PG&E alternative condition 25]	**One-time:** Within one year of license issuance, file a vegetation management plan	**Ongoing:** Monitor areas with ground disturbing activities annually for three years after disturbance; monitor known populations beginning in the first year after plan approval and every other year for 10 years thereafter; control infestations of high-priority invasive species within one year of detection or as soon as practicable	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Terrestrial - Potential project impacts on foothill yellow-legged frog	Develop a foothill yellow-legged frog monitoring plan[a] *This measure is modified to specify that the foothill yellow-legged frog monitoring plan would be incorporated into the terrestrial biological monitoring plan* [Forest Service 10(a) recommendation 1 and PG&E reply comments to 10(a) recommendation 1]	**One-time:** Within two years of license issuance, submit a foothill yellow-legged frog monitoring plan	**Ongoing:** Conduct population survey at specific suitable habitat in the project area for first year after plan approval and every tenth year thereafter.	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Terrestrial - Potential project related impacts on general wildlife and avian species	Develop and implement a terrestrial biological management plan and ensure new and rebuilt power poles conform to APLIC standards for avian collision and electrocution hazards reduction [Forest Service condition 26 and PG&E alternative condition 26][a]	**One-time:** Within one year of license issuance, develop a terrestrial biological management plan **Ongoing:** Implement through term of license	**Ongoing:** Report terrestrial survey and monitoring results every five years or at frequency specified for individual species in PG&E alternative condition 26. For Shasta salamander, both pre- and post-construction surveys should be conducted.	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Land use – potential degradation of access roads needed to safely maintain project facilities	Road and transportation facilities management plan [Measure 18 and Forest Service condition 29]	**One-time:** Develop and file a road and transportation facilities management plan with the Commission within one year of license issuance **Ongoing:** Implement the plan through the term of the license		PG&E	
Land use – project O&M-related effects on land management	Develop and implement a fire prevention and response plan [Measure 21 and Forest Service condition 33]	**One-time:** Develop and file a fire prevention and response plan with the Commission within one year of license issuance **Ongoing:** Implement the plan through the license term		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Land use – oil and hazardous substances spill	Develop and implement a Hazardous Substance Management Plan [Forest Service condition 28 and PG&E alternative condition 28]	**One-time:** File with the Commission the existing SPCC plan and HMBP and provide copies to the Forest Service within 30 days of license issuance **Ongoing:** Implement the plans throughout the term of the license		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Land use – maintenance of roads and recreational facilities providing access to project lands and waters	Revise project boundary and file a revised Exhibit G[a]	**One-time:** Incorporate all project roads and recreation sites within the project boundary and file a revised Exhibit G with the Commission within one year of license issuance **Ongoing:** As new project facilities are constructed, including recreation sites, file revised exhibit maps with the Commission		PG&E	

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implementation	Monitoring
Aesthetic resources – project facilities and operation may impact aesthetic resources in the project area	Develop and implement a visual quality management plan [Forest Service condition 32 and PG&E alternative condition 32][a]	**One-time:** Develop and file a visual quality management plan with the Commission within one year of license issuance **Ongoing:** Implement the plan through the term of the license		PG&E	
Recreation-Potential effects of streamflow on recreation opportunities	Provide recreation flow information for lower McCloud River [Measure 19, Forest Service condition 19, PG&E alternative condition 19][a]	**Ongoing:** Implement by providing real-time flow data for gage MC-1 and drawdown information to the public via PG&E's webpage on the internet through the term of the license		PG&E	

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implementation	Monitoring
Recreation-potential increases in project-related recreation use	Recreation Development and Management plan [Measure 19, Forest Service condition 30, PG&E alternative condition 30] [a] *Modified to specify submittal of final plan to Forest Service for review and to Commission within one year, PG&E O&M responsibility for all recreation facilities including Forest Service facilities, and removal of ADA compliance and project patrol component.*	**One-time:** Develop and file recreation plan with the Commission within one year of license issuance **Ongoing:** Implement the plan through the term of the license		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Recreation-Potential safety issues, provide public information	Develop and implement a project sign plan [PG&E Measure 19, Forest condition 31, PG&E alternative condition 31][a] *This measure is modified to also include road and trail safety signs and traffic signs and an interpretive and education component*	**One-time:** Develop and file with recreation plan with the Commission within one year of license issuance **Ongoing:** Implement plan through the term of the license		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Recreation-potential increases in project-related recreation use	Recreation monitoring plan/component [Measure 19, Forest Service condition 30, and PG&E alternative condition 30] [a] *Modified to include details on monitoring; consultation with Forest Service on survey methods; Forest Service report review; and consult every six years with Forest Service and interested parties to review recreation management objectives*	**One-time:** Develop and file with recreation plan with the Commission within one year of license issuance **Ongoing:** Implement through the term of the license	**Ongoing:** Every 6 years	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Recreation--potential increases in project-related recreation use, potential public safety issues	Surface water management plan/component [Measure 19, Forest Service condition 30, and PG&E alternative condition 30][a] *Modified to include protocols, e.g., to prevent unapproved buoy courses, unauthorized access to project areas; approved use of docks; annual surface sweeps of McCloud and Iron Canyon reservoirs*	**One-time:** Develop and file with recreation plan with the Commission within one year of license issuance **Ongoing:** Implement through the term of the license	**Ongoing:** Boat use monitoring - every 6 years	PG&E	PG&E

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implementation	Monitoring
Recreation--potential increases in project-related recreation use, potential public safety issues	Annually stock up to 60,000 pounds of trout at the project and develop and implement a fish stocking plan [California Fish and Game 10(j)][a]	**Ongoing:** Annually stock 60,000 pounds of trout at the project and implement fish stocking plan **One-time:** Develop (for Commission approval) a fish stocking plan in consultation with California Fish and Game within two years of license issuance.	**Ongoing:** Evaluate and monitor the amount of fish to be stocked every six years through the term of the license	PG&E	PG&E

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Recreation--potential public safety issues and resource damage	At McCloud and Iron Canyon reservoirs, assess and implement closures of user-created roads leading to the shoreline of McCloud and Iron Canyon reservoirs [Measure 19, Forest Service condition 30, and PG&E alternative condition 30] [a] *This measure is modified to specify that this would also include trail and dispersed use closure*	**Ongoing:** Implement through the term of the license		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Recreation-potential increases in project-related recreation use	Provide or reconstruct day-use facilities: Battle Creek, East McCloud dam, Red Banks, Star City, Tarantula Gulch, Tarantula Gulch Inlet, West McCloud dam, Iron Canyon Reservoir, Iron Canyon dam, and Fenders Flat [Measure 19, Forest Service condition 30, and PG&E alternative condition 30] [a] *This measure is modified to include specific details of what amenities would be provided at each facility*	**One-time:** Construct facilities **Ongoing:** Operation and maintenance of facilities		PG&E	

Impact	Mitigation	Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
		One-time or Ongoing	One-time or Ongoing	Implementation	Monitoring
Recreation-potential increases in project-related recreation use potential public safety issues and resource damage	Provide or reconstruct a campground at Star City, Deadlun and Hawkins Landing [Measure 19, Forest Service condition 30, and PG&E alternative condition 30] [a] *This measure is modified to include specifications for camping area and to remove the requirement for a host*	**One-time:** Construct facilities **Ongoing:** Operation and maintenance of facilities		PG&E	
Recreation-potential increases in project-related recreation use	Construct a pedestrian shoreline access trail at the upper end of Pit 7 reservoir [Measure 19, Forest Service condition 30, and PG&E alternative condition 30][a]	**One-time:** Conduct feasibility study within two years of license issuance and construct facilities within five years of license issuance **Ongoing:** Operation and maintenance of facilities		PG&E	

		Mitigation Implementation Duration	Monitoring Duration	Mitigation Responsibility	
Impact	**Mitigation**	**One-time or Ongoing**	**One-time or Ongoing**	**Implementation**	**Monitoring**
Cultural Resources – project-related impacts to archaeological and historic era resources	Finalize and implement historic properties management plan (HPMP) [Measure 22, Forest Service condition 34 and PG&E alternative condition 34][a]	**Ongoing**: Implement general and site specific treatment measures identified in the HPMP, to begin upon new license issue	**Ongoing**: Conduct long-term historic properties monitoring; baseline monitoring within one year following new license issuance, annual monitoring thereafter	PG&E	PG&E

[a] Staff alternative: includes additional measures identified by staff based on agency and non-governmental organization recommendations and our analysis.

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Appendix B

Capital and Annual Costs of Measures for the McCloud-Pit Project

Table B-1. Estimated capital and O&M costs of measures proposed by PG&E and recommended by staff and agencies for the McCloud-Pit Hydroelectric Project. (Source: Staff)

Measure	**Entity and Measure No.**	**Staff Recom-mend?**	**Capital Cost (2009 $)**	**Annual-ized Capital Cost (2009 $)**	**Annual O&M Cost (2009 $)**	**Annual Energy Costs (2009 $)**	**Total Annualized Cost (2009 $)**	**Comments**
Consult with Forest Service annually regarding planned operation and maintenance activities on National Forest System lands	FS (4e #1), PG&E (#1)	Adopt	$0	$0	$30,000	$0	$30,000	
Provide annual employee training in coordination with the Forest Service	FS (4e #1, 25), PG&E (#2)	Adopt	$0	$0	$60,000	$0	$60,000	
Obtain Forest Service approval for all final design plans	PG&E (#3)	Adopt	$0	$0	$0	$0	$0	
Consult annually on newly added special status species	NMFS/FWS (10(j) #1B)	Adopt	$0	$0	$11,000	$0	The cost for this measure is reflected in the cost ($30,000) for FS condition 1.	
Implement gravel augmentation and amphibian indicator species monitoring	CF&G (10(a))	Adopt with staff modificati on	$0	$0	$75,000	$0	The cost for the staff alternative for this measure is $78,807.	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement gravel augmentation plan for listed salmonids	NMFS/FWS (10(j) #4A and B)	Do not adopt	$0	$0	$100,000	$0	$100,000	The cost of developing and implementing gravel augmentation plans that may be prescribed in the future cannot be estimated at this time
Develop a plan for gravel and coarse sediment management	FS (4e #23), PG&E (Alternative to FS 4e #23)	Adopt with incorpora-tion of PG&E alternative	$20,000	$3,807	$75,000	$0	$84,517	The cost for the staff alternative for this measure is $78,807.
Maintain stream channel in McCloud River to minimize impacts on listed salmonid habitat	NMFS/FWS (10(j) #5)	Do not adopt	$0	$0	$10,000	$0	$10,000	The cost of mitigation plans that may be prescribed in the future cannot be estimated at this time

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Prepare a reservoir dredging plan if dredging is required for increasing gravel and sediment supply or for removing sediment from reservoirs to accomplish project management objectives	FS (4e #24), PG&E (Alternative to FS 4e #24)	Adopt alternative	$30,000	$5,710	$0	$0	$5,710	
Protect and enhance riparian habitat function for listed salmonids	NMFS/ FWS(10(j) #6)	Do not adopt	$0	$0	$0	$0	$0	The cost of riparian protection and enhancement measures that may be prescribed in the future cannot be estimated at this time
Move flow compliance gage from MC-1 to MC-7	CF&G (10(j) #1), NMFS/ FWS (10(j) #3B)	Do not adopt	$0	$0	$60,000	$0	$60,000	
Monitor instream flow at two compliance points below McCloud dam	PG&E (Alternative to FS 4e #19, part 1)	Adopt	$0	$0	$60,000	$0	$60,000	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Operate, maintain, and modify (if necessary) and provide real-time flow data	FS (4e #19, part 3)	Adopt	$0	$0	$120,000	$0	$120,000	
Provide real-time flow data for gage MC-1 on the California Data Exchange Center website or its successor.	FS (4e #19, part 3)	Do not adopt	$0	$0	$2,000	$0	$2,000	
Determine water year type	FS (4e #19) CF&G (10(j) #1)	Do not adopt	$0	$0	$5,000	$0	$5,000	
Determine water year type	PG&E (Alternative to FS 4e #19, part 2)	Adopt	$0	$0	$5,000	$0	$5,000	
Implement ramping rates during controllable spill events and valve testing	FS (4e 19) CF&G (10j #1)	Adopt	$0	$0	$0	$0	$0	
Implement minimum flows proposed in FLA	PG&E (#5, 7, 8)	Do not adopt	$0	$0	$0	$0	$9,972,222	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Implement California Fish and Game's recommended minimum flows	CF&G (10(j) #1)	Do not adopt	$0	$0	$0	$0	$12,035,673	
Implement Forest Service's 4(e) minimum flows	FS (4e #19)	Do not adopt	$0	$0	$0	$0	$10,090,617	
Implement PG&E's alternative 4(e) flows below McCloud dam[a]	PG&E (Alternative to FS 4e #19)	Do not Adopt	$0	$0	$0	$0	$10,090,617	
Implement Trout Unlimited, California Trout, and McCloud River Club's alternative 4(e) flows below McCloud dam	Trout Unlimited/ California Trout/ McCloud River Club (Alternative to FS 4e #19)	Adopt	$0	$0	$0	$0	$10,090,617	
Implement McCloud RiverKeepers alternative 4(e) flows below McCloud dam	McCloud RiverKeepers (Alternative to FS 4e #19)	Do not adopt	$0	$0	$0	$0	$4,255,446	
Implement PG&E's alternative 4(e) flows below Iron Canyon dam[a]	PG&E (Alternative to FS 4e #19)	Adopt	$0	$0	$0	$0	$726,937	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Implement McCloud dam up-ramping flows prior to uncontrolled spill events[a]	FS (4e #19), CF&G (10(j) #1), PG&E (#9, Alternative to FS 4e #19)	Adopt	$0	$0	$0	$0	$0	
Provide a recreation flow event from McCloud dam	PG&E (#6)	Do not adopt	$0	$0	$0	$0	$0	
Upgrade gage MC-10	FS (4e #19), CF&G (10(j) #1), PG&E (#7)	Do Not Adopt	$41,000	$7,804	$0	$0	$7,804	
Develop and implement a water quality monitoring plan in consultation with California Water Board, Forest Service, California Fish and Game	FS (4e #20), PG&E (#10, Alternative to FS 4e #20)	Adopt with incorpora-tion of PG&E alternative	$85,000	$16,179	$70,000	$0	$86,179	
Modify project structure and operations necessary to mitigate impacts of water quality and temperature to listed salmonids	NMFS/ FWS (10(j) #7)	Do not adopt	$0	$0	$0	$0	$0	The cost of project mitigation plans that may be prescribed in the future cannot be estimated at this time

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a Large Woody Debris Management Plan	FS (4e #21), PG&E (#11)	Adopt	$1,500,000	$285,506	$167,000	$0	$452,506	
Reserve authority to prescribe fishways	NMFS (Section 18)	Adopt	$0	$0	$0	$0	$0	The cost of any fishways that may be prescribed in the future cannot be estimated at this time.
Provide access to suitable habitat for anadromous fish and restore habitat conditions	NMFS/ FWS (10(j) #2)	Do not adopt	$0	$0	$0	$0	$0	The cost of any fishways that may be prescribed in the future cannot be estimated at this time.
Develop and implement an Erosion and Sediment Monitoring and Control Plan	FS (4e #22), PG&E (#12)	Adopt	$550,000	$104,686	$15,000	$0	$119,686	
Develop and implement a Vegetation Management Plan	PG&E (#13)	Do not adopt	$300,000	$57,101	$275,000	$0	$332,101	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a Vegetation Management Plan	FS (4e #25), PG&E (Alternative to FS 4e #25)	Adopt with incorpora-tion of PG&E alternative	$325,215	$61,901	$275,000	$0	$336,901	
Prepare a biological evaluation to protect Forest Service special status species	FS (4e #11), PG&E (#15)	Adopt	$0	$0	$0	$0	$0	
Prepare and file a biological evaluation for newly added special status species	NMFS/ FWS (10(j) #1B)	Adopt	$0	$0	$0	$0	$0	
Develop and implement a foothill yellow-legged frog monitoring plan	FS (10(a) #1), PG&E (Alternative reply comments)	Adopt with incorpora-tion of PG&E alternative	$0	$0	$70,000	$0	$70,000	
Develop and implement a wildlife management plan	PG&E (#14, 16)	Do not adopt	$310,000	$59,005	$287,000	$0	$346,005	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a terrestrial biological management plan	FS (4e #26), PG&E (Alternative to FS 4e #26)	Adopt with incorpora-tion of PG&E alternative	$250,000	$47,584	$150,000	$0	$197,584	
Develop and implement an aquatic biological management and monitoring plan	FS (4e #27), PG&E (Alternative to FS 4e #27)	Adopt with incorpora-tion of PG&E alternative	$500,000	$95,169	$100,000	$0	$195,169	
Submit biological evaluation or assessment for special status species protection or mitigation	NMFS/ FWS (10(j) #1A)	Do not adopt	$20,000	$3,807	$1,800	$0	$5,607	Biological evaluation would be conducted under terrestrial and aquatic biological management plan
Create a listed salmonid Technical Integration Committee	NMFS (10(j) #8)	Do not adopt	$0	$0	$20,000	$0	$20,000	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement avian hazard reduction measures	PG&E (#16)	Adopt	$123,000	$23,411	$0	$0	The cost of this measure is reflected in the terrestrial biological management plan	
Stock trout in McCloud and Iron Canyon reservoirs and Shasta Lake, as proposed in FLA	PG&E (#17)	Do not adopt	$0	$0	$117,000	$0	$117,000	
Stock up to 60,000 pounds of trout within project boundary annually	CF&G (10(j) #3)	Adopted with staff modificati ons	$0	$0	$117,000	$0	$117,000	
Provide at least $5,000 annually for the monitoring and evaluation of fish stocking program or stocking of white sturgeon within Shasta Lake	CF&G (10(j) #3)	Do not adopt	$5,000	$952	$0	$0	$952	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a Road and Transportation Facility Management Plan	FS (4e #29 & 30a), PG&E (#18, Alternative to FS 4e #29)	Adopt with incorpora-tion of PG&E's alternative	$15,500,000	$2,950,229	$1,000,000	$0	$3,950,229	
Develop and implement a Recreation Development and Management Plan in consultation with Forest Service, California Fish and Game, and California Water Board	FS (4e #30 & 30a), PG&E (Alternative to FS 4e #30)	Adopt with staff modifica-tions and incorpora-tion of PG&E's alternative	$150,000	$28,551	$0	$0	$28,551	
Develop and implement a Recreation Development and Management Plan in consultation with Forest Service, California Fish and Game, and California Water Board	PG&E (#19)	Do not adopt	$150,000	$28,551	$0	$0	$28,551	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Provide recreation flow information for lower McCloud River	FS (4e #30, PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tions	$0	$0	$4,000	$0	$4,000	
Develop and implement a Project Sign Plan as proposed in FLA	PG&E (#19)	Do not adopt	$200,000	$38,067	$0	$0	$38,067	
Develop and implement a Project Sign Plan	FS (4e #31), PG&E (Alternative to FS 4e #31)	Adopt with incorpora-tion of PG&E's alternative	$314,000	$59,766	$12,000	$0	$71,766	The cost of the Project Sign Plan is $41,874 and the cost of the Interpretive and Education Component is $29,892
Develop and implement an Interpretive and Education Sign Plan as proposed in FLA/component of Sign Plan	PG&E (#19, Alternative to FS 4e #31)	Do not adopt	$94,000	$17,892	$2,000	$0	$19,892	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a Recreation Monitoring component	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tions and incorporat ion of PG&E's alternative	$0	$0	$300,000	$0	$300,000	
Develop a Surface Water and Shoreline Management Plan	PG&E (#19, Alternative to FS 4e #30)	Do not adopt	$0	$0	$10,000	$0	$10,000	
Develop and implement Surface Water Management component	FS (4e #30)	Adopt with staff modifica-tions	$0	$0	$50,000	$0	$5,000	
Provide McCloud dam angler recreation access	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$413,000	$78,609	$11,000	$0	$89,609	
Upgrade/relocate river access trail from Ash Camp to Ah-Di-Na	FS (4e #30)	Do not adopt	$5,500	$1,047	$1,500	$0	$2,547	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Provide Battle Creek day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$216,000	$41,113	$6,000	$0	$47,113	
Provide East McCloud dam day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$216,000	$41,113	$6,000	$0	$47,113	
Provide Red Banks day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$783,000	$149,034	$21,000	$0	$170,034	
Develop Star City day-use area and campground	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tion and incorpora-tion of PG&E's alternative	$2,646,000	$503,633	$67,000	$0	$570,633	
Reconstruct Tarantula Gulch boat launch and provide day-use area	PG&E (#19 Alternative to FS 4e #30)	Adopt PG&E's alternative	$4,456,000	$848,143	$88,000	$0	$936,143	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Reconstruct Tarantula Gulch boat launch and provide day-use area	FS (4e #30)	Do not adopt	$4,456,000	$848,143	$228,000	$0	$1,076,143	
Provide Tarantula Gulch inlet day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$188,000	$35,783	$4,000	$0	$35,783	
Provide West McCloud dam day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$225,000	$42,826	$6,000	$0	$48,826	
Conduct site evaluation and provide three day-use parking areas at Iron Canyon reservoir	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modificati ons	$816,000	$155,315	$22,000	$0	$177,315	
Reconstruct/relocate Deadlun Campground	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tion and incorpora-tion of PG&E's alternative	$2,016,000	$383,720	$59,000	$0	$442,720	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Reconstruct Hawkins Landing Campground and boat launch	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$1,450,000	$275,989	$41,000	$0	$316,989	
Design and construct Iron Canyon dam boat launch	PG&E (#19, Alternative to FS 4e #30)	Adopt PG&E alternative with staff modifica-tions	$1,962,000	$373,442	$98,000	$0	$471,442	
Design and construct Iron Canyon dam boat launch	FS (4e #30)	Do not adopt	$1,962,000	$373,442	$198,000	$0	$571,442	
Evaluate feasibility and construct shoreline access trail (upper end of Pit 7)	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tions and incorpora-tion of some of PG&E's alternative	$70,000	$13,324	$4,000	$0	$17,324	
Evaluate feasibility and construct a boat put-in at Montgomery Creek (Pit 7 reservoir)	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Do not adopt	$125,000	23,792	$85,000	$0	$108,792	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Provide day-use site at Fenders Flat; maintain access to car-top boat launch; and provide restroom near Pit 7 afterbay car-top boat launch	PG&E (#19)	Do not adopt	$1,404,000	$267,234	$109,000	$0	$376,234	
Reconstruct day-use site at Fenders Flat	FS (4e #30), PG&E (Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$1,620,000	$308,346	$115,000	$0	$423,346	
Close/rehabilitate/eval uate off-highway vehicle trails	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt with staff modifica-tions and incorpora-tion of PG&E's alternative	$600,000	$114,202	$0	$0	$114,202	
Develop and implement plan to provide project-wide patrol as proposed in FLA	PG&E (#20)	Do not adopt	$0	$0	$263,000	$0	$263,000	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Provide project-wide patrol for project and project-affected NFS land	FS (4e #30), PG&E (Alternative to FS 4e #30)	Do not adopt	$0	$0	$263,000	$0	$263,000	
Prepare a Fire Response Plan in consultation with the Forest Service, California Department of Forestry and Protection, and Big Bend Volunteer Fire Department	FS (4e #33), PG&E (#21, Alternative to FS 4e #33)	Adopt with incorpora-tion of PG&E's alternative	$10,000	$1,903	$2,000	$0	$3,903	
Implement the HPMP included in the FLA	PG&E (#22)	Do not adopt	$440,000	$83,748	$200,000	$0	$283,748	
Additional measures likely to be required in an HPMP approved by the Forest Service	FS (4e #34), PG&E Alternative to FS 4e #34)	Adopt with staff modificati ons	$440,000	$83,748	$200,000	$0	$283,748	
Develop a shoreline trail at Pit 6 Reservoir if determined necessary based on six-year recreation use monitoring	FS (4e #30.2)	Do not adopt	$5,500	$1,047	$1,000	$0	$2,047	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Develop and implement a plan to protect visual quality of project lands	FS (4e #32)	Adopt PG&E's alternative with staff modifica-tions	$60,000	$11,420	$0	$0	$11,420	
File a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup.	FS (4e #28)	Adopt with inclusion of PG&E's alternative	$0	$0	$0	$0	$0	
If Montgomery Creek is not feasible for a hand-launch boat put-in, develop a river access trail along one side of the Pit 7 reservoir for pedestrian fishing	FS (4e #30)	Adopt	$64,500	$12,277	$1,000	$0	$13,277	
If Montgomery Creek is not feasible for a hand-launch boat put-in, develop a river access trail along one side of the Pit 7 reservoir for hand-launch boat access	FS (4e #30)	Do not adopt	$5,500	$1,047	$3,000	$0	$4,047	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annual-ized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Reconstruct the car-top boat launch near Fenders Flat and provide re-vegetation	FS (4e #30), PG&E (Alternative to FS 4e #30)	Adopt with incorpora-tion of PG&E's alternative	$50,000	$9,517	$4,000	$0	$13,517	
Revise project boundary and file a revised Exhibit G	NA	Staff recom-mended alternative	$50,000	$9,517	$0	$0	$9,517	
Total Applicant's Proposal			$36,106,000	$6,872,320	$3,380,000	$1,566,250	$10,252,320	
Staff Alternative			$37,550,715	$7,147,303	$3,435,000	$3,500,000	$10,582,303	
Staff Alternative with 4(e) Mandatory Conditions			$37,717,215	$7,178,994	$4,030,500	$3,500,000	$11,209,494	

[a] This measure would be implemented even if there is no new powerhouse constructed. Annual energy cost would differ, however, if the new powerhouses are constructed.

Table B-2. Estimated capital and O&M costs of measures proposed by PG&E and recommended by staff and agencies for construction of new powerhouses and transmission lines at the McCloud-Pit Hydroelectric Project. (Source: Staff)

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annualized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Obtain Forest Service approval for all final design plans	PG&E (#3)	Adopt	$163,000	$31,025	$16,500	$0	$47,525	
Move flow compliance gage from MC-1 to MC-7	CF&G (10(j) #1), NMFS/FWS (10(j) #3B)	Do not adopt	$0	$0	$0	$0	$0	
Implement minimum flows proposed in FLA	PG&E (#5, 7, 8)	Do not adopt	$0	$0	$0	$2,062,222 to $5,195,722[a]	$2,062,222 to $5,195,722[a]	
Implement California Fish and Game's recommended minimum flows	CF&G (10(j) #1)	Do not adopt	$0	$0	$0	$4,125,673 to $7,223,173[a]	$4,125,673 to $7,223,173[a]	
Implement Forest Service's 4(e) minimum flows	FS (4e #19)	Do not adopt	$0	$0	$0	$2,180,617 to $5,278,117[a]	$2,180,617 to $5,278,117[a]	
Implement PG&E's alternative 4(e) flows below McCloud dam[b]	PG&E (Alternative to FS 4e #19)	Do not adopt	$0	$0	$0	$2,180,617 to $5,278,117[a]	$2,180,617 to $5,278,117[a]	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annualized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Implement Trout Unlimited and McCloud River Club's alternative 4(e) flows below McCloud dam[b]	Trout Unlimited/McCloud River Club (Alternative to FS 4e #19)	Adopt	$0	$0	$0	$2,180,617 to $5,278,117[a]	$2,180,617 to $5,278,117[a]	
Implement McCloud RiverKeepers alternative 4(e) flows below McCloud dam[b]	McCloud RiverKeepers (Alternative to FS 4e #19)	Do not adopt	$0	$0	$0	$0	$0	
Implement PG&E's alternative 4(e) flows below Iron Canyon dam[b]	PG&E (Alternative to FS 4e 19)	Adopt	$0	$0	$0	$0	$0	
Implement McCloud dam up-ramping flows prior to uncontrolled spill events[b]	FS (4e #19), PG&E (#9, Alternative to FS 4e #19)	Adopt	$0	$0	$0	$0	$0	
Prepare a biological evaluation before taking actions that may affect Forest Service special status species on National Forest System lands	FS (4e #11), PG&E (#15)	Adopt	$310,000	$59,005	$287,000	$0	$346,005	

Measure	Entity and Measure No.	Staff Recom-mend?	Capital Cost (2009 $)	Annualized Capital Cost (2009 $)	Annual O&M Cost (2009 $)	Annual Energy Costs (2009 $)	Total Annualized Cost (2009 $)	Comments
Provide Pit 7 afterbay powerhouse day-use area	FS (4e #30), PG&E (#19, Alternative to FS 4e #30)	Adopt 4(e) with staff modifica-tions and incorpora-tion of some of PG&E's alternative 4(e)	$141,000	$26,838	$11,000	$0	$37,838	

[a] Costs based on estimated generation capacity of proposed McCloud and Pit 7 afterbay powerhouses

[b] This measure would be implemented even if there is no new powerhouse constructed; capital and annual costs are included only in table B-1. Annual energy cost would differ, however, if the new powerhouses are constructed.

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Appendix C

Commission Staff Recommended License Conditions

I. MANDATORY CONDITIONS

On January 29, 2010, the United States Department of Agriculture - Forest Service (Forest Service) filed 34 section 4(e) conditions, 19 of which we consider pertinent to environmental resources (described in section 2.2.5.3 of the EIS and included in Appendix D).[1] In the staff alternative, we recommend five of the 19 conditions specified by the Forest Service. In addition, we recommend 13 of the specified conditions with modifications and we do not recommend one condition (reservoir dredging plan).[2] We recognize, however, that the Commission is required to include valid 4(e) conditions in any license issued for the project. As such, each of the measures that staff does not recommend or recommends be modified in the staff alternative (as discussed in section 5 *Comprehensive Development and Recommended Alternative*) would not be included in any license issued by the Commission. Instead, those conditions would be replaced with the Forest Service's corresponding conditions, as filed with the Commission.

II. ADDITIONAL LICENSE ARTICLES RECOMMENDED BY COMMISSION STAFF

We recommend including the following license articles in any license issued for the project, in addition to the mandatory conditions.

Draft Article 4XX. *Gravel and Coarse Sediment Management Plan.* Within one year of license issuance, the licensee shall include in the gravel and coarse sediment management plan that will be filed for approval with the Commission pursuant to the United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 23 (Appendix D): (1) provisions for periodic gravel and coarse sediment augmentation downstream of McCloud dam; (2) evaluation of Star City Creek as a

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[1] On March 1, 2010, the Forest Service filed a revised 4(e) condition 19, part 1, which is discussed in the EIS and included in Appendix D.

[2] As explained in section 5 of the draft Environmental Impact Statement, of the 18 conditions, we recommend modifying the following 12 conditions: (1) streamflow (condition 19); (2) water quality and temperature monitoring (condition 20); (3) gravel and coarse sediment management and monitoring (condition 23); (4) vegetation and invasive weed management and monitoring (condition 25); (5) terrestrial biological management and monitoring (condition 26); (6) aquatic biological management and monitoring (condition 27); (7) Hazardous Substance Management (condition 28); (8) road and transportation facility management (condition 29); (9) recreation development, management, and monitoring (condition 30); (10) project sign plan (condition 31); (11) visual quality management (condition 32); (12) fire prevention and response (condition 33); and (13) heritage resources management and monitoring (condition 34).

primary source of gravel; and (3) evaluation of other potential alternate local sites. Additionally, as part of the plan, the licensee should consider fish and aquatic invertebrate monitoring for assessments of sediment augmentation success.

The licensee shall develop the gravel and coarse sediment management plan in consultation with the Forest Service, California Department of Fish and Game (California Fish and Game), the California State Water Resources Control Board (California Water Board), and other interested parties. The licensee shall include with the gravel and coarse sediment management plan that it files with the Commission, documentation of agency consultation, copies of comments and recommendations made in connection with the plan, and a description of how the plan accommodates the comments and recommendations. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Minimum Flow Releases.* Within 90 days of license issuance, the licensee shall maintain minimum flow releases in project reaches below McCloud dam, Iron Canyon dam, and Pit 7 dam consistent with United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 19, and revised Forest Service condition 19, part 1, subpart B (Appendix D), except where noted herein. The minimum flows required by Forest Service condition 19, part 1, subpart C shall be modified as provided by California Water Resources Bulletin 120 (Bulletin 120) to: (1) define the below normal, dry, critically dry water year as less than 100 percent of the average forecasted runoff for April through July; (2) define the above normal water year as 100 to 119 percent of the average forecasted runoff for April through July; (3) define the wet water year as 120 percent or greater of the average forecasted runoff for April through July; (4) allow flow changes in December of each year to be conducted as soon as site accessibility permits; and (5) require flow changes during February through May to be conducted once, within five business days of the actual publication date of each month's Bulletin 120, or as soon as site accessibility permits. The previous month's flows shall be allowed to continue through the first several days of these months until new minimum flows have been determined and flow changes are conducted.

Draft Article 4XX. *Flow Ramping Protocol.* Upon license issuance, the licensee shall implement ramping procedures consistent with United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 19, part 1 subpart B for McCloud dam and consistent with Forest Service condition 19, part 1, subpart C for Iron Canyon dam (Appendix D). The requirements of Forest Service condition 19, part 1, subpart C shall be modified to allow valve testing for dam safety compliance at Iron

Canyon dam to occur between March 1 and March 31 of each year for the term of the license, if unsafe access conditions exist at the site.

Draft Article 4XX. *Water Quality and Temperature Monitoring Plan*. Within one year of license issuance, the licensee shall file with the Commission, for approval, a water quality and temperature monitoring plan consistent with United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 20 (Appendix D), except as noted herein. The water quality and temperature monitoring plan required by Forest Service condition 20 shall be modified to: (1) allow a provision for delayed maintenance and deployment of temperature and turbidity sensors resulting from site safety and access constraints; (2) identify specific contaminant monitoring locations within project reservoirs and a schedule for implementation of periodic monitoring; (3) identify specific dissolved oxygen monitoring locations within McCloud, Pit 6, and Pit 7 reservoirs and a schedule for implementation of periodic monitoring; (4) specify timeframes and reasons to possibly revise the monitoring program after 10 years of data collection; and (5) specify monitoring equipment to be used and a monthly maintenance and inspection program for said equipment, for the period of deployment.

The licensee shall develop the plan in consultation with the Forest Service, United States Department of Commerce – National Marine Fisheries Service, United States Department of Interior – Fish and Wildlife Service, and California department of Fish and Game. The licensee shall include with the plan copies of comments and recommendations made on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted agencies to comment and make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Annual Water Quality and Temperature Monitoring Report*. Within one year of license issuance, and as part of the Water Quality and Temperature Monitoring Report required by United States Department of Agriculture – Forest Service (Forest Service) section 4(e) condition 20, the licensee shall prepare an annual report that: (1) summarizes the monitoring results, compares the results to applicable water quality and temperature standards; (2) determines whether temperatures that do not meet criteria of the water quality control plan (Basin Plan) for the Sacramento and San Joaquin River Basins are project-controllable factors; (3) makes recommendations, if applicable, for changes in project operations or facilities that may enable Basin Plan criteria to be met;

and (4) specifies any changes to the monitoring program or project operations that are proposed for the following year based on the monitoring results.

The licensee shall provide a draft of the annual report to the Forest Service, United States Department of Commerce – National Marine Fisheries Service, United States Department of Interior – Fish and Wildlife Service, and California department of Fish and Game for review and comment prior to the annual resource coordination meeting specified in Forest Service condition 2 (Appendix D). Within 30 days following the annual resource coordination meeting, the report shall be filed with the Commission, along with a summary of agency comments on the report, and how the final report addresses any comments received. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

Draft Article 4XX. *Reservation of Authority to Prescribe Fishways*. Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretaries of the Interior and Commerce pursuant to section 18 of the Federal Power Act.

Draft Article 4XX. *Aquatic Biological Management and Monitoring Plan.* Within one year of license issuance, the licensee shall file with the Commission, for approval, an aquatic biological management and monitoring plan consistent with United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 27 (Appendix D), except as noted herein. The aquatic biological management and monitoring plan shall be modified to: (1) require resource-specific provisions for monitoring and reporting requirements for fish populations, benthic macroinvertebrates, and special status aquatic mollusks; (2) require a list of species to be monitored, if applicable; (3) not require fish population monitoring in project reservoirs; (4) require standardized sampling and data methodologies consistent with the McCloud-Pit Project aquatic resources relicensing studies; and (5) require monitoring to begin following the Commission's approval of the plan and not following the effective date of the license.

The documentation and reporting component of Forest Service condition 27 shall also be modified to include a provision that a draft technical report of all aquatic biological monitoring components be prepared within one year following the completion of each sampling effort.

The licensee shall prepare the plan and all components after consultation with the Forest Service, California State Water Resources Control Board, United States Department of Interior – Fish and Wildlife Service, and California department of Fish and Game. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan

with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan.

Draft Article 4XX. *Streamflow Measurement.* Upon license issuance, the licensee shall operate and maintain existing gages below McCloud dam, Pit 7 dam, and Iron Canyon dam, under the supervision of the United States Geological Survey consistent with United States Department of Agriculture – Forest Service (Forest Service) 4(e) condition 19, part 3 (Appendix D). Within three years of license issuance, the licensee shall modify, if necessary, the gage facilities necessary to measure the new minimum streamflow releases consistent with Forest Service condition 19, part 3.

Draft Article 4XX. *Vegetation Management Plan*. Within one year of license issuance, the licensee shall file with the Commission, for approval, a vegetation management plan consistent with the United States Department of Agriculture - Forest Service (Forest Service) section 4(e) condition 25 (Appendix D), except as noted herein. The vegetation management plan shall be modified to include: (1) the implementation of Best Management Practices to protect wetlands during construction any construction activities; and (2) language requiring the use of native vegetation when restoring areas disturbed by project-related operation and maintenance activities.

The licensee shall develop the plan in consultation with the Forest Service, the United States Department of Interior – Fish and Wildlife Service, and the California Department of Fish and Game. The licensee shall include with the plan copies of comments and recommendations made on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted agencies to comment and make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Special Status Species Review and Protection.* The special status species review and protection measures required by United States Department of Agriculture - Forest Service (Forest Service) section 4(e) conditions 25 and 26 (Appendix D) shall apply to all accessible project lands and shall also include federal and state rare, candidate, threatened, and endangered species. The Commission reserves the right to require additional measures to protect special status species.

Draft Article 4XX. *Fish Stocking Plan.* Within one year of license issuance, the licensee shall file with the Commission for approval, a plan to evaluate and monitor the amount of fish to be stocked every 6 years in the reservoirs and affected stream reaches at the project. The licensee shall develop the plan after consultation with California Department of Fish and Game and include a description of the number, location, and species of fish to be stocked in McCloud, Iron Canyon, Pit 6 and Pit 7 reservoirs, and other affected stream reaches at the project and an implementation schedule. This stocking plan shall be included as a part of the recreation monitoring effort that shall occur concurrently with the FERC Form 80 schedule every 6 years after license issuance.

The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the entities above, and specific descriptions of how the entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific reasons.

The Commission reserves the right to require changes to the plan. Upon Commission approval the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Recreation Facilities.* The following existing facilities shall be operated and maintained for the term of the license: Tarantula Gulch Boat Launch, Star City dispersed area, Deadlun Campground, Hawkins Landing Campground and boat launch, and Fenders Flat Car-top boat launch.

Draft Article 4XX. *McCloud Reservoir Swimming/Fishing Platform.* Within two years of license issuance, the licensee shall conduct a site evaluation to determine the location of a fishing/swimming platform on McCloud reservoir, and file a report containing the results of the evaluation and recommendations for the placement and construction of the platform with the Commission, for approval. After Commission approval, the licensee shall construct the platform within three years of license issuance.

The licensee shall provide the report to the U. S. Department of Agriculture – Forest Service (Forest Service) for comment. The licensee shall include with the report copies of comments and recommendations made on the completed report after it has been prepared and provided to the Forest Service, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the Forest Service to comment and make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the report. The report shall not be implemented until the licensee is notified that it has been approved by the

Commission. Upon Commission approval, the licensee shall construct the platform with any modifications required by the Commission.

Draft Article 4XX. *Pit 7 Reservoir Fishing Access Trail*. Within two years of license issuance, the licensee shall conduct a site evaluation to determine the location of a pedestrian shoreline fishing access trail at the lower end of Pit 7 reservoir, and file a report containing the results of the evaluation and recommendations for the placement and construction of the platform with the Commission, for approval. After Commission approval, the licensee shall construct the trail within three years of license issuance.

The licensee shall provide the report to the U. S. Department of Agriculture – Forest Service (Forest Service) for comment. The licensee shall include with the report copies of comments and recommendations made on the completed report after it has been prepared and provided to the Forest Service, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the Forest Service to comment and make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the report. The report shall not be implemented until the licensee is notified that it has been approved by the Commission. Upon Commission approval, the licensee shall construct the trail with any modifications required by the Commission.

Draft Article 4XX. *Fire Prevention and Response Plan*. Within one year of license issuance, the licensee shall file with the Commission a Department of Agriculture – Forest Service (Forest Service)-approved fire prevention and response plan prepared consistent with Forest Service section 4(e) condition 33 (Appendix D). During the development of the plan, the licensee shall also consult with the California Department of Forestry and Fire Protection and the Big Bend Volunteer Fire Department. The plan shall include provisions for fuels treatment/vegetation management, fire prevention, emergency response, preparedness, reporting, and identifying fire control extinguishing locations within the project boundary.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Road and Transportation Facilities Management Plan*. Within one year of license issuance, the licensee shall file with the Commission a road and transportation facilities management plan, as specified by United States Department of Agriculture – Forest Service section 4(e) condition 29 (Appendix D), for all roads and transportation facilities within the project boundary, consistent. The plan shall address operations, maintenance, construction and reconstruction, monitoring, and road use.

The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Programmatic Agreement and Historic Properties*. The licensee shall implement the "Programmatic Agreement among the Federal Energy Regulatory Commission, the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation for Managing Historic Properties that may be Affected by Issuing a License to Pacific Gas & Electric for the Continued Operation and Maintenance of the McCloud-Pit Hydroelectric Project in Shasta County, California, (FERC No. 2106-059)" executed on (future date). Within 1 year of license issuance, and pursuant to the requirements of the (future date) Programmatic Agreement and United States Department of Agriculture – Forest Service section 4(e) condition 34 (Appendix D), the licensee shall implement the Historic Properties Management Plan (HPMP) with the following modifications: (1) treatment measures, to be conducted within 1 year of license issuance, that resolve project-related adverse effects on National Register-eligible archeological site CA-SHA-252; (2) National Register evaluations, to be completed within 1 year of license issuance, on all cultural resources that are currently, or in the future will be, adversely affected by the project; (3) site-specific protection measures, to be completed within 2 years of license issuance, to resolve project-related erosion effects on all National Register-eligible archeological sites; and (4) measures for handling of newly discovered paleontological resources, due to the recent paleontological law enacted by Congress in March 2009 that requires all federal land managers to manage and protect paleontological resources discovered on their lands. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 4XX. *Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee also shall have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for any interests that it has conveyed under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant or a conveyance made under the authority of this article is violated, the licensee

shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The types of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure to the satisfaction of the Commission's authorized representative that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine if the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

If no conveyance was made during the prior calendar year, the licensee shall so inform the Commission in writing no later than January 31 of each year.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is 5 acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Energy Projects, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; and (ii) the grantee shall take all reasonable precautions to

ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

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Appendix D

Forest Service 4(e) Conditions

PRELIMINARY LICENSE TERMS AND CONDITIONS
NECESSARY FOR THE PROTECTION AND UTILIZATION
OF THE SHASTA-TRINITY NATIONAL FOREST
IN CONNECTION WITH
THE APPLICATION FOR LICENSE

McCloud-Pit Hydroelectric Project
FERC Project No. 2106
Pacific Gas and Electric Company

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ENCLOSURE 1:

PRELIMINARY LICENSE TERMS AND CONDITIONS
NECESSARY FOR THE PROTECTION AND UTILIZATION OF THE
SHASTA-TRINITY NATIONAL FOREST
IN CONNECTION WITH THE
MCCLOUD-PIT HYDROELECTRIC PROJECT, FERC NO. 2106
PACIFIC GAS AND ELECTRIC COMPANY

I. GENERAL

The Forest Service (FS) provides the following Preliminary Section 4(e) conditions for the McCloud-Pit Hydroelectric Project, FERC No. 2106 in accordance with 18 CFR 4.34(b)(1)(i). Section 4(e) of the Federal Power Act (FPA), which states the Commission may issue a license for a Project within a reservation only if it finds that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired. This is an independent threshold determination made by FERC, with the purpose of the reservation defined by the authorizing legislation or proclamation (see Rainsong v. FERC, 106 F.3d 269 (9th Cir. 1977). The Forest Service, for its protection and utilization determination under Section 4(e) of the FPA may rely on broader purposes than those contained in the original authorizing statutes and proclamations in prescribing conditions (see Southern California Edison v. FERC, 116F.3d 507 (D.C. Cir. 1997)).

The following terms and conditions are based on those resource and management requirements enumerated in the Organic Administration Act of 1897 (30 Stat. 11), the Multiple-Use Sustained Yield Act of 1960 (74 Stat. 215), the National Forest Management Act of 1976 (90 Stat. 2949), and any other law specifically establishing a unit of the National Forest System (NFS) or prescribing the management thereof (such as the Wilderness Act or the Wild and Scenic Rivers Act), as such laws may be amended from time to time, and as implemented by regulations and approved Land and Resource Management Plans prepared in accordance with the National Forest Management Act. Specifically, the 4(e) conditions in this document are based on the Land and Resource Management Plan (as amended) for the Shasta-Trinity National Forest, as approved April 28, 1995 by the Regional Forester of the Pacific Southwest Region.

Pursuant to Section 4(e) of the Federal Power Act, the Secretary of Agriculture, acting by and through the Forest Service, considers the following conditions necessary for the adequate protection and utilization of the land and resources of the Shasta-Trinity National Forest. License articles contained in the Federal Energy Regulatory Commission's (Commission) Standard Form L-1 (revised October 1975) issued by Order

No. 540, dated October 31, 1975, cover general requirements. Section II of this document includes administrative conditions deemed necessary for the administration of National Forest System lands. Section III covers specific resource requirements for protection and utilization of National Forest System (NFS) lands.

II. ADMINISTRATIVE FOREST SERVICE PROVISIONS

CONDITION NO. 1 - CONSULTATION

The Licensee shall, beginning the first full calendar year after license issuance, participate in annual meetings with the Forest Service to present Project operation and maintenance activities planned for the next calendar year. In addition, Licensee shall present results from current year monitoring of noxious weeds and special status species as well as any additional information that has been compiled for the Project area, including progress reports on other resource measures. The goals of this meeting are to share information, mutually agreed upon planned maintenance activities, and identify concerns that the Forest Service may have regarding activities and their potential effects on sensitive resources, and any measures required to avoid or mitigate potential effects.

The date of the consultation meeting will be mutually agreed to by the Licensee and the Forest Service. Representatives from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDF&G), State Water Resources Control Board (SWRCB) or other interested agency representatives concerned with operation of the Project may request to attend the meeting.

Consultation shall include, but not be limited to:

- A status report regarding implementation of license conditions;
- Results of any monitoring studies performed over the previous year in formats agreed to by the Forest Service and the Licensee during development of study plans;
- Review of any non-routine maintenance;
- Discussion of any foreseeable changes to Project facilities or features;
- Discussion of any necessary revisions or modifications to plans approved as part of this license;
- Discussion of needed protection measures for species newly listed as threatened, endangered, or sensitive, or changes to existing management plans that may no longer be warranted due to delisting of species or, to incorporate new knowledge about a species requiring protection;
- Discussion of elements of current year maintenance plans, e.g. road maintenance; and
- Discussion of any planned pesticide use.

A record of the meeting shall be kept by the Licensee and shall include any recommendations made by the Forest Service for the protection of NFS lands and resources. The Licensee shall file the meeting record, if requested, with the Commission no later than 60 days following the meeting.

Copies of other reports related to Project safety and non-compliance shall be submitted to the Forest Service concurrently with submittal to the FERC. These include, but are not limited to: any non-compliance report filed by the Licensee, geologic or seismic reports, and structural safety reports for facilities located on or affecting NFS lands.

The Forest Service reserves the right, after notice and opportunity for comment, to require changes in the Project and its operation through revision of the Section 4(e) conditions to accomplish protection and utilization of NFS lands and resources.

CONDITION NO. 2 - APPROVAL OF CHANGES

Notwithstanding any license authorization to make changes to the Project, when such changes directly affect NFS lands the Licensee shall obtain written approval from the Forest Service prior to making any changes in any constructed Project features or facilities, or in the uses of Project lands and waters or any departure from the requirements of any approved exhibits filed with the Commission. Following receipt of such approval from the Forest Service, and a minimum of 60-days prior to initiating any such changes, the Licensee shall file a report with the Commission describing the changes, the reasons for the changes, and showing the approval of the Forest Service for such changes. The Licensee shall file an exact copy of this report with the Forest Service at the same time it is filed with the Commission. This condition does not relieve the Licensee from the amendment or other requirements of Article 2 or Article 3 of this license.

CONDITION NO. 3 - MAINTENANCE OF IMPROVEMENTS ON OR AFFECTING NATIONAL FOREST SYSTEM LANDS

The Licensee shall maintain all its improvements and premises on NFS lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the Forest Service. Disposal of all materials will be at an approved existing location, except as otherwise agreed by the Forest Service.

CONDITION NO. 4 - EXISTING CLAIMS

The license shall be subject to all valid claims and existing rights of third parties. The United States is not liable to the Licensee for the exercise of any such right or claim.

CONDITION NO. 5 - COMPLIANCE WITH REGULATIONS

The Licensee shall comply with the regulations of the Department of Agriculture for activities on NFS lands, and all applicable Federal, State, county, and municipal laws, ordinances, or regulations in regards to the area or operations on or directly affecting NFS lands, to the extent those laws, ordinances or regulations are not preempted by federal law.

CONDITION NO. 6 - SURRENDER OF LICENSE OR TRANSFER OF OWNERSHIP

Prior to any surrender of this license, the Licensee shall provide assurance acceptable to the Forest Service that Licensee shall restore any Project area directly affecting NFS lands to a condition satisfactory to the Forest Service upon or after surrender of the license, as appropriate. To the extent restoration is required, Licensee shall prepare a restoration plan which shall identify the measures to be taken to restore such NFS lands and shall include or identify adequate financial mechanisms to ensure performance of the restoration measures.

In the event of any transfer of the license or sale of the Project, the Licensee shall assure that, in a manner satisfactory to the Forest Service, the Licensee or transferee will provide for the costs of surrender and restoration. If deemed necessary by the Forest Service to assist it in evaluating the Licensee's proposal, the Licensee shall conduct an analysis, using experts approved by the Forest Service, to estimate the potential costs associated with surrender and restoration of any Project area directly affecting NFS lands to Forest Service specifications. In addition, the Forest Service may require the Licensee to pay for an independent audit of the transferee to assist the Forest Service in determining whether the transferee has the financial ability to fund the surrender and restoration work specified in the analysis.

CONDITION NO. 7- PROTECTION OF UNITED STATES PROPERTY

The Licensee, including any agents or employees of the Licensee acting within the scope of their employment, shall exercise diligence in protecting from damage the

land and property of the United States covered by and used in connection with this license.

CONDITION NO. 8 - INDEMNIFICATION

The Licensee shall indemnify, defend, and hold the United States harmless for:

- any violations incurred under any laws and regulations applicable to, or
- judgments, claims, penalties, fees, or demands assessed against the United States caused by, or
- costs, damages, and expenses incurred by the United States caused by, or
- the releases or threatened release of any solid waste, hazardous substances, pollutant, contaminant, or oil in any form in the environment related to the construction, maintenance, or operation of the Project works or of the works appurtenant or accessory thereto under the license.

The Licensee's indemnification of the United States shall include any loss by personal injury, loss of life or damage to property caused by the construction, maintenance, or operation of the Project works or of the works appurtenant or accessory thereto under the license. Indemnification shall include, but is not limited to, the value of resources damaged or destroyed; the costs of restoration, cleanup, or other mitigation; fire suppression or other types of abatement costs; third party claims and judgments; and all administrative, interest, and other legal costs. Upon surrender, transfer, or termination of the license, the Licensee's obligation to indemnify and hold harmless the United States shall survive for all valid claims for actions that occurred prior to such surrender, transfer or termination.

CONDITION NO. 9 - DAMAGE TO LAND, PROPERTY, AND INTERESTS OF THE UNITED STATES

The Licensee has an affirmative duty to protect the land, property, and interests of the United States from damage arising from the Licensee's construction, maintenance, or operation of the Project works or the works appurtenant or accessory thereto under the license. The Licensee's liability for fire and other damages to NFS lands shall be determined in accordance with the Federal Power Act and standard Form L-1 Articles 22 and 24.

CONDITION NO. 10 - RISKS AND HAZARDS ON NATIONAL FOREST SYSTEM LANDS

As part of the occupancy and use of the Project area, the Licensee has a continuing responsibility to reasonably identify and report all known or observed hazardous conditions on or directly affecting NFS lands within the Project boundary that would affect the improvements, resources, or pose a risk of injury to individuals. Licensee will abate those conditions, except those caused by third parties or not related to the occupancy and use authorized by the License. Any non-emergency actions to abate such hazards on NFS lands shall be performed after consultation with the Forest Service. In emergency situations, the Licensee shall notify the Forest Service of its actions as soon as possible, but not more than 48 hours, after such actions have been taken. Whether or not the Forest Service is notified or provides consultation, the Licensee shall remain solely responsible for all abatement measures performed. Other hazards should be reported to the appropriate agency as soon as possible.

CONDITION NO. 11 – PROTECTION OF FOREST SERVICE SPECIAL STATUS SPECIES

Before taking actions to construct new project features on NFS lands that may affect Forest Service special status species or their critical habitat, the Licensee shall prepare and submit a biological evaluation (BE) for Forest Service approval. The BE shall evaluate the potential impact of the action on the species or its habitat. In coordination with the Commission, the Forest Service may require mitigation measures for the protection of the affected species.

The biological evaluation shall:

- Include procedures to minimize adverse effects to special status species.
- Ensure project-related activities shall meet restrictions included in site management plans for special status species.
- Develop implementation and effectiveness monitoring of measures taken or employed to reduce effects to special status species.

CONDITION NO. 12 - ACCESS

The Forest Service reserves the right to use or permit others to use any part of the licensed area on NFS lands for any purpose, provided such use does not interfere with the rights and privileges authorized by this license or the Federal Power Act.

CONDITION NO. 13 - CROSSINGS

The Licensee shall maintain suitable crossings as required by the Forest Service for all roads and trails that intersect the right-of-way occupied by linear Project facilities (powerline, penstock, ditch, and pipeline).

CONDITION NO. 14 - SURVEYS, LAND CORNERS

The Licensee shall avoid disturbance to all public land survey monuments, private property corners, and forest boundary markers. In the event that any such land markers or monuments on NFS lands are destroyed by an act or omission of the Licensee, in connection with the use and/or occupancy authorized by this license, depending on the type of monument destroyed, the Licensee shall reestablish or reference same in accordance with (1) the procedures outlined in the "Manual of Instructions for the Survey of the Public Land of the United States," (2) the specifications of the County Surveyor, or (3) the specifications of the Forest Service. Further, the Licensee shall ensure that any such official survey records affected are amended as provided by law.

CONDITION NO. 15 - PESTICIDE-USE RESTRICTIONS ON NATIONAL FOREST SYSTEM LANDS

Pesticides may not be used on NFS lands or in areas affecting NFS lands to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, trash fish, etc., without the prior written approval of the Forest Service. During the Annual Consultation meeting described in Condition 1, the Licensee shall submit a request for approval of planned uses of pesticides for the upcoming year. The Licensee shall provide at a minimum the following information essential for review:

- whether pesticide applications are essential for use on NFS lands;
- specific locations of use;
- specific herbicides proposed for use;
- application rates;
- dose and exposure rates; and
- safety risk and timeframes for application.

Exceptions to this schedule may be allowed only when unexpected outbreaks of pests require control measures that were not anticipated at the time the report was submitted. In such an instance, an emergency request and approval may be made.

Pesticide use will be excluded from NFS lands within 500 feet of known locations of Shasta Salamanders, Northern Pond Turtles, Foothill Yellow Legged Frog, or known locations of Forest Service Special Status or culturally significant plant populations. Application of pesticides must be consistent with Forest Service riparian conservation objectives.

On NFS lands, the Licensee shall only use those materials registered by the U.S. Environmental Protection Agency and consistent with those applied by the Shasta-Trinity National Forest and approved through Forest Service review for the specific purpose planned. The Licensee must strictly follow label instructions in the preparation and application of pesticides and disposal of excess materials and containers. The Licensee may also submit Pesticide Use Proposal(s) with accompanying risk assessment and other Forest Service required documents to use pesticides on a regular basis for the term of the license as addressed further in Condition 25: Vegetation and Invasive Weed Management and Monitoring. Submission of this plan will not relieve the Licensee of the responsibility of annual notification and review.

CONDITION NO. 16 - MODIFICATIONS OF 4(E) CONDITIONS AFTER BIOLOGICAL OPINION OR WATER QUALITY CERTIFICATION

The Forest Service reserves the right to modify these conditions, if necessary, to respond to any Final Biological Opinion issued for this Project by the National Marine Fisheries Service, United States Fish and Wildlife Service; or any Certification issued for this Project by the State Water Resources Control Board.

CONDITION NO. 17 - SIGNS

The Licensee shall consult with the Forest Service prior to erecting signs related to safety issues on NFS lands covered by the license. Prior to the Licensee erecting any other signs or advertising devices on NFS lands covered by the license, the Licensee must obtain the approval of the Forest Service as to location, design, size, color, and message. The Licensee shall be responsible for maintaining all Licensee-erected signs to neat and presentable standards.

CONDITION NO. 18 – GROUND DISTURBING ACTIVITIES

If the Licensee proposes activities that were not specifically addressed in the Commission's NEPA processes, the Licensee, in consultation with the Forest Service,

shall determine the scope of work and potential for Project-related effects, and whether additional information is required to proceed with the planned activity. Upon Forest Service request, the Licensee shall enter into an agreement with the Forest Service under which the Licensee shall fund a reasonable portion of Forest Service's staff time and expenses for staff activities related to the proposed activities.

III. ADDITIONAL FOREST SERVICE PROVISIONS

CONDITION NO. 19- STREAMFLOW

Part 1. Minimum Streamflow Requirements and Measurement

Licensee shall maintain specified minimum streamflows in project reaches in accordance with provisions described below. Minimum streamflows shall commence within 90 days of license issuance, unless facility modifications are required. License Condition 16 (Modification of 4(e) Conditions After Biological Opinion or Water Quality Certification) provides the opportunity to adjust these minimum streamflow requirements to comply with the NOAA Biological Opinion and the SWRCB 401 Water Quality Certificate, if needed.

Minimum streamflows for the Lower McCloud River and Iron Canyon Creek shall be measured in two ways: as the 24-hour average of the flow (mean daily flow), and as an instantaneous flow. Minimum streamflow measurement at Pit 7 shall be instantaneous flow. There is no minimum flow at Pit 6. The instantaneous flow is the flow value used to construct the average daily flow value and shall be measured in time increments of at least 15-minutes. The 24-hour average flow is the average of the incremental readings from midnight of one day, to midnight of the following day, or an alternate 24-hour period as agreed. Licensee shall record instantaneous 15-minute streamflow as required by US Geological Survey (USGS) standards at all gages. The minimum instantaneous 15-minute streamflow shall be at least 80 % of the prescribed mean daily flow for those minimum streamflows less than or equal to 10 cubic feet per second (cfs), and at least 90% of the prescribed mean daily flow for those minimum streamflows required to be greater than 10 cfs.

Should the mean daily flow as measured be less than the required mean daily flow but more than the instantaneous flow, Licensee shall begin releasing the equivalent under-released volume of water within 7 days of discovery of the under-release. Credit for such additional releases will not exceed 20% of the instantaneous flow amount, when used to attain the equivalent of the under-released volume.

The Licensee shall schedule the timing of maintenance or other planned outages to avoid negative ecological effects from the resultant spills. The Licensee shall provide written notification to the Forest Service at least 90 days prior to any planned or scheduled maintenance outages that would affect streamflows in the Pit River, McCloud River or Iron Canyon Creek reaches. Notification shall include a

description of Project and coordinated measures the Licensee plans to take to minimize the magnitude and duration of spills into the Project reach. The Licensee shall not proceed with the planned maintenance outage without the formal written approval of the Forest Service and notification on Licensee's public Project website. The Forest Service will respond in a timely manner.

The Minimum Streamflow requirements are subject to temporary modification if required by equipment malfunction, as directed by law enforcement authorities, or in emergencies. An emergency is defined as an event that is reasonably out of the control of the Licensee and requires Licensee to take immediate action, either unilaterally or under instruction by law enforcement or other regulatory agency staff, to prevent imminent loss of human life or substantial property damage. An emergency may include, but is not limited to, natural events such as landslides, storms or wildfires, malfunction or failure of Project works, and recreation accidents.

If the Licensee temporarily modifies the requirements of these conditions, then the Licensee shall make all reasonable efforts to promptly resume performance of such requirements and shall notify the Forest Service and other interested or affected governmental agencies within 48 hours of the modification.

Where facility modification is required to implement the efficient release of Minimum Streamflows, the Licensee shall submit applications for permits within one year after license issuance, and complete such modifications and initiate minimum streamflows as soon as reasonably practicable but no later than two years after receipt of all required permits and approvals. Prior to completion of such required facility modifications, the Licensee shall make a good faith effort to provide the specified Minimum Streamflows within the capabilities of the existing facilities.

a) Pit River below Pit 7 Dam

The Licensee shall release instantaneous flow of 150 cfs in the Pit River below Pit 7 Dam as measured at USGS Gage 11365000 year round. Instantaneous flow is defined as the flow value used to construct the average daily flow value and shall be measured in time increments of at most 15-minutes.

b) McCloud River below McCloud Dam

The Licensee shall release mean daily flows of ***at least*** ~~200~~ ***175*** cfs year round from the McCloud Dam ***such that the mean daily flow at USGS Gage 11367800 (MC-1) at Ah-Di-Na is at least 200 cfs.*** These flows shall be augmented during the period February 15 through June 30 according to the prescription shown below. Flows shall be measured ***for compliance at both USGS Gage 11367800 (MC-1) and*** either at Gage MC-7 or directly at McCloud Dam.

Each month, Licensee shall consult Bulletin 120 published by the California Department of Water Resources (or its successor) and determine the "Percent of Average, April through July Forecast" for the McCloud River above Shasta Lake. That value shall be compared to values in Table 1-1 and the flow shall be modified as indicated. No ramping is required between semi-monthly increments.

Licensee shall downramp all spill events once controllable by valve operation (assumed to be at 1000 cfs). Down ramping shall proceed at an increment of 150 cfs decrease each 48 hour period until the prescribed minimum instream flow value is reached. Operational controllable spills (e.g. valve testing for dam safety compliance) also shall be up ramped in increments not to exceed 200 cfs each 24 hour period.

1-1. Flow Rule for McCloud River Instream Flow

If the February 1 McCloud Runoff % is:	**then for the period: February 15-29**	**and for the period: March 1-15**
0-75	No Change	No Change
76-89	No Change	Increase flow by 50 cfs
90-99	Increase flow by ~~50~~ ***75*** cfs	Increase flow by 50 cfs
100-119	Increase flow by ~~100~~ ***125*** cfs	Increase flow by 100 cfs
120+	Increase flow by ~~150~~ ***175*** cfs	Increase flow by 150 cfs

If the March 1 McCloud Runoff percentage is:	**then for the period: March 16-31**	**and for the period: April 1-15**
0-75	No Change	No Change
76-89	No Change	No Change
90-99	Increase flow by 50 cfs	No Change
100-119	Increase flow by 100 cfs	Increase flow by 50 cfs
120+	Increase flow by 150 cfs	Increase flow by 50 cfs

~~**If the April McCloud Runoff percentage is:**~~	~~**then for the period: April 16- to the last Friday/Saturday in April**~~
~~0-89~~	~~Decrease flow by 50 cfs (but to no less than 200 cfs)~~
~~Greater than 90~~	~~No Change~~

~~Beginning the last Friday/Saturday combination entirely in April, decrease the flow 50 cfs each Friday until the flow reaches 200 cfs~~

If the release from McCloud Dam (MC-7) on April 15 is equal to or greater than 200 cfs:

On each Friday after April 15, decrease the flow 50 cfs per week until the flow reaches 200 cfs, then maintain 200 cfs release at McCloud Dam (MC-7) through June 30.

Beginning July 1: release 175 cfs at MC-7 but maintain at least 200 cfs at Ah-Di-Na (MC-1).

If the release from McCloud Dam (MC-7) on April 15 is less than 200 cfs:

Beginning April 16: Release 175 cfs at MC-7; but maintain at least 200 cfs at Ah-Di-Na (MC-1).

c) Iron Canyon Creek below Iron Canyon Dam

The Licensee shall release mean daily flows in Iron Canyon Creek below Iron Canyon Dam in accordance with the schedule shown below in Table 1-2 as measured at Gage MC-10.

Table 1-2. Iron Canyon Creek

Month	Mean Daily Flow (cfs) by Water Year		
	Below Normal, Dry, Critically Dry	Above Normal	Wet
Oct	7	7	10
Nov	7	7	10
Dec	7	10	15
Jan	7	10	15
Feb	7	10	15
Mar	10	15	>20**
Apr	10	15	>20**
May	7	10	15
Jun	7	10	15
Jul	7	7	10
Aug	7	7	10
Sep	7	7	10

**In March and April of Wet Water Year Types, the Flow Control Valve on Iron Canyon Dam shall be fully opened. Mean Daily flow shall be at least 20 cfs during this period.

No ramping is required between monthly increments. Valve testing for dam safety compliance shall only occur between March 5 and 15. Up ramping to test flow valve (assumed 200 cfs maximum) shall occur in 20 cfs increments spaced at least 15-minutes apart. Down ramping shall occur in 20 cfs increments spaced at least 30-minutes apart

Part 2. Water Year Type.

The Licensee shall determine the water year type based on the forecast of unimpaired runoff of the Sacramento River near Redding as provided by the California Department of Water Resources (DWR) Bulletin 120 report of water conditions in California. In January, February, March, and April the Licensee shall determine the water year type based on the DWR Bulletin 120 forecast and shall operate for that month based on that forecast. The May forecast shall be used to establish the water year type for the remaining months until the next January, when forecasting shall begin again. Minimum Instream Flows (MIFs) triggered by the water year type will be implemented within two business days of the actual publication date of DWR Bulletin 120.

Part 3. Streamflow Measurement.

For the purpose of determining the river stage and minimum streamflow on the Lower McCloud River below McCloud Dam, Pit River below the Pit 7 Dam, and Iron Canyon Creek below the Iron Canyon Dam, the Licensee shall operate and maintain the existing gages, consistent with all requirements of FERC and under the supervision of the USGS. Any modification of the gage facilities at any of these gages that may be necessary to measure the new Minimum Streamflow releases shall be completed within three years of issuance of the new Project license. Licensee shall install an instream measuring device either within or adjacent to the McCloud Dam to directly measure instream flow releases from McCloud dam

The Licensee shall measure and document all instream flow releases in publicly available and readily accessible formats. Flow data at MC-1 shall be real-time data and posted on the California Data Exchange Center (CDEC) or its successor website. Flow data collected by Licensee from the stream gages will be reviewed by the Licensee's hydrographers as part of its quality assurance/quality control (QA/QC) protocol. Upon completion of the QA/QC process, the data will be catalogued and made available to USGS in annual hydrology summary reports. Licensee understands that the USGS will then complete their QA/QC review of the data and subsequently publish the data and post it within their electronic database that can be accessed via the Internet. The flow values (generally 15-minute recordings) used to construct the 24-hour average flows will be available to the resource agencies from the Licensee upon request.

CONDITION NO. 20 - WATER QUALITY AND TEMPERATURE MONITORING

Within one year of license issuance, and in consultation with applicable Federal and State agencies, the Licensee shall file with the Commission a Water Quality and Temperature Monitoring Plan that is approved by the Forest Service, as it relates to aquatic habitats managed by the Forest Service. Upon Commission approval, Licensee shall implement the Plan. This plan shall include:

- Periodic monitoring of all project reservoirs once every five years for contaminants (including e. coli, to measure possible sanitation concerns at appropriate key recreation locations, e.g. boat ramps, day use areas, near campgrounds, etc.);
- Periodic monitoring of dissolved oxygen at McCloud, Pit 6 and Pit 7 reservoirs;
- Annual monitoring during the months of May through September at a minimum, for a period of ten years, of potential water temperature effects to beneficial uses including recreation, aquatic habitats, and target species (i.e. Foothill Yellow Legged Frogs, fish, and benthic macroinvertebrates), as a result of modified in-stream flows and reservoir operations. Monitoring to be conducted by Project segment (i.e. reservoirs and Project-affected rivers). If monitoring indicates that high temperatures (above 20° C) are occurring within the project reservoirs or downstream reaches, then additional monitoring may be required;
- Continuous monitoring of turbidity for the term of the license in the Lower McCloud River (at MC-7 or MC-1) during the fishing season (approximately April 25 to November 15) to record elevated turbidity for recreational use. Turbidity levels shall be available real-time during the fishing season on the Licensee's public Project website. Periodic turbidity monitoring during construction, re-construction, or other soil disturbing activities to identify point source erosion that may require repair or stabilization;
- Continuous monitoring of turbidity for a minimum of five years after license issuance in Iron Canyon Creek (at MC-10) to ensure that Licensee's repairs have reduced sedimentation into the creek below the dam. If elevated turbidity (above Basin Plan level) is still occurring after five years, continue monitoring for an additional five years until additional mitigations reduce turbidity to or below Basin Plan level.
- Implement "Best Management Practices" (BMP's) within the Project and Project-affected area that will satisfy the Aquatic Conservation Strategy objectives within the Northwest Forest Planning area, and mitigate impacts from:
    - Project operation and maintenance activities;
    - Developed and dispersed recreation use;
    - Road use, routine maintenance, and repair;
    - Vegetation manipulation;
    - Prescribed fire and wildland fire planning, and fire suppression;
    - Watershed practices;

CONDITION NO. 21 - LARGE WOODY DEBRIS

Within one year of license issuance, Licensee shall, in consultation with the Forest Service, CDF&G, SWRCB, potentially affected tribes, and other interested parties, prepare a Large Woody Debris Management Plan approved by the Forest Service. The plan shall provide an operating procedure to facilitate the placement of woody debris downstream of McCloud Dam. The Plan will specify: (1) size criteria, (2) placement and storage sites, (3) volume and frequency of placement, and (4) monitoring procedures that assess the effectiveness of (Large Woody Debris) LWD mobilization and dispersal in the Lower McCloud River. Upon Commission approval, Licensee shall implement the Plan.

CONDITION NO. 22 - EROSION AND SEDIMENT CONTROL MANAGEMENT AND MONITORING

Within one year of license issuance, the Licensee shall file with the Commission an Erosion and Sediment Control Management and Monitoring Plan developed in consultation with the Forest Service, SWRCB, CDF&G, and other interested parties, and approved by the Forest Service that will provide direction for managing erosion and controlling sediment during the term of the new license. Upon Commission approval, Licensee shall implement the Plan.

The plan shall include the following elements:

- Methods for inventorying and monitoring Project-related erosion and sedimentation;
- An inspection schedule for monitoring of Project and Project-related erosion and sedimentation sites during the term of the license. The schedule will include various timelines based on the type of erosion process, type of erosion site, and the activity level of each erosion feature. Effectiveness monitoring of erosion control measures at high priority sites shall occur for a period of three years after treatment in order to determine if further erosion control measures are needed. Periodic monitoring of the entire Project and Project-affected area shall occur at a minimum of once every ten years to assess the effectiveness of erosion control measures at existing sites and to identify new erosion sites. Periodic monitoring should incorporate protocols used in Study GS-S1 (*Inventory and assessment of erosion and sediment from Project Construction, Operation, and Maintenance*) in order to provide a consistent framework for identifying and reporting erosion sites and effectiveness of erosion control measures;

- An inventory of erosion sites (e.g., map and database) included in periodic monitoring. The inventory of Project-related erosion and sedimentation will include Project roads, facilities, infrastructure, tunnel spoils and borrow pits, reservoir shorelines, developed and dispersed recreational use areas, and areas of mass wasting that are Project-related or affected by Project roads and facilities. New erosion sites will be included in subsequent monitoring and treatment schedules;
- Criteria for treating erosion sites including a decision tree for determining when and how specific sites will be treated to control erosion and sedimentation;
- Schedule for repair of erosion sites including a list of sites requiring immediate mitigation and schedule for their implementation. Priority will be placed on the 56 sites ranked as having high erosion potential in study results from *Inventory and Assessment of Erosion and Sediment from Project Construction, Operation, and Maintenance (TM-67)*. Remaining moderate and low priority sites, and any new sites added as a result of periodic monitoring, will be scheduled in priority order for repair;
- Protocols for emergency erosion and sediment control;
- A process and schedule for reporting survey monitoring results, including periodic plan review and revision;
- Erosion control measures will follow best management practices (e.g., USFS, 2002) customized to site-specific conditions.[1]

Sites where erosion can be mitigated by routine maintenance (e.g. plugged culverts and ditches) should be addressed as soon as feasible and no later than one year following license issuance, unless the site is incorporated into a larger design change (e.g. reconstruction of roadway and drainage features to achieve Road Management Objectives).

Annual monitoring reports will include a GIS database, compatible with Forest Service standards, of erosion sites and detailed, site-specific, erosion and sediment control measures where necessary and appropriate.

Erosion Control Guidelines for New Construction or Non-Routine Maintenance

During planning, and before any new construction or non-routine maintenance projects with the potential for causing erosion and/or stream sedimentation on or affecting NFS lands (including but not limited to the planned recreation-related construction), the Licensee shall develop site-specific erosion control plans for each

[1] USDA Forest Service, Pacific Southwest Region, 2000. Water quality management for Forest System lands in California.

project that will be approved by the Forest Service. The plans shall include measures to control erosion, stream sedimentation, dust, and soil mass movement.

The Plan shall be based on actual on-site geological, soil, and groundwater conditions and shall include:

- A description of the current actual site conditions;
- Detailed descriptions, design drawings, and specific topographic locations of all erosion control measures;
- Measures to divert runoff away from disturbed land surfaces;
- Measures to collect and filter runoff over disturbed land surfaces, including sediment ponds at the diversion and powerhouse sites;
- Revegetating disturbed areas in accordance with current direction on use of weed-free straw, native plants, and locality of plant and seed sources;
- Measures to dissipate energy and prevent future erosion.

CONDITION NO. 23 - GRAVEL AND COARSE SEDIMENT MANAGEMENT AND MONITORING

Within one year of license issuance, the Licensee shall develop, in consultation with the Forest Service, CDF&G, SWRCB, and other interested parties, and file with the Commission a Gravel and Course Sediment Management Plan that is approved by the Forest Service. Upon Commission approval, Licensee shall implement the Plan.

The plan shall require the addition of between of 150 to 600 tonnes of gravel and associated coarse sediment to the Lower McCloud River annually. The gravel and coarse sediment shall range between 8-128 mm in size. The amount of gravel/coarse sediment will initially be 150 tonnes. This amount may be increased to a maximum of 600 tonnes depending on monitoring results. The source of the gravel and coarse sediment will be the responsibility of the Licensee; however, it is recommended that Licensee consider using sorted gravel and coarse sediment in the Star City Creek inlet as the source of material for the plan. If other sources are selected, the selected gravels shall be clean, rounded and ranging in size from approximately 8-128 mm. Inputs of gravel and coarse sediment will occur within the reach of the Lower McCloud River between the spillway and the Hawkins Creek confluence.

At a minimum, the Gravel and Sediment Management Plan shall:

- Identify the source(s) of gravel and coarse sediment;
- Identify the locations for gravel introduction in the Lower McCloud River below McCloud Dam;

- Identify facilities or improvements necessary for accessing the Lower McCloud River for placement of gravel and coarse sediment;
- Identify approved temporary or long-term stock pile sites, if needed;
- Develop a schedule for gravel and coarse sediment placement;
- Include an adaptive management component to allow non-delivery of gravel and coarse sediment in non-spill years or in years when spill is insufficient to mobilize the gravel and sediment from the placement site(s) or increased delivery above the minimum 150 tonnes if monitoring results indicate a need for greater quantities of the gravel and coarse sediment.

The plan shall also include a monitoring component that is integrated into the Biological Monitoring Plan (see Condition No. 27; Aquatic Biological Monitoring). Monitoring shall evaluate the biological population trends of species that are affected by the gravel and coarse sediment, specifically trout and macroinvertebrates, long term changes in channel morphology, and the fate of introduced gravels and coarse sediment over the course of the license term. The monitoring shall be conducted in the reach of the Lower McCloud River between McCloud Dam and Bald Mountain Creek confluence.

During the Annual Consultation Meeting required by Condition No. 1, the Forest Service will review monitoring results and discuss any needed changes to the Gravel and Coarse Sediment Management Plan. Any proposed changes shall require Forest Service approval.

CONDITION NO. 24 - RESERVOIR DREDGING

If required for the purposes of increasing gravel and sediment supply or for removing sediment from reservoirs to accomplish Project management objectives, the Licensee shall prepare a Reservoir Dredging Plan in consultation with and approved by the Forest Service. Licensee shall file the approved plan with the Commission not less than 90 days prior to any proposed or scheduled reservoir dredging operations. Upon Commission approval, Licensee shall implement the Plan. At a minimum, the Plan shall include:

- Location, amount, and timing of dredging operation (including map and photos);
- Extent, approximate amount, composition and size of dredged materials;
- Identify approved temporary or long-term stock pile sites, if needed;
- Equipment, road access, temporary access needs and storage/staging locations of material;

- Proposed start and end date of dredging;

- Conditions to minimize ecological impacts related to dredging operations;
- Public notification information regarding the purpose of dredging, timing and dredging location.

CONDITION NO. 25 - VEGETATION AND INVASIVE WEED MANAGEMENT AND MONITORING

Within one year of license issuance, the Licensee shall file with the Commission a Vegetation and Invasive Weed Management Plan approved by the Forest Service and developed in consultation with the Forest Service, appropriate County Agricultural Commissioner, California Department of Food and Agriculture, potentially affected tribes, and other interested parties. Targeted invasive species will be those species defined by the California Department of Food and Agriculture (CDFA) code, the California Invasive Plant Council (Cal-IPC) rating system, or as Forest Service species of concern. The plan will address Special Status species, both aquatic and terrestrial invasive species, and culturally significant plants within the Project boundary and adjacent to Project features directly affecting NFS lands including, roads, and distribution and transmission lines. Upon Commission approval, Licensee shall implement the Plan.

The Vegetation Management and Monitoring plan shall include and/or address the following components:

- Treatment protocols and measures for removing or trimming vegetation within the Project and Project affected area, including:
    - Hazard tree removal and trimming, including slash disposal;
    - Powerline/transmission line clearing, including slash disposal;
    - Vegetation management for habitat improvement;
    - Revegetation of disturbed sites, including standards of success, monitoring schedule and remediation measures when initial efforts are not successful;
    - Soil protection and erosion control, including use of certified weed-free straw and other methods that minimize the risk of introducing non-native invasive species;
    - Establishment of and/or revegetation with culturally important plant populations;
    - Use of clean, weed-free seed with guidance on the use of locally collected native seed. Plan shall include a means for collecting and propagating, or otherwise acquiring an adequate supply of appropriate native plant materials for Licensee use in erosion control, revegetation, and landscaping.

- Protection of Special Status and Culturally Significant plants and populations;
- Invasive Species Management and Monitoring;
- Pesticide/herbicide use restrictions and prohibitions;

Special Status and Culturally Significant Plants and Habitat Component

Licensee shall develop, in consultation with the Forest Service, a Monitoring Component for Special Status Plants, and culturally significant plants[2] approved by the Forest Service. This Plan Component shall include objectives, monitoring methods, locations of test plots, and a schedule for implementation. At a minimum this Plan Component will:

- Identify the current locations (including the boundaries) of special status and culturally significant plant populations in the Project and Project-affected area, as delineated by using a GPS instrument;
- Provide for periodic monitoring once every five years of the population boundaries to assess any expansion or contraction of the existing special status and culturally significant plant populations;
- Provide for periodic survey of the Project and Project-affected area every ten years to determine if additional special status plant species have moved into the Project or Project-affected area, and if so, measures for addressing those species;
- Survey for any new listings of special status plant species potentially occurring within the Project or Project-affected area, and provide monitoring if located.

In addition, in order to reduce impacts from all operations within the Project and Project-affected area, the Licensee shall share information on the locations of sensitive, culturally significant, invasive species, and other rare plant locations with the managers for operation and maintenance of any power distribution lines that cross portions of the Project area. Information shall include all protective, monitoring and survey measures from the license.

Special Status Species Survey Element

The Licensee shall begin annual consultation with the Forest Service, concurrent with the Annual Consultation Meeting noted in Condition 1 above, to review the most current list of special status plant species (species that are Forest Service Sensitive (FSS), Management Indicator Species (MIS), Survey and Manage species (S&M), or

[2] Ethnobotanical resources (i.e. culturally sensitive plants) at Tribal collection sites identified in the Traditional Cultural Properties Study (CR-S2) are addressed in the Heritage Properties Management Plan. The reference here pertains specifically to protection of other culturally significant plant populations that have not been identified in that study and revegetation with culturally significant plants following construction, restoration or other ground disturbing activities. This topic could be addressed entirely in the HPMP, but if so, should be referenced in this License Condition.

on the Shasta-Trinity National Forest Watch List) that might occur on NFS lands in the Project area or Project-affected area as a result of Project operations.

When a species is added to one or more of the lists, the Forest Service, in consultation with the Licensee, shall determine if the species, or un-surveyed suitable habitat for the species, is likely to occur on such NFS lands. For such newly added species, if the Forest Service determines that the species is likely to occur on such NFS lands, the Licensee shall, within one year, develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the Project on the species. The Licensee shall prepare a report on the study including objectives, methods, results, recommended resource measures where appropriate, a schedule for implementation, and shall provide a draft of the final report to the Forest Service for review and approval. The Licensee shall file the final report, including evidence of consultation, with the Commission.

Invasive Species Management and Monitoring Component

The Invasive Weed Management and Monitoring Component shall include and/or address the following elements:

- Monitoring areas with ground disturbing activities associated with the license annually for three years after disturbance to determine if any invasive weed populations have been introduced into the Project area (including powerline alignments) as a result of construction or re-construction activities associated with the new license conditions (e.g. roads, recreation, micro-hydro installations, etc.).
- Monitoring known populations of invasive weeds annually for the first three years after license issuance to determine if invasive weed populations are expanding into any locations of existing special status or culturally significant plant populations; or if other adverse impacts to these populations are occurring, then once every five years for the term of the license to monitor population size and threat.
- Inventory and mapping of new populations of invasive weeds using a Forest Service compatible database and GIS software. The invasive weed GIS data layer shall be updated every five years and shared with resource agencies;
- Protocols and/or strategies to prevent and control spread of known populations or introductions of new populations, such as:
    - Thoroughly clean all construction equipment before entering the Project area, to reasonably ensure that seeds of invasive weeds are not introduced. Such cleaning will be required for all construction equipment that leaves the road or disturbs the soil, but shall not apply to vehicles used for the Licensee's regular maintenance and operations activities;

- Use certified weed-free straw for all construction or restoration needs. If certified weed-free straw is not available, rice straw may be substituted. Use gravel and sand from weed-free sources where possible. The Licensee shall use an approved mix of plant species native to the Shasta-Trinity National Forest for restoration or erosion control purposes;
  1.

- Development of a schedule for control (containment or eradication) of all known populations of CDFA rated A, B and Q species, Cal-IPC "high" and "moderate" rated species, and selected other rated invasive weed species, designated by resource agencies;
- Annual monitoring of known populations of invasive species for the term of the license in locations tied to Project actions or effects, such as road maintenance, at Project facilities, O&M activities, new construction sites, etc. to evaluate the effectiveness of re-vegetation and invasive weed control measures;
- Provision for an environmental training program for the Licensee's O&M staff on the location and identification of invasive weeds that may occur in the area;
- Notification of the Forest Service when the Licensee's O&M staff observes any new populations of invasive weeds and coordination with them on the control of the population;

Licensee shall avoid entering areas with existing populations of invasive species. If entry is necessary, the Licensee shall, where reasonably feasible, conduct work in weed-free areas first and then in the areas with invasive species to avoid spreading them within the Project area.

New infestations of A& B rated or "high" and "moderate" rated species shall be controlled within one year of detection, or as soon as is practical and feasible. The A, B, C, & Q ratings refer to the California Department of Food & Agriculture Action Oriented Pest Rating System. The "high", "moderate", and "limited" ratings refer to the California Invasive Plant Council rating system. At specific sites where other objectives need to be met, all classes of invasive species may require treatment.

Monitoring shall be done in the appropriate season when plants are identifiable, but can be done in conjunction with other project maintenance and resource surveys to minimize separate travel and personnel. Monitoring information, in database and GIS formats, will be provided to the Forest Service as part of the annual consultation meeting (see Condition No. 1). To assist with this monitoring requirement, training in invasive weed identification shall be provided to project employees and contractors by the Licensee.

Licensee shall restore/revegetate areas where treatment has eliminated invasive weeds in an effort to prevent the reestablishment or new establishment of invasive weed

species. Project-induced ground disturbing activities shall be monitored annually for the first three years after disturbance to detect and map new populations of invasive species. Spot treatments of new, small infestations may be done at the time of detection.

Invasive species known to occur in the Project and Project-affected area include**:**

- Tree of heaven *(Ailanthus altissima)*(Cal-IPC-moderate)
- Cheatgrass *(Bromus tectorum)*(Cal-IPC-high)
- Italian thistle *(Carduus pycnocephalus)* (Cal-IPC-moderate, CDFA-C)
- Spotted knapweed *(Centaurea maculosa)* (Cal-IPC-high, CDFA-A)
- Yellow star-thistle *(Centaurea solstitialis)* (Cal-IPC-high, CDFA-C)
- Canada thistle *(Cirsium arvense)* (Cal-IPC-moderate, CDFA-B)
- Bull thistle *(Cirsium vulgare)*(Cal-IPC-moderate)
- Gypsyflower *(Cynoglossum officinale)*(Cal-IPC-moderate)
- Scotch broom *(Cytisus scoparius)* (Cal-IPC-high, CDFA-C)
- Fuller's teasel *(Dipsacus fullonum)*(Cal-IPC-moderate)
- Tall fescue *(Festuca arundinacea)*(Cal-IPC-moderate)
- English ivy *(Hedera helix)*(Cal-IPC-high)
- Common St. Johnswort *(Hypericum perforatum)* (Cal-IPC-moderate, CDFA-C)
- Pale yellow iris *(Iris pseudacorus)*(Cal-IPC-limited)
- Dyer's woad *(Isatis tinctoria)* (Cal-IPC-moderate, CDFA-B)
- Perennial sweet pea *(Lathyrus latifolius)*(USFS-species of concern)
- Pepperweed *(Lepidium campestre)*(USFS-species of concern)
- Black locust *(Robinia pseudoacacia)*(Cal-IPC-limited)
- Himalayan blackberry *(Rubus discolor)*(Cal-IPC-high)
- Cutleaf blackberry *(Rubus laciniatus)*(USFS-species of concern)
- Spanish broom *(Spartium junceum)*(Cal-IPC-high)
- Spreading hedgeparsley *(Torilis arvensis)*(Cal-IPC-moderate)
- Puncturevine *(Tribulus terrestris)* (CDFA-C)
- Common mullein *(Verbascum Thapsus)*(Cal-IPC-limited)

Where populations of CDFA "A" and "B" rated species, and Cal-IPC "high" and "moderate" rated species are: 1) contiguous and extend outside the Project boundary or 2) downstream of populations inside the Project boundary and have a reasonable nexus to the Project, the Licensee shall make reasonable efforts to control the entire population unit. Populations of CDFA "C" rated, Cal-IPC "Limited" rated, or "USFS species of concern" shall be evaluated for control options based on total population size, access, potential for spread and/or re-infestation.

The plan will include an adaptive management element to implement methods for prevention of aquatic invasive weeds, as necessary. These actions may include, but may not be limited to:

- Public education and signing of public boat access;
- Preparation of an Aquatic Plant Management component to the Plan

CONDITION NO. 26 - TERRESTRIAL BIOLOGICAL MANAGEMENT AND MONITORING

Within one year of license issuance, the Licensee shall develop, in consultation with the Forest Service, CDF&G, potentially affected tribes, and other interested parties, and approved by the Forest Service, a Terrestrial Biological Management Plan, including Forest Service special status species (i.e. Forest Service sensitive, survey and manage, and management indicator species) potentially affected by the Project on NFS lands. Upon Commission approval, Licensee shall implement the plan.

To the extent possible, this plan should be developed consistent with completed biological implementation plans from the recently relicensed Pit 3, 4, 5 Project to provide similar data collection protocols for species that span both hydroelectric Project areas on adjacent NFS lands. The Plan shall include, but may not be limited to, the following components:

- Occupation and population monitoring at specific intervals for the species listed below;
- Periodic surveys throughout the term of the license within the Project and Project-affected area to determine if additional populations develop, as specified below;
- Reporting of terrestrial survey and monitoring results including suitable habitat, populations, individuals, pairs, and nest locations every five years (or at Frequency specified below by species) with a Forest Service GIS compatible map that includes base data from study plan surveys, and updated data from periodic monitoring and surveys.

Mitigation measures to be implemented by the Licensee include:

- Licensee shall conduct pre-disturbance/pre-construction surveys for Forest Service special status species that follow standard protocols as reviewed and approved by the Forest Service, or protocols collaboratively developed and approved by the Forest Service if no protocols exist at the time;
- Licensee shall observe Limited Operating Periods (LOP's) where required (LOP's do not apply to emergency situations);

- Licensee shall utilize post-license monitoring and surveys for Forest Service special status species to determine if mitigation measures are necessary to protect Forest Service special status species.

Terrestrial Mollusks

Monitor sensitive terrestrial mollusks once every five years, survey potentially suitable habitat for new populations every ten years for the term of the license. Species to be monitored include the Shasta sideband snail (*Monadenia troglodytes troglodytes*), Wintu sideband snail (*Monadenia troglodytes wintu*), Shasta chaparral snail (*Trilobopsis roperi*), Tehama chaparral (*Trilobopsis tehamana*) and Shasta hesperian (*Vespericola Shasta*) at known sites along the McCloud Reservoir, Lower McCloud River, Iron Canyon Reservoir and Creek, and Pit 6 & 7 Reservoirs. Protect or relocate species when located in development sites.

Elderberry Longhorn Beetle

Monitor known suitable habitat once every 5 years for individuals. Protect if located.

Shasta Salamanders

Monitor for Shasta Salamander (*Hydromantes shastae*) at known locations once every 5 years along the McCloud Reservoir and Fenders Ferry Flat Afterbay, and survey suitable habitat once every ten years. Include estimates of population age distribution in terrestrial reporting.

Foothill Yellow Legged Frog

Survey once every ten years for additional populations of Foothill Yellow Legged Frogs (*Rana boylii)* along the 5.4 miles of NFS lands along the Lower McCloud River, and along the Pit 6 and Pit 7 reservoirs and tributaries. Protect or relocate species if found in areas proposed for construction or disturbance.

North Western Pond Turtles

Monitor North Western Pond Turtle (*Clemys marmorata*) at suitable locations once every five years, and survey suitable habitat once every ten years to identify additional populations. Include estimates of population age distribution in terrestrial reporting. Protect or relocate species if located in areas proposed for construction or disturbance.

Northern Goshawk

Monitor Northern Goshawk (*Accipiter gentilis*) within ¼ mile of detection site(s) identified in study results once every five years, and survey suitable habitat once every ten years to identify any additional individuals or pairs. Conduct surveys in suitable habitat prior to disturbance activities, or observe annual limited operating period of February 1 – August 15.

Bald Eagles

Monitor Bald Eagle (*Haliaeetus leucocephalys*) individuals, pairs and nest productivity annually at the McCloud Reservoir, Iron Canyon Reservoir, Pit 6 and Pit 7 Reservoirs, and any additional locations identified during surveys or monitoring, as approved by the Forest Service**.** Conduct surveys prior to disturbance activities, or observe annual limited operating period of January 1 – August 1. In addition:

- Identify disturbance factors and appropriate actions needed to minimize disturbances including recreational use, Project operations, timber harvest, road maintenance, etc. Consider actions such as:
    - Buffer zones around each known nest territory
    - Potential water surface zoning of Project reservoirs with respect to watercraft use.
- Coordinate Licensee and Forest Service land management activities within bald eagle nest territories in the Project area, such as timber harvest, mining, woodcutting, etc.;
- Periodically monitor, in conjunction with recreation monitoring, human use patterns to discern human/bald eagle interaction conflicts. Include monitoring of watercraft use on areas of McCloud Reservoir and Iron Canyon Reservoir near nests;
- Develop an interpretive sign at McCloud and Iron Canyon Reservoirs addressing bald eagles, consistent with specific visual direction in the Interpretation and Education Sign Plan.

Peregrine Falcon

Monitor Peregrine Falcon (*Falco peregrinus*) individuals, pairs, and nest productivity within ¼ mile of the known sites on NFS lands annually, and conduct surveys once every five years in potentially suitable habitat. Conduct surveys prior to disturbance activities, or observe annual limited operating period of February 1 – August 15. In addition:

- Identify disturbance factors and appropriate actions needed to minimize disturbances including recreational use, Project operations, timber harvest, road maintenance, etc. Consider actions such as buffer zones around each

known nest territory;

- Coordinate Licensee and Forest Service land management activities within Peregrine Falcon nest territories, such as timber harvest, mining, woodcutting, etc.

Northern Spotted Owl

Monitor Northern Spotted Owl (*Strix occidentalis caurina*) within ¼ mile of suitable habitat in the Project area once every five years, and conduct surveys within suitable habitat once every ten years to identify new individuals, pairs or nest sites. Conduct surveys prior to disturbance activities, or observe annual limited operating period of February 1 – July 9.

Willow Flycatcher

Survey suitable Willow Flycatcher (*Empidonax traillii*) habitat (including dispersed campsites) once every five years, and conduct surveys prior to disturbance activities, or observe annual limited operating period of April 1 – August 30. Restore and enhance existing willow habitat within the Project or Project-affected area where Project activities have impacted vegetation.

Breeding Birds

Conduct surveys for (Neo-tropical) Breeding Birds within suitable habitat prior to disturbance activities or observe annual limited operating period of April 1- August 30.

Special Status Bats

Monitor Special Status Bats including Townsend's Big-eared Bat (*Corynorhinus townsendii*), Pallid Bat (*Antrozous pallidus*), and Western Red Bat (*Lasiurus blossevilli*) annually at known locations around McCloud Reservoir, and Pit 7 reservoir, and conduct surveys once every five years in suitable habitat. Conduct surveys prior to disturbance, or observe annual limited operating period of March 1 to September 30. In addition:

- Prior to any construction or re-construction within 1 mile of known locations, develop a strategy/mitigation plan for the land-based population at McCloud Reservoir;
- Screen all bathroom vents at all existing and proposed recreational sites to reduce bat mortality. Consult with Forest Service prior to implementing any bat exclusion techniques on other Project or Project-affected facilities.

Forest Carnivores (Fisher)

Survey for Fisher (*Martes pennanti*) once every five years in suitable habitat within the Project and Project affected areas.

Documentation and Reporting

Results of pre-construction and pre-disturbance surveys shall be provided to the Forest Service as collected to facilitate review and approval of project activities and construction. Results of pre-construction and pre-disturbance surveys shall also be included in five-year data reports and on GIS layer mapping products.

A draft technical report of all Terrestrial Biological Monitoring components shall be prepared following completion of each survey and monitoring effort for agency review, input, and concurrence. In addition to describing the results, the report shall compare results with those of previous surveys. All monitoring component reports shall discuss implications regarding trends in parameters over time. Additionally, it shall address any monitoring results that may indicate biological concerns and an adaptive process to further assess and implement actions that may be necessary to address identified concerns related to Project effects. A final report incorporating input (or addressing why it was not incorporated) shall be prepared and filed with the Forest Service, applicable agencies, and the Commission.

Special Status Species Surveys

Beginning the first full calendar year after license issuance, the Licensee shall, in consultation with the Forest Service, annually review the current list of special status wildlife species (species that are Forest Service Sensitive (FSS), Survey and Manage (S&M), Management Indicator Species (MIS), or on the Shasta-Trinity National Forest Watch List) that might occur on NFS lands in the Project or Project-affected area.

When a species is added to one or more of the lists, the Forest Service in consultation with the Licensee shall determine if the species or un-surveyed suitable habitat for the species is likely to occur on NFS lands within the Project or Project-affected areas. If the Forest Service determines that the species is likely to occur, the Licensee shall develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the Project on the species. The Licensee shall prepare a report on the study including objectives, methods, results, recommended resource measures where appropriate, and a schedule of implementation, and shall provide a draft of the final report to the Forest Service for review and approval. The Licensee shall file the final report, including evidence of consultation, with the Commission. Upon approval by the Commission, Licensee shall implement those resource management measures.

Avian Collision and Electrocution Hazards

Within one year of license issuance, the Licensee shall file with the Commission, an Avian Collision and Electrocution Hazards Plan, approved by the Forest Service in consultation with appropriate Federal and State agencies that minimizes adverse interactions between Project transmission lines and avian species. All new or rebuilt power poles shall conform to, guidelines in "Suggested Practices for Raptor Protection—State of the Art in 1996" (APLIC 1996) or updated guidelines when they are issued. Any pole involved in a bird fatality shall be immediately repaired/replaced to meet these guidelines.

CONDITION NO. 27 - AQUATIC BIOLOGICAL MANAGEMENT AND MONITORING

Within one year of license issuance, the Licensee shall develop, in consultation with the Forest Service, CDF&G, potentially affected tribes, and other interested parties, and approved by the Forest Service, an Aquatic Biological Management Plan, including Forest Service special status species (i.e. Forest Service sensitive, survey and manage, and management indicator species) potentially affected by the Project on NFS lands. Upon Commission approval, Licensee shall implement the plan.

To the extent possible, this plan should be developed consistent with completed biological implementation plans from the recently relicensed Pit 3, 4, 5 Project to provide similar data collection protocols for species that span both hydroelectric Project areas on adjacent NFS lands. The Plan shall include, but may not be limited to, the following components:

- Population trends, age-class structure, and fish condition factors in the McCloud Reservoir, Iron Canyon Reservoir, Pit 6 Reservoir, Pit 7 Reservoir, Lower McCloud River, and the Pit River, and monitoring at specific intervals for the species listed below;
- List of fish species to be monitored, standardized sampling and data protocols consistent with pre-licensing studies, to the extent possible, to ensure comparability of survey results with pre-licensing data;
- Periodic survey once every three years (or as determined by the agencies, potentially affected tribes and other interested parties) for the first 9 years of the license period, and then once every five years for the term of the license;
- Report aquatic survey and monitoring results, including suitable habitat by age class (e.g. fry, juvenile, adult) and populations by age class and species, every five years (or at frequency specified below by species) with a Forest Service

GIS compatible map that includes base data from study plan surveys, and updated data from periodic monitoring and surveys.

Benthic Macroinvertebrates

Monitor benthic macroinvertebrate population robustness and heterogeneity, composition of functional feeding groups, and pollution tolerance/intolerance trend on the Lower McCloud River and Iron Canyon Creek. Periodic sampling shall occur once every three years during the first nine years following license issuance, and thereafter, once every five years. The number of sites, site locations, and the frequency of monitoring may be modified with Forest Service approval after consultation with the Forest Service, potentially affected tribes, and other interested parties if needed based on initial sampling results. Ten percent of the sites will be within the first 1.5 miles of the Lower McCloud River below the McCloud Dam.

Special status aquatic mollusks

Monitor special status aquatic mollusks including: the California floater, (*Anadonta californiensis*), nugget pebblesnail (*Fluminicola seminalis*), scalloped juga (*Juga occata*), and the montane peaclam (*Pisidium ultramontanum*). Monitoring will include population trends and changes in distribution. Periodic monitoring will occur once every three years (or for a period determined by the Forest Service to be sufficient that is consistent with other monitoring requirements) during the first nine years after license issuance and once every five years thereafter. The monitoring methodology will be approved by the Forest Service prior to implementation.

Documentation and Reporting

A draft technical report of all Aquatic Biological Monitoring components shall be prepared following completion of each sampling effort for agency review, input and concurrence. The fish-based sampling report shall discuss implications regarding trends in fish abundance, changes in age-class structure, as well as any changes in fish condition factors. The benthic macroinvertebrate sampling report shall discuss any changes over time regarding the composition of functional feeding groups, overall population heterogeneity and robustness, and pollution tolerance/intolerance trends.

In addition to describing the results, the report is to compare results with those of previous surveys. All monitoring component reports shall discuss implications regarding trends in parameters over time. Additionally, it shall address any monitoring results that may indicate biological concerns and an adaptive process to further assess and implement actions that may be necessary to address identified concerns related to Project effects. A final report incorporating input (or addressing

why it was not incorporated) shall be prepared and filed with the Forest Service, applicable agencies, and the Commission.

Special Status Species

In consultation with the Forest Service, the Licensee shall, beginning the first full calendar year after license issuance, annually review the current list of special status aquatic wildlife species (species that are Forest Service Sensitive (FSS), Survey and Manage (S&M), Management Indicator Species (MIS), or on the Shasta-Trinity National Forest Watch List) that might occur on NFS lands and waters in the Project and Project-affected area.

When a species is added to one or more of the lists, the Forest Service in consultation with the Licensee, shall determine if the species or un-surveyed suitable habitat for the species is likely to occur on such NFS lands and waters. For such newly added species, if the Forest Service determines that the species is likely to occur on such NFS lands and waters, the Licensee shall develop and implement a study plan in consultation with the Forest Service to reasonably assess the effects of the Project on the species. The Licensee shall prepare a report on the study including objectives, methods, results, recommended resource measures where appropriate, and a schedule of implementation, and shall provide a draft of the final report to the Forest Service for review and approval. The Licensee shall file the final report, including evidence of consultation with the Commission. Upon Commission approval, Licensee shall implement those resource management measures.

Invasive Aquatic Species

Consistent with Fish and Game code 2302, assess the threat from invasive mussels and develop and implement a prevention plan.

Provide fish passage at stream crossings

Within one year of license issuance, the Licensee will develop, in consultation with the Forest Service, the CDF&G, potentially affected tribes, and other interested parties, specific management actions and schedule for providing fish passage, including monitoring, into the following affected reservoir streams: Deadlun, McGill, Cedar Salt Log, Little Gap and Gap Creeks on Iron Canyon Reservoir, and Tarantula Gulch and Battle Creek on the McCloud Reservoir. Upon Forest Service and Commission approval of the actions, the Licensee will construct or correct fish passage structures on these streams within one year. These structures are to be maintained on an annual basis, if needed, concurrent with road condition surveys, such that they are able to pass the entire run of stream spawning fish. All of the named streams will be monitored every three years to determine fish passage structure

effectiveness. Monitoring reports are due concurrent with Aquatic Monitoring Reports, in years conducted.

CONDITION NO. 28 - HAZARDOUS SUBSTANCE MANAGEMENT

Within one year of license issuance, and at least 60 days before starting any activities the Forest Service determines to be of a land-disturbing nature on NFS lands, the Licensee shall file with the Commission, a plan approved by the Forest Service for oil and hazardous substances storage and spill prevention and cleanup.

At a minimum, the plan shall require the Licensee to:

- Maintain in the Project area, a cache of spill cleanup equipment suitable to contain any spill from the Project;
- Periodically inform the Forest Service of the location of the spill cleanup equipment on NFS lands and of the location, type, and quantity of oil and hazardous substances stored in the Project area;
- Inform the Forest Service immediately of the nature, time, date, location, and action taken for any spill on or affecting NFS lands.

CONDITION NO. 29 - ROAD AND TRANSPORTATION FACILITY MANAGEMENT

Within one year of license issuance, Licensee shall file with the Commission a Road and Transportation Facility Management Plan, approved by the Forest Service, for protection and maintenance of Project and Project-affected roads that are on or affect NFS lands. The Licensee shall consult with the Forest Service and other affected parties in the development of this Plan. The Licensee shall take appropriate measures to meet appropriate Forest Service Maintenance Level, Traffic Service Level, and Road Management Objectives (RMOs). Upon Commission approval, Licensee shall implement the Plan and actions specified therein. At a minimum, the Road and Transportation Facilities Management Plan shall include the following components:

1. **Planning & Inventory** (Project and Project-affected roads)**:**

    - A map(s) compatible with Forest Service Travel Management Routes and GIS database showing all Project and Project-affected roads, culverts, bridges, drainages, watering sources, borrow and disposal sites for surplus rock and soil from road maintenance within and adjacent to the Project Boundary;

- Identification of uses (e.g. recreation, facility access) of the roads and season of operation;
- An inventory of road and road facility conditions including any construction or maintenance needs. Identify each Project and Project-affected road and identify how and when it will be addressed further. At a minimum, this inventory shall include the roads shown in Table 1-3, below;
- A Traffic Safety component, including an inventory and condition for all existing and proposed traffic/road signs (excluding recreation and interpretive signs) and schedule for sign maintenance;
- Any proposed changes to maintenance levels.

2. **Operation, Maintenance, and Road-Associated Debris** (Project and applicable Project-affected roads)**:**

- Develop an annual road operation and maintenance (O&M) schedule for Project roads and applicable Project-affected roads on NFS lands to comply with Forest Service standards, RMOs, BMPs, and Travel Management guidelines.
- Complete normal maintenance activities on an annual basis including: road surface maintenance, repair and replacement of damaged culverts, cleaning debris and rockfall from drainage channels, vegetation removal to allow adequate sight distances, vegetation removal to maintain an open traveled way consistent with Forest Service standards, etc.
- Describe types of road-associated debris (e.g. native materials such as dirt, rocks, trees, etc.), any acceptable locations on NFS lands where this material can be stored (identify if temporary only or permanent), and measures to control erosion, weed infestation, etc. on these piles. Remove all road spoil piles not currently located at approved sites on NFS lands to a location either off the Forest, or to a Forest Service approved disposal site.
- Include any required limited operating periods (LOP's) for wildlife species and noxious weed prevention provisions in planning and performing maintenance activities.
- Comply with the following O&M guidelines:
    - Slope: Outslope roads where feasible; utilize long, gradual rolling dips to disperse runoff. For insloped roads, use sufficient drainage structures to minimize runoff in inside ditches.
    - Erosion/Sediment: Disconnect road sediment sources to watercourses and incorporate erosion control measures by/through the use of rolling dips, waterbars, filter strips, cross-drains, etc. Treat potential erosion or mass wasting sites.
    - Drainage: Assess cross-drain frequency, waterbars, rolling dips, and lead outs that minimize flow concentration.

- Timing: Address timing use restrictions (winter period, wet weather, or other).
- Design: Address need to upgrade surfacing to comply with RMO's. For Bridges: meet current AASHTO Standard specifications for Highway Bridges (latest edition) including guardrails, and pave 50 feet either side of approaches. For Gates: comply with Forest Service standards for construction and signing.
- Decommissioning/closures: Address need and schedule for any road closures and decommissioning.
- Snowplowing: Conduct plowing according to Forest Service procedures.
- For road and stream crossings, implement the following:
    - Sidecast: Remove or minimize with particular care near streams.
    - Realign existing routes that pose risks to water quality.
    - Culverts: Replace "shotgunned" cross drains, armor inlets/outlets with rip-rap, utilize culvert diameters equal to or greater than the average active channel width, utilize extra cross drains, critical dips and road aggregate surfacing at connected crossings to decrease chronic and potential catastrophic delivery of sediment, upgrade crossings to reduce diversion potential.
    - Drainage: Treat roads to minimize erosion and sediment delivery to the watercourse. Include overflow dips/critical dips or other feature to minimize watercourse diversion potential at culvert crossings. Inslope roads at crossings, where feasible and safe, to prevent road runoff from discharging onto the downstream fill face. Construct and maintain crossings to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.
    - Fish Passage: Provide for fish passage and proper stream function for all stream crossings that are identified as fish habitat areas.

- Intermittent and perennial stream crossings shall accommodate a 100-year storm event and associated bedload and debris unless an exception is allowed by the Forest Service. Provide hydrologic information to verify calculations where requested by Forest Service.

3. **Construction and Reconstruction** (Project and applicable Project-affected roads)**:**

- Develop a road construction and reconstruction implementation schedule to bring existing roads and associated facilities (i.e. culverts, gates, bridges, crossings, crib-walls, etc.) into compliance with Forest Service standards that achieve Forest Service RMOs and Travel Management Guidelines for

applicable roads in Table 1-3, below. The schedule shall bring existing roads into compliance within five years of Plan approval, with health and safety items as well as water passage/resource objectives within the second year of implementation, road surfacing items within the third year of implementation, and all lower priority projects in years four and five after implementation;

- During construction and reconstruction activities, comply with O&M guidelines provided in Item 2. Operation, Maintenance, and Road-Associated Debris, above.

Specific Construction & Reconstruction Items:

  - Within two years following Plan approval, repair those road sites identified in Table 1-4 listed below, with greater than 75% erosion hazard.
  - Implement any remaining or new Forest Service approved reconstruction mitigations resulting from McCloud Dam spillway flows undercutting Forest Service road 38N11 that were not completed under the existing license.
  - Identify and close, after Forest Service review and approval, those user created roads accessing Iron Canyon Reservoir that generate water quality impacts or impacts to other resources. Closure methods may include: natural materials (i.e. boulders & fallen trees), barriers, gates, or signing.

4. Monitoring (Project and Project-affected roads)**:**

- Conduct traffic use surveys scheduled on a six-year basis (coinciding with the Commission's recreation Form 80 schedule) at Forest Service specified locations, to determine the number and type of vehicles per day, describe study periods and reporting requirements, and determine use trends. Conduct a minimum of 60 survey days during survey years;
- Conduct a road capacity and use review every six years following completion of use surveys, to determine if the roads continue to meet current road management objectives. If the Forest Service determines roads no longer comply, define actions and timelines to correct deficiencies;
- Following annual or periodic monitoring, any roads or bridges found to not meet Forest Service standards and guidelines requiring work beyond normal O&M shall be identified. This list, along with proposed measures to bring the roads or bridges into compliance, shall be submitted to the Forest Service at least 30 days prior to the Annual Consultation Meeting required under License Condition 1, or as needed.

5. **Licensee Road Memorandum of Understanding** (Project-affected roads)**:**

   For applicable Project-affected roads (see Table 1-3) develop a Memorandum of Understanding (MOU) with the Forest Service and other affected parties to address shared road management responsibilities. The goal of the MOU shall be to define proportionate road share costs, address specific public safety needs, resource protection, and erosion control mitigations to be performed by the Licensee. Implement plan when agreement is reached between parties and upon Forest Service and Commission approval.

6. **Road Use by Government**

   The United States shall have unrestricted use of any road over which the Licensee has control within the Project area for all purposes deemed necessary and desirable in connection with the protection, administration, management, and utilization of NFS lands or resources. When needed for the protection, administration, and management of NFS lands or resources the United States shall have the right to extend rights and privileges for use of the right of way and road thereon to States and local subdivisions thereof, as well as to other users. The United States shall control such use so as not to unreasonably interfere with the safety or security uses, or cause the Licensee to bear a share of the costs disproportionate to the Licensee's use in comparison to the use of the road by others.

7. **Road Use**

   The Licensee shall confine all vehicles being used for Project purposes, including but not limited to administrative and transportation vehicles and construction and inspection equipment, to roads or specifically designed access routes, as identified in the Road and Transportation Facility Management Plan. The Forest Service reserves the right to close any and all such routes where damage is occurring to the soil or vegetation, or, if requested by Licensee, to require reconstruction/construction by the Licensee to the extent needed to accommodate the Licensee's use. The Forest Service agrees to provide notice to the Licensee and the Commission prior to road closures, except in an emergency, in which case notice will be provided as soon as practicable.

Table 1-3. Project and Project-Affected Roads

Road #	Name	Project Rd. or MOU	Start	End	Length	Other R/W	Current RMO
McCloud Reservoir Area Roads							
38N11	Hawkins Creek FA11 (Segment 1)	Project	Siskiyou MC1N01	Tunnel Spoil Pile	14.25	Hearst	4/3
38N81	Brown Trout	Project	38N11	Ramp	0.3	Hearst	4
38N53	Ah-Di-Na	See License Condition #30a	38N11	T37N, R2W, Sec 5, NE ¼, MDM	7.27	Hearst	3
38N04Y	Star City	Project	38N11	Bridge	5	Hearst	3
U38N11X	Dam Rd	Project	38N11	Base of McCloud Dam			N/A
U38N11Y	Ash Camp	MOU	38N11	Ash Camp	0.25		3
Iron Canyon Area Roads							
38N11	Hawkins Creek FA11 (Segment 2)	MOU	Shasta 7M01	North 37N78	6.6	SPI	3
37N78	Iron Canyon loop	Project	38N11	(Oak Mtn Rd) 37N34	8.54	SPI Co-op 3.36 mi	3
37N27Y (to be relocated)	Deadlun Campground	Project	37N78	Campground	0.34		3
37N66Y	Hawkins Landing	Project	38N11	Ramp	0.56		3

Table 1-3. Project and Project-Affected Roads (continued)

Road #	Name	Project Rd. or MOU	Start	End	Length	Other R/W	Current RMO
37N78A	MC-10 gage Rd	Project	37N78	NEW Sec. 28	0.28		2
37N34	Oak Mtn. 12kV line	Project	38N11	Pit 5 Bridge	7.71	SPI	3
37N93	Ridge Iron Canyon	Project	37N93A 37N93C	Oak Mtn Road	0.3		2
37N93A	Ridge	Project	37N93		0.6		2
37N33C	Willow	Project	37N93		0.5		2
Pit 6, Pit 7 and Afterbay Area Roads							
Pit 6 Power-house	Pit 6 Powerhouse	Project	Cove Road	Pit 6 Powerhouse			N/A
34N17	Fenders Ferry FA27	MOU	County Road 6L005	Hogback Turnoff	6.19	SPI Co-op	3
35N23	Pit 7 Road	Project	34N17	Pit 7 Dam & Powerhouse	1.79		3
35N66	Fenders Flat	Project	35N23	Afterbay Dam	0.57		3
35N46	Reynolds Basin (Fenders Ferry to Hogback)	MOU	34N17	35N93	11.93		3
35N93	Hog Back Mtn	Special Use Permit	35N46	Communi-cation Site	5	SPI Co-op	2

Table 1-4. Roads with Currently Active High Erosion Potential Sites Requiring Repair

Site I.D. (T.M. 67)	Project Region	Road	Erosion Risk %	Description
McCloud Reservoir				
T7-A	MC Res.	38N81 (Segment 1)	79%	Rilling caused by concentrated runoff near parking lot area at McCloud Boat Ramp
T7-B	MC Res	38N81	93%	Gullying caused by concentrated runoff near parking lot area
MT-7A	MC Res	38N11	83%	Gullying caused by concentrated runoff
MT-7B	MC Res	38N11	85%	Shallow landslide caused by concentrated runoff
MT-7C	MC Res	38N11	79%	Gully caused by concentrated runoff
MT-4	MC Res	38N11	76%	Rilling caused by culvert design or condition
MT-3	MC Res	38N11	79%	Gully caused by culvert design or condition
MT-1	MC Res	38N11	85%	Surface erosion caused by concentrated runoff
MR-1B	MC Res	38N11	83%	Rock slide caused by road design or condition
MR-2	MC Res	38N11	90%	Rock fall caused by Project management
MR-3	MC Res	38N11	79%	Channel bank erosion caused by Project management
MR-7	MC Res	38N11	95%	Surface erosion caused by culvert design or condition
DRU-6	MC Res	38N04Y (Star City)	79%	Debris slide caused by road design or condition
Iron Canyon				
ICP-9	IC Res	37N78 (Loop Road)	85%	Gully caused by culvert design or condition
ICP-11	IC Res	37N78	89%	Debris flow torrent track caused by mass wasting
ICD-1	IC Res	37N78	85%	Gully caused by concentrated runoff
OM-1	IC Res	37N34	76%	Gully caused by concentrated runoff
MC-10A	IC Res	37N78A (Road to MC-10)	85%	Rilling caused by concentrated runoff
MC-10B	IC Res	37N78A	85%	Gully caused by concentrated runoff
ICD-3	IC Res	37N78A	95%	Shallow landslide caused by road design or condition
ICD-4	IC Res	37N78A	89%	Gully caused by concentrated runoff
Oak Mountain				
WCN-5	Oak Mtn	37N93	99%	Shallow landslide caused by road design or condition
WCN-1	Oak Mtn.	37N93	95%	Deep-seated landslide caused by road design or condition
WCN-4	Oak Mtn	37N93A (Road to 12kV)	97%	Shallow landslide caused by road design or condition
WCN-3	Oak Mtn.	37N93A	100%	Shallow landslide caused by road design or condition

Table 1-4. Roads with Currently Active High Erosion Potential Sites Requiring Repair (continued)

Site I.D. (T.M. 67)	Project Region	Road	Erosion Risk %	Description
Oak Mountain (continued)				
WCN-2	Oak Mtn.	37N93A	93%	Shallow landslide caused by road design or condition
WCS-3A	Oak Mtn.	37N93C (Road to siphon)	90%	Rilling caused by concentrated runoff
WCS-3B	Oak Mtn.	37N93C	85%	Rilling caused by concentrated runoff
WCS-3C	Oak Mtn.	37N93C	83%	Surface erosion caused by road design or condition
WCS-3D	Oak Mtn.	37N93C	97%	Gully caused by concentrated runoff
OM-6	Oak Mtn.	37N34 (Oak Mountain)	79%	Surface erosion caused by concentrated runoff
OM-10	Oak Mtn	37N34	79%	Shallow landslide caused by road design or condition
OM-11	Oak Mtn	37N34	83%	Gully caused by concentrated runoff
OM-12	Oak Mtn	37N34	83%	Gully caused by concentrated runoff
OM-14	Oak Mtn.	37N34	97%	Gully caused by concentrated runoff
OMS3-2	Oak Mtn	spur rd (Penstock)	100%	Shallow landslide caused by concentrated runoff
OMS3-4	Oak Mtn	spur trail (Penstock)	85%	Shallow landslide caused by concentrated runoff
DRU-16	Oak Mtn.	37N34	93%	Gully caused by concentrated runoff
JBB-PH1	Oak Mtn.	37N34	93%	Channel bank erosion caused by concentrated runoff
Pit 6				
P6-1	Pit 6	Pit 6 Rd	76%	Gully caused by culvert design or condition
P6-8	Pit 6	Pit 6 Rd	95%	Gully caused by concentrated runoff
P6-16	Pit 6	Pit 6 Rd	90%	Surface erosion caused by concentrated runoff
P6-17	Pit 6	Pit 6 Rd	99%	Debris side slope caused by mass wasting
Pit 7				
P7-10	Pit 7	35N23 (Pit 7 Road)	76%	Gully caused by culvert design or condition

"Total index score is derived by summing points from the erosion potential, sediment delivery, and Project infrastructure components provides a relative measure of erosion severity. High index values represent erosion sites with a greater potential to cause future effects to Project infrastructure or water resources of concern by direct sediment delivery." (McCloud-Pit Project, FERC No. 2106, Technical Memorandum; Erosion and Sediment Inventory (TM-67) Page 8.

CONDITION NO. 30 - RECREATION DEVELOPMENT, MANAGEMENT AND MONITORING

Within two years of license issuance, Licensee shall prepare a Recreation Development and Management Plan developed in consultation with the Forest Service, CDF&G, SWRCB, and other interested parties, and approved by the Forest Service, to address recreation resource needs associated with the Project. All new and reconstructed Project recreation facilities located on Licensee's lands will be designed to meet applicable Americans with Disability Act (ADA) and Architectural Barrier Act (ABA) Standards as currently written at the time of project design. New and reconstructed recreation facilities located on NFS lands will meet ADA/ABA Standards, Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) and Forest Service Trail Accessibility Guidelines (FSTAG), where applicable as currently written at the time of design. New and reconstructed recreation facilities on NFS lands will be approved by the Forest Service and meet all Forest Service laws, standards and policy, such as protecting sensitive resources (e.g. cultural, wildlife, etc.) and meet Forest Service recreation design guidelines. Where design or site analysis constraints preclude specific developments stipulated in this License Condition, the Forest Service will review and approve modifications that meet the intent of this Condition. All Project facilities will be designed to be consistent with the Recreation Opportunity Spectrum (ROS) class and Visual Quality Objective (VQO) where they are located. Upon Commission approval, Licensee shall implement the Plan. At a minimum, the Plan shall address the following components and additionally specify location, design, structures, and schedules for completion, as appropriate:

1. Project-Wide Measures

a. Operation and Maintenance:

Develop and implement an Operation and Maintenance (O&M) component (including fee collection) for all Project and Project-associated recreation facilities (i.e. all facilities identified in this License Condition). Operation and maintenance includes all annual, operational, and heavy maintenance, as well as any minor reconstruction or retrofits at existing facilities. These may be necessitated by exhaustion of usable life of facility, wear and tear, ecological/facility/social capacity needs, or others as determined through monitoring or compliance with laws, regulations, codes, and other legal direction (such as ADA/ABA compliance). Discussions of any needed actions shall be conducted at the annual consultation meeting following recognition of the need or following monitoring as addressed under the Recreation Survey and Monitoring component, below, as appropriate. Items to be addressed in this O&M component include: all existing Project recreation facilities, existing Forest Service-

owned Project-affected recreation facilities, as identified under the heading of "Construction and Reconstruction" below, and new Project recreation facilities. This component shall include but is not limited to:

- Annual schedule and standard protocols for opening and closing recreation facilities, including primary season and shoulder seasons;
- Water testing protocols for potable water sources;
- List of routine maintenance items (e.g. campground road clearing, brush clearing, painting, debris removal, maintenance schedule, signing, etc.);
- Annual review and meeting;
- A percentage of fee retention by Forest Service if used on–site (e.g. interpretation, campfire programs, etc.);
- Maintenance of shaded fuel breaks around Project recreation facilities (to be addressed in the Fire and Fuels Management Plan).

b. Recreation Survey and Monitoring:

Develop and implement a Recreation Survey and Monitoring component with Report that is implemented on a six-year interval (concurrent with the Commission's Recreation Form 80). A copy of the Report shall be provided to the Forest Service and filed with the Commission after Forest Service approval. The Forest Service reserves the right, after notice and opportunity for comment and administrative review, to require changes in the Project and its operation through revision of the Section 4(e) conditions that require measures necessary to accomplish protection and utilization of National Forest resources identified as a result of the Report findings. The Survey and Monitoring component shall address the following:

- At facilities where fees or passes are issued or required, Licensee shall annually collect use data that includes use numbers by location, dates, occupancy, party size (if collected) and zip codes (if collected). Annual data will be included in the 6-year Report;
- Licensee shall conduct a Recreational Resource Survey once every 6 years (concurrent with the Commission's Recreation Form 80) starting from license issuance. Survey methods shall be reviewed and approved by the Forest Service. The Recreation Survey shall include but not be limited to:
    - Occupancy of Project facilities over the entire recreation season, including (and breaking out) shoulder seasons;
    - Use and use patterns both on water surfaces and land;
    - Quality of recreational opportunities, including fishing success;
    - Kinds and sizes of vehicles (including boats);
    - Preferences of users, including day use vs. overnight;

- Summary of any facility closures (campgrounds, roads, ramps, etc.).

- Licensee will conduct Recreation Monitoring once every six years (coinciding with the Commission's recreation Form 80 schedule), which will include evaluation of resource impacts from developed and dispersed use;
- Licensee shall summarize the most current regional and statewide trends in recreation based on available surveys and reports;
- Licensee shall draft the Recreation Monitoring and Survey Report, that incorporates data from the Recreation Survey (see above), and addresses any changes in trends since previous reports (or initially from relicensing studies);
- Licensee shall, every six years (coinciding with the Commission's recreation Form 80), consult with the Forest Service, appropriate agencies, and interested parties to review and adjust Project-wide recreation management objectives, if needed. Forest Service reserves the right, after consultation with Licensee, to extend the review of management objectives interval to every 8, 10 or 12 years depending on survey results. This review shall be based on findings in the periodic Recreation Monitoring and Survey Report, traffic counters, biological resource monitoring results, law enforcement input, Project Patrol reports, and other applicable study and monitoring results. The review shall address, at a minimum, the following factors:

    - Use, including volume, changes in use type, season, and duration of stay;
    - Capacity; including developed and dispersed sites, roads, trails, water bodies, and river reaches;
    - Condition of facilities, including roads, trails parking areas, directional/informational and interpretive signing;
    - Kinds, quality, quantity, and range of opportunities;
    - Health and safety;
    - User and resource conflicts;
    - Any mandated updated guidelines, such as ADA, etc.;
    - New or modified management actions (increased patrols, additional sanitation facilities, closure orders, etc.) as needed to address concerns identified in report;
    - Schedule to implement actions; and
    - All recreation facilities will be analyzed, redesigned and reconstructed, if necessary, utilizing the Recreation Monitoring and Survey Report information.

c. Project Patrol

Develop and implement a Project Patrol component for Project and Project-affected NFS land. Annually, the Licensee shall coordinate with the agencies and interested parties to review information from the prior season and plan any adjustments for the next high use season (April through November). This position may be either a Licensee employee or equivalent funding provided to an appropriate Federal, State, or local agency. This component shall outline duties of a seasonal (April – November) part time Project Patrol to implement, at a minimum, the following duties:

- Monitor and encourage compliance with fire safety regulations, closures, clearance, etc.;
- Monitor and encourage compliance with rules associated with camping, parking, and trail use;
- Install signs and adjust as seasonally needed;

- Disperse Project-related information to the public including appropriate OHV use, campfire safety, leave no trace, and other resource messages;
- Patrol dispersed public use areas within ¼ mile of all Project and Project-affected waterways (e.g. Hawkins Creek crossing, Lower McCloud River, etc.);
- Watch for and report looting/vandalism of cultural sites or other resource damage;
- Report illegal activities and cooperate with law enforcement agencies, as needed;
- Perform minor maintenance of Project recreation facilities and report larger maintenance needs to appropriate Licensee staff;
- Perform other duties that provide for the safety of the public and protection of Project-affected resources;
- Maintain a log of activities, key resource issues and public concerns to summarize in an annual report provided at least 30 days prior to the annual consultation meeting (License Condition No. 1).

d. Reservoir Water Surface Management

Develop and implement a Reservoir Water Surface Management component that addresses monitoring and management of recreation user safety, trespass on private lands by Project users, and County code compliance by Project users on each Reservoir surface (i.e. McCloud, Iron Canyon, Pit 6 & Pit 7). The component shall include, but may not be limited to the following:

- Surface Management: develop protocols for preventing/removing unapproved buoy courses, approved use of docks, and measures to prevent trespass on private lands;
- Speed Restriction Ordinance Request: In cooperation with the Forest Service, Licensee shall submit request to the Shasta County Boating Unit of the Sheriff's office for the establishment of a 5-mph restriction on McCloud Reservoir upstream from (and beginning at) the McCloud Bridge. Licensee will evaluate the need for a speed restriction on remaining reservoirs based on user conflicts or safety concerns on a six-year interval when monitoring other Project-affected recreation use;
- No Boating Buoy Line Request: Licensee shall, in cooperation with the CDF&G and private landowner, submit a request to the Shasta County Boating Unit of the Sheriff's office for establishment of a buoy line to be installed near Huckleberry Creek on McCloud Reservoir to prevent fishing boats from traveling upstream during the period from November 15 to the last Saturday in April each year to separate the year-round fishing access on the reservoir from the seasonally restricted stream fishing season on the stream above this point;
- Surface Debris Removal: Annual surface sweep of McCloud and Iron Canyon reservoirs and boat ramps to collect logs and other debris from the lake surface. Surface sweep shall be conducted a minimum of once prior to the start of the recreation season (April 27) and additionally during the season if late season storms create additional surface debris. Debris shall be removed and stockpiled. Large woody debris may be re-introduced to the Lower McCloud River as directed in the LWD Plan, smaller debris and trash shall be removed off of NFS lands;
- Every six years (coinciding with the Commission's recreation Form 80) monitor boat use numbers, type, season, and activity type during the recreation season on the McCloud and Iron Canyon reservoir surfaces. Incorporate this information with monitoring from Recreation Monitoring and Survey Report and road traffic use from the Road and Transportation Facility Management Plan;
- Reassess any needed water surface management mitigations every six years (concurrent with the "Recreation Survey and Monitoring" component, above).

2. Construction and Reconstruction

Use Forest Service design standards (including applicable standards for providing access to users with all abilities, signage, etc) for facilities constructed on NFS lands. All new and reconstructed Project recreation facilities located on Licensee's lands will be designed to meet applicable Americans with Disability Act (ADA) and Architectural Barrier Act (ABA) Standards as currently written at the time of project

design. New and reconstructed recreation facilities located on NFS lands will meet ADA/ABA Standards, Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) and Forest Service Trail Accessibility Guidelines (FSTAG), where applicable as currently written at the time of design. The following site capacities are general estimates only and will be refined during site design based on ROS class, laws, standards and policy for resource protection and recreation facility design. All Project and Project-related recreation facilities and infrastructure will be replaced in-kind or with an appropriate upgraded facility within 25 years of License issuance or the mid-point of the License term, whichever is greater. All replaced facilities will be constructed to the standards and regulations in place at the time of replacement.

McCloud Reservoir Facilities

a. McCloud Reservoir Boat Ramp (Tarantula Gulch) – within three years of license issuance, Licensee shall, in consultation with the Forest Service:

    - Reconstruct the existing boat ramp to Cal Boating standards to provide for a 2-lane ramp with boarding dock and sidewalk. Ramp shall provide a minimum of 4-feet draft clearance below minimum pool;
    - Maintain in the current location, or relocate as necessary and maintain, a vault restroom to be open and serviceable when the ramp is operational;
    - Redesign the existing parking lot and day use area to maximize parking capacity (estimate 30 – 40 spaces). Develop a paved parking area and turnaround at the top of the ramp. Designate parking spaces for vehicles (both with and without trailers) using signs and/or asphalt markings;
    - Develop a day use site with up to 2 picnic tables and shade structure adjacent to the parking lot that overlooks the reservoir, and a short trail that connects the day use site to the shoreline for lake access;
    - Develop a potable water source that can be accessed by recreationists at all times during the recreation season;
    - Provide security/safety lighting in the parking area that is visible from the courtesy dock;
    - Provide snow removal on the access road (from junction with 38N11) and parking area between April 1 and December 1, when access to the junction is available.

b. Star City Campground – Within five years of license issuance, in order to provide overnight use on McCloud Reservoir, Licensee shall acquire rights, by any means necessary, but not including by condemnation pursuant to Section 21 of the Federal Power Act or any other law, for the purpose of overnight public recreational use, of a portion of the Star City Creek parcel located in the SE ¼ of Section 15, Township 38

North, Range 2 West, M.D.B.M. (included as a portion of APN's 015-040-035, 015-190-002) and shall re-develop the existing dispersed use area as follows:

- Develop an overnight camping area with up to 10 campsites at Development Level 3. Each campsite shall include: site post with number, picnic table, animal resistant food locker, and campfire ring. Campground shall include a 2-vault accessible restroom facility, and potable water source for campground users that can be accessed at all times when campground is open to the public;
- Develop a Day Use area near the shoreline with up to 5 sites, each with table and pedestal grill. The Day Use area shall also have animal resistant trash container with sufficient capacity to meet the needs of the visitors;
- Develop a potable water source for Day Use area that can be accessed by recreationists at all times when the facility is open to the public. The water hydrants may be shared with the campground;
- Develop water surface lake access with dock at the Day Use area where boaters may beach or moor vessels. Develop car-top boat access to the lake that is available to Campground and Day use visitors;
- Develop a single-vault accessible restroom for the Day Use area and reservoir users;
- Develop a surfaced parking area with striping that serves both the campground and day use area;
- Designate swim/beach area to separate swimming and wading, from boat beaching and mooring;
- Provide a Camp Host on site when campground is open to the public;
- Licensee shall manage and maintain Star City campground to meet the Recreation Plan objectives of overnight use on McCloud Reservoir during the recreation season.

c. New Day-Use Facilities - Within five years of license issuance, the Licensee shall construct new Day-Use areas at: Tarantula Gulch Boat Ramp (see Boat Ramp description in "a." directly above), Tarantula Gulch inlet, Red Banks, and Star City Creek (see above). The Day use sites shall include paved parking for a minimum of 5 vehicles, up to 3 picnic tables with pedestal grills, vault toilet, animal resistant trash receptacles, and a pedestrian access trail to the high water line. Licensee shall ensure legal access from roadway to reservoir day use areas. Parking and vault toilet for Tarantula Gulch Boat ramp is included with Boat Ramp capacity. Develop at one of these locations, or another designated recreation day use location around the reservoir, a fishing/swimming platform to accommodate a fluctuating water level.

d. Reservoir Access Points – Within three years of license issuance, the Licensee shall construct reservoir access points at Battle Creek and on each side of the McCloud Dam. Access points shall include paved parking for 3 vehicles, and access trail to the

shoreline. Picnic tables may be installed where space allows. Licensee shall ensure legal access from roadway to reservoir access areas.

Lower McCloud River

a. McCloud Dam: Within five years of license issuance:

- Construct and maintain a day use recreation site that includes access road (minimum Maintenance Level 3), paved parking for a minimum of 3 vehicles, vault toilet, animal resistant trash receptacle, signing, and trail from the base of McCloud Dam to a point past the in-stream flow valve release to the splash pool below the spillway. Trail shall be designed to accommodate both fishing and boating access. Access could be by road, if road is developed for other condition requirements.

b. Upgrade, relocate where needed, and improve tread and drainage of existing user-created streamside river access trail along opposite side of river from Ash Camp Campground. Trail to begin at Ash Camp Bridge/PCT junction and travel downstream along the river's edge to Ah-Di-Na. Maintain to a standard approved by Forest Service.

Iron Canyon Reservoir

a. General: Within three years of License issuance:

- Allow use of at least one campground year-round when accessible (potable water not required during the winter months) with weekly servicing (as accessible) by Licensee;
- Provide a minimum of 3 day-use parking areas around reservoir with paved parking for up to 3 vehicles each, and pedestrian-only access to shoreline;
- Consistent with Shasta-Trinity Travel Management Plan and the Historic Properties Management Plan, evaluate road closures, trail closures and dispersed use closure around reservoir;

b. Iron Canyon Dam Boat Ramp: Within five years of license issuance:

- Construct a new single lane boat ramp to Cal Boating standards with boarding dock functional at 90% of operational lake levels (ramp design and placement should include option for 2-lanes if needed at mid-license facility review). Parking for a minimum of 15 vehicles shall be striped and include parking for 5 single vehicles and 10 vehicles with trailers. Parking area shall include single-vault toilet;

- Provide potable water, picnic tables, and trash receptacles, available during normal recreation season (April – November) and security lighting visible from the dock;
- Provide snow removal during shoulder seasons (March/April and December) at parking area when Oak Mountain access road and Iron Canyon boat ramp surface is passable;

c. Hawkins Landing Recreation Sites: Within three years of license issuance:

- Reconstruct Hawkins Campground to provide for a minimum of 11 campsites (10 plus host site) that meet Forest Service Recreation Level 3. Campground shall include entrance gate with signing, surfaced loop road, parking spurs, site posts, picnic tables, animal resistant food boxes, and fire rings. Campground will have vault restrooms, animal resistant trash receptacles, potable water available at all times when the campground is open to the public, camp host, and developed trail from the campground to the adjacent boat ramp and shoreline for pedestrian fishing access. Views of reservoir will be maximized by thinning and/or limbing trees and vegetation at campsites. Reconstruction to include a combination of single (5 PAOTs) and double sites (10 PAOT's);
- Reconstruct the Hawkins Landing Boat Ramp surface (length and width, but not grade) to meet Cal Boating standard for single lane. If possible under reservoir operations, ramp should be operable a minimum of 155 days during the recreation season (April 27 – November 15). Ramp shall include a surfaced parking lot above high water level for a minimum of 10 vehicles (minimum 5 with trailers). Parking lot shall be surfaced, striped, include a single-vault toilet, animal resistant trash receptacle, and informational sign board;

d. Deadlun Campground: Within five years of license issuance:

- Licensee shall re-locate the Deadlun campground to 1 or 2 Forest Service approved location(s) along the Iron Canyon shoreline. The new campground(s) will meet Forest Service Recreation Level 3 and have a mix of single (5 PAOT's) and group (10 or 15 PAOT's) campsites with no less than 200 PAOT's total. (More specific information should be available after the Forest Service/Licensee field review in 2010, and will be contained in the Final Section 4(e) document). Campground(s) shall have a host, entrance gate, surfaced loop road, parking spurs, site posts, picnic tables, animal resistant food lockers, and fire rings. Campground(s) will include two 2-vault restrooms, animal resistant trash receptacle, and potable water available at all times during the recreation season;

- Licensee will develop a trail from the campground(s) to the high water line of the reservoir shoreline for pedestrian-only access;

Pit 6 Reservoir

- Develop a shoreline trail if capacity or demand (based on six-year recreation use monitoring) indicates increased use of the reservoir for fishing or boating.

Pit 7 Reservoir

Within three years of license issuance Licensee shall:

- Construct one trailhead, with parking for a minimum of 3 vehicles, and develop a river access trail along one side of the reservoir for pedestrian fishing, and hand-launch boating access. Access point and trailheads should be located at the upper (Pit 6 dam access road) end of reservoir;
- Conduct feasibility assessment for providing a hand-launch boat put-in where Montgomery Creek enters the reservoir, with paved parking, vault restroom, tables, animal resistant trash receptacles and pedestrian access trail on public lands. If constructed, boating would be restricted from Project infrastructure for public safety reasons by installing buoy lines or other safety devices, at the upper and lower ends of the reservoir;
- If Montgomery Creek is not feasible, construct a second trailhead, with parking for a minimum of 3 vehicles, and develop a river access trail along one side of the reservoir for pedestrian fishing, and hand-launch boat access from the lower end of Pit 7 reservoir.

Pit 7 Afterbay (Fenders Flat)

Within three years of license issuance, Licensee shall:

- Re-construct boat launch and day-use site below the Pit 7 afterbay at Fenders Flat with single-vault toilet, animal resistant trash receptacles, picnic tables, pedestal grills (not campfire rings), and designated surfaced parking area for a minimum of 5 vehicles without trailers;
- Reconstruct the car-top boat launch with improved grooved concrete surfacing and minimum one-lane width. (Will not meet all of Cal Boating standards). Provide re-vegetation, in consultation with the Forest Service, and prevent vehicle access beyond the access road and parking area;
- If additional generation is developed at this location, construct surfaced parking area, single-vault toilet, trash receptacles, and river access trail on the opposite river bank from Fenders Flat day use area.

CONDITION NO. 30A – SPECIFIC RECREATION AND ROAD AGREEMENT

Until and unless the Forest Service and Licensee reach mutual, signed agreement outside of relicensing, under which Licensee will assume responsibilities described below for the three listed facilities (one road and two campgrounds), they will be incorporated into the road (#29) and recreation (#30) conditions in the Final 4(e) license filing.

1. Ah-Di-Na Road (FS road #38N53):
   Currently, there is concurrence that road reconstruction, maintenance, and operation should be shared between the Forest Service, Licensee, and other affected parties. The Licensee has indicated they would prefer this agreement be outside of the license. This is acceptable in concept with the Forest Service as long as agreement on the terms can be reached. Should agreement not be reached, it will be included within the MOU discussed as a license term in Condition #29, Part 5, above.
2. Ash Camp:
   The concept of the Licensee providing full reconstruction, operation and maintenance of this facility outside of the license is acceptable in concept with the Forest Service as long as agreement on the terms can be reached. Should agreement not be reached, this mitigation will be included in the Final 4(e) license filing as a component of, and with specificity similar to, other mitigations in Recreation Condition #30 above.

3. Ah-Di-Na Campground:
   The concept of the Licensee providing full reconstruction, operation and maintenance of this facility outside of the license is acceptable in concept with the Forest Service as long as agreement on the terms can be reached. Should agreement not be reached, this mitigation will be included in the Final 4(e) license filing as a component of, and with specificity similar to, other mitigations in Recreation Condition #30 above.

CONDITION NO. 31 – INFORMATIONAL SIGN PLAN

Develop and implement a Project Sign Plan which includes road and trail safety, directional and traffic signs and an Interpretive and Educational component. Sign locations will be identified as well as design elements such as size, layout, content and materials. Signage and locations are to be collaboratively developed.

Interpretive and Education Component:

Develop and implement an Interpretive and Education component, specific to Project-affected resources, to include, at a minimum, the following:

- Themes, design, audience, delivery methods, colors, locations, and schedule for implementation;
- Specific projects include:
    - Website with public information on:
        - Where to get information about recreation facilities (including size, season, fees, driving directions);
        - current and scheduled river flows (hourly average) measured at MC-1 or MC-7, and turbidity;
        - Where to get more information about fishing, boating, trails, trailheads, access points, put ins & take outs, maps;
        - Seasonal lake levels, fish stocking;
        - Scheduled repairs, outages, valve tests, or road work that would change flows or reservoir levels, close access, or close facilities (i.e. boat ramps);
        - Other information as needed to assist the public in finding and using the recreation opportunities.
    - Informational kiosks at all developed recreation facilities, including: McCloud Boat Ramp and Day Use, Star City Campground, Iron Canyon Dam Boat Ramp, Hawkins Creek Campground and Boat ramp, relocated Deadlun Campground(s), Pit 7 Afterbay, or other locations, as agreed. Informational kiosks will include at a minimum:
        - Locations of developed recreation sites;
        - Maps of the Project area;
        - Fee and regulation information, if appropriate;
        - Seasonal and safety information.

CONDITION NO. 32 - VISUAL QUALITY MANAGEMENT

Within one year of license issuance, Licensee shall develop, for Forest Service approval and filing with the Commission, procedures and/or a timeline, to assure implementation of the following specific mitigation measures to provide for visual quality of Project and Project-affected NFS lands:

1. General:

- Identify the existing visual condition areas within ¼ to ½ mile from project lakes, rivers, developed recreation sites, Ah-Di-Na Road (38N53), the Pacific Crest Trail and any other socially sensitive viewpoints;
- Analyze and identify mitigations for existing facilities including buildings, fences, signs and gates, debris piles, miscellaneous related debris, transportation related features and utility lines within the above sensitive visual areas;
- Consult with Forest Service (within view of NFS lands-see above) for repairs/improvements that will blend with the environment;
- All proposed facilities will be approved by the Forest Service for compliance with scenery direction.

2. Mitigations:

- Paint or reconstruct facilities with natural looking materials and colors to help the facilities to visually blend with the surrounding natural environment;
- Vegetate, re-vegetate, or screen facilities, where appropriate;
- Re-contour spoil piles to blend with natural topography;
- Complete facility deferred maintenance, such as replacing window panes, weed removal, etc.;
- Transportation mitigations may include using colored gunnite, 'black' MSE wire walls, simulated rock, 'corten' traffic barriers, using rip rap that matches existing natural rock outcroppings or 'staining' rock to look aged, and colored, or stamped concrete;
- Where Project facilities cannot be modified to meet VQO's, consider providing interpretive information and incorporate into the I&E Plan ;
- Maintain reservoir capacities at agreed upon elevation during peak recreation season;
- Assess Project and Project-affected NFS lands to develop ways to blend Project modifications with the natural surroundings; e.g. colored gunnite, plant screening, vegetation, natural landscaping, use natural materials (rock, wood, etc.) to achieve objectives;
- Evaluate Project-associated signs for visual appeal.

3. Project disposal piles (e.g. material from trash racks, reservoir build-up, etc.):

- Remove, burn, chip, or dispose of debris piles on NFS lands in a timely manner;
- Remove this material, as a minimum annually, prior to recreation season.

CONDITION NO. 33 - FIRE AND FUELS MANAGEMENT

Within one year of license issuance, the Licensee shall file with the Commission a Fire and Fuels Plan that is approved by the Forest Service, and developed in consultation with appropriate State and local fire agencies. The plan shall set forth in detail the Licensee's responsibility for the prevention, reporting, and emergency response to fires in the vicinity of the Project resulting from Project operations. At a minimum, the plan shall address the following categories.

Fuels Treatment

- Consistent with Visual Quality Objectives for recreation sites, reduce fuels in and around developed and dispersed recreation sites identified in the Recreation Management Plan. Treatment may include shaded fuel breaks, limbing, brush trimming, and selective clearing around the perimeter of the site. Select vegetation treatments within recreation sites to maintain screening between sites where possible. Size fuel treatment according to the size and capacity of the facility. The Licensee shall implement and maintain fuel treatments;
- Maintain vegetation clearing around all Project infrastructure (dams, gages, valve houses, etc.) to comply with CalFire requirements;
- Fuel treatment disposal methods may include chipping, off-site disposal, or lopping and scattering (only with Forest Service approval, in limited amounts and locations). These fuels treatment methods are applicable to the Licensee's annual, routine vegetation management within the Project area. Larger fuel treatment projects that include merchantable Forest Service timber shall be handled separately under Timber Sale Contract with specific provisions for fire and fuels;
- During annual coordination meetings with the Forest Service, provide the proposed annual vegetation treatment schedule (with a map) for all areas where fuel treatment is planned (including Project powerlines). Include known Limited Operating Periods or survey data for any areas with known sensitive resources;
- Standard protocols for Licensee compliance with the Forest Service Project Activity Level (PAL) during Project construction, reconstruction or maintenance.

Prevention and Response

- <u>Access and Safety:</u>
    - Identify Project sites potentially available for equipment staging, helispots, water drafting, Incident Command, safe zones, or other fire suppression strategies;
    - Include status of access roads, community road escape routes, helispots to allow aerial firefighting assistance, and water drafting sites;
    - Address fire danger and public safety associated with Project induced recreation, including fire danger associated with dispersed camping,

existing and proposed developed recreation sites, trails, and vehicle access.

- Emergency Response Preparedness:

  - Include emergency contact list (updated annually) for Licensee Project operations, including operations personnel for power and dam operation, road maintenance contacts, transmission and distribution line staff, timber operations, and public affairs/website management.

- Reporting and Response:

  - Licensee shall report any Project related fires on National Forest System lands to Forest Service dispatch immediately but no later than 24 hours. Report shall include location, approximate size, fire activity, and nearest vehicle access routes;
  - Licensee shall, where possible, make equipment (including communications) and personnel available on-site during initial emergency response until relieved by State or Federal resources and shall take action as appropriate to suppress fires within or adjacent to Project, when possible.

Investigation of Project Related Fires

The Licensee agrees to fully cooperate with the Forest Service on all fire investigations. The Licensee shall produce upon request all materials and witnesses not subject to the attorney-client or attorney work product privileges, over which the Licensee has control, related to the fire and its investigation including:

- All investigation reports;
- All witness statements;
- All photographs;
- All drawings;
- All analysis of cause and origin;
- All other similar materials and documents regardless of how collected or maintained.

The Licensee shall preserve all physical evidence, and give custody to the Forest Service of all physical evidence requested. The Forest Service shall provide the Licensee with reasonable access to the physical evidence and documents the Licensee requires in order to defend any and all claims, which may arise from a fire resulting from Project operations, to the extent such access is not precluded by ongoing criminal or civil litigation.

CONDITION NO. 34 - HERITAGE RESOURCES MANAGEMENT AND MONITORING

Within one year of license issuance, Licensee shall file with the Commission a Historic Properties Management Plan (HPMP) that is approved by the Forest Service. The HPMP is tiered to a Programmatic Agreement, to which the Forest Service will be a signatory, as defined by 36 CFR 800, and implements regulations of the National Historic Preservation Act. The Licensee shall consult with the State Historic Preservation Officer, applicable Native American Tribes, Forest Service, and other applicable agencies during the preparation of the Plan. Collaborative meetings for the development of the Final HPMP with the Licensee, Forest Service and potentially affected Tribes shall be facilitated.

The final HPMP shall include, but is not limited to, a complete integration of the CR-S1 and CR-S2 study results (including the currently incomplete CR-S2 ethnographic Winnemem Wintu study or equivalent data), detailed site monitoring and schedule, National Register determinations of eligibility for sites periodically inundated by reservoir fluctuations in Iron Canyon Reservoir, and expected and potential effects of current or proposed Project operation effects on historic properties including specific detailed mitigations for those effects. Additionally, the Final HPMP is to include a study/evaluation of whether there is compelling evidence for a Historic archaeological and ethnographic District on the Lower McCloud River within the project expanded APE.

If, prior to, or during ground-disturbing activities, or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on NFS lands or on Licensee’s adjoining fee title property when heritage properties extend onto NFS lands, the Licensee shall immediately cease work in the area so affected. The Licensee shall then notify the Forest Service and shall not resume work on ground-disturbing activity until it receives written approval from the Forest Service. If it deems it necessary, the Forest Service may require the Licensee to perform recovery, excavation, and preservation of the site and its artifacts at the Licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service. The Licensee shall implement the Plan upon approval by the Commission.

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ENCLOSURE 2:
FOREST SERVICE RATIONALE
FOR
PRELIMINARY LICENSE TERMS AND CONDITIONS

GENERAL COMMENTS:

This enclosure provides a detailed explanation of the Forest Service's reasoning for the preliminary Section 4(e) license terms and conditions (Enclosure 1), which are necessary for the adequate protection and utilization of the affected NFS lands. This rationale supplements the Licensee's Application For New License (July 2009) for consideration in the Federal Energy Regulatory Commission (FERC) staff's NEPA analysis.

Many of the preliminary conditions are consistent with those identified in the Final License Application (FLA or PG&E, 2009), and reflect detailed collaborative meetings between the Licensee and Relicensing Participants to develop new conditions that are protective of Forest Service resources.

While the Forest Service provides detailed supporting rationale below, general comments on the FLA are as follows:

The Executive Summary (ES, p. 2) notes that four study plans remain incomplete including CR-S2, Traditional Cultural Properties, for each of the represented tribes. While the Forest Service agrees that this study is incomplete, it should be noted that many of the sites identified in study CR-S1, Archeological and Historic-Era Properties, were given preliminary integrity ratings pending completion of CR-S2 which could show that current traditional cultural use will change these integrity ratings. For this reason, the Forest Service does not agree that study CR-S1 is complete, until results from study CR-S2 can be compared and incorporated into the final results.

The Executive Summary (ES, p. 5) also identifies several locations where the Licensee anticipates additions to the Project Boundary. In addition to those listed, the Forest Service believes that additions may be necessary in the additional locations:

- Area at Star City Creek where recreation facilities will be expanded and improved;
- Forest Service road 38N11 Segment 1, and the area between the road and the McCloud Reservoir water surface to include all new Project recreation sites and the parking areas and access roads that serve them;

- Forest Service road 37N78 and the area between the access road and any recreation sites along the Iron Canyon reservoir shoreline developed for the Project;
- Tunnel Spoil Pile at Hawkins Creek Crossing to accommodate the proposed Large Woody Debris and Gravel and Sediment stockpile sites proposed in the FLA and Preliminary Section 4(e) conditions.

Exhibit A, Project Description, includes a Project Description of Road Operations and Maintenance for Project Infrastructure. It does not appear that all current license maintenance responsibilities are included (e.g. road to MC-10 gage, road to McCloud Dam). These are current responsibilities that should be reflected, and will be carried into the new license.

The Licensee has proposed draft Resource Management Plans in Volume 1 of the FLA that propose monitoring and protection measures for Forest Service resources. The Forest Service concurs with many of these proposals with the following general comments:

Final License Application, Volume VI

Water Quality Monitoring Plan

The Forest Service has expanded water quality monitoring to all of the Project reservoirs (including Pit 6 and Pit 7) to monitor for possible Project effects over the term of the license.

Annual temperature monitoring is increased to a ten-year period to ensure that measurements are taken during all water-year types where temperatures may be affected by new Project flows and operations.

Turbidity concerns in the Lower McCloud River were raised throughout the study plan period both by the agencies and concerned anglers. The FLA notes that most of these events in the Lower McCloud are not Project induced, but do affect fishing quality along the Lower River. To address these concerns, the Forest Service has added a measurement location at MC-7 (just below the dam), and required that this information be posted on-line, real-time with flow information for the license term, to provide more useful information about turbidity events to the public.

Bacteriological testing requirements have been modified to also include dissolved oxygen testing in the Project reservoirs where impacts to aquatic biota are a concern. Best Management Practices (BMP's) should also be followed wherever impacts to Project waters is a concern.

Erosion and Sediment Monitoring and Control Plan

In addition to provisions for existing Project erosion sites, the Forest Service has added a requirement for site specific erosion control plans associated with any new construction or ground disturbing work as a result of the new license. These will include the appropriate BMP's for the work proposed, with follow-up monitoring and measures to control erosion.

In addition to the Erosion and Sediment Plan, the Forest Service has included a Gravel and Sediment Management Plan to reintroduce a portion of the historic gravel and sediment component that is currently blocked by McCloud Dam in order to meet the Aquatic Conservation Strategy objectives.

Wildlife Management Plan

The Forest Service has proposed some changes to the periodicity and term for wildlife surveys, and aquatic surveys have been included for fish, benthic macroinvertebrates (BMI's), and aquatic mollusks. Fish passage concerns are addressed in the Road and Aquatic Biological Management Plan.

Road and Transportation Facility Management Plan

The Forest Service has completed and signed the Road Management Objectives (RMO's) for the Project and Project-affected roads within the McCloud-Pit Project. These objectives will govern the road maintenance standards for those roads within the new license. Road Management Objectives have been designed to match the expected use of each road system (e.g. public recreation, Licensee facility maintenance, etc.).

Recreation Development and Management Plan

The Forest Service has included Visual Quality mitigations to ensure that project facilities meet the appropriate Visual Quality Objectives (VQO's) identified for each area of the Project.

As the FLA notes, both McCloud Reservoir and Iron Canyon Reservoir experience dispersed camping use around the shoreline. A decision to issue a Forest Order closing these areas to dispersed camping will be made pending the development of improved overnight camping facilities around each reservoir that can accommodate Project-induced demand for this type of use.

Additional car-top boat launch opportunities have been designated around McCloud and Pit 7 Reservoirs.

For the Lower McCloud River, the Forest Service provides substantial evidence of a Project nexus to the Lower River by way of several documents written at the time the Project was in development, and which point clearly to the need for additional recreation support facilities to accommodate the increased use along the Lower River corridor induced by Project changes to instream flows, etc.. As a result, the Forest Service has included recreation facilities, and the road system that serves it, to the license conditions as a part of the Project recreation need. While most of these facilities are oriented towards fishing use, they also include camping, hiking and boating. These additional sites include Ash Camp, Ah-Di-Na, trails, roads, and the dispersed areas along the Lower McCloud River on NFS lands. When Cultural studies are complete, additional sites or specific developments may be appropriate.

The Forest Service disagrees with the Licensee conclusion that Deadlun Campground on Iron Canyon Reservoir should remain at the existing location. Study evidence points to the need to relocate this facility to one or two sites that are closer to the water at all reservoir elevations, and the Forest Service will work with the Licensee to find alternative and improved locations prior to the Final 4(e) conditions.

The Forest Service proposes the addition of a pedestrian trail and car-top boat access from the Pit 7 Dam along the Pit 7 Reservoir in the event that the proposed Montgomery Creek site is not feasible.

Fire Response Plan

It is not clear that the Equipment and Preparedness portions of the Fire Plan have been useful in past Licenses. For fire emergencies, the Forest Service uses the Incident Command System (ICS) and federal contracting regulations to provide personnel and equipment to the fireline. A recent example is the 2009 Chalk Fire on the Shasta-Trinity National Forest. While the fire occurred within portions of the newly relicensed Pit 3, 4, 5 Project, the plan did not prove useful or effective during the initial emergency response. Thus, the Forest Service Fire and Fuels Management Plan condition does not include some of the previously standard language regarding emergency response preparedness (i.e. Part 2.3 in Licensee's Fire Response Plan Element). Reporting, investigation and documentation requirements were helpful and should remain in the license.

Fisheries and Aquatics

The most significant variation between the Final License Application and the preliminary 4(e) conditions is the absence in the FLA of any proposed monitoring of aquatic resources in the Project Reservoirs, or the Lower McCloud River as a result of the new license conditions. Roughly 1/3 of all the Study Plans, and a substantial amount of Project time and money, were devoted to measuring flow effects on the existing fishery, BMI, aquatic biota, and riparian habitat within these water bodies. Studies conducted included the Unimpaired Hydrology Model, Habitat Criteria Mapping (HCM), Individual Base Modeling (IBM), BMI and crayfish surveys, snorkel surveys, and the 1-D modeling effort, in addition to riparian habitat and species surveys. Most of the public comments, and nearly all of the public controversy, have been devoted to concerns about flow effects on the Lower McCloud River fishery and fishing conditions.

As a result, the Forest Service has proposed a license condition to monitor, periodically survey, and report on impacts to aquatic species and riparian habitat over the term of the new license. This will provide data on any actual changes to these conditions as a result of the license changes. It will also provide factual data for any adaptive management changes needed during the license term, and provide new baseline in order to address public concerns regarding potential instream flow affects on the aquatic biota.

Historic Properties Management Plan

As discussed in more detail under the rationale for Forest Service Condition No. 33 below, the Forest Service still considers the Historic Properties Management Plan a draft. Until both CR-S1, CR-S2 and consultation is complete, the HPMP cannot be completed. The Forest Service, Tribes, and other interested parties will continue to collaborate on options for interpretation, avoidance, and the development of specific mitigations in support of a Final HPMP.

STANDARD CONDITIONS 1-18

The preliminary Section 4(e) standard conditions include requirements that serve to address the statutory, resource protection, and administrative responsibilities of the Shasta-Trinity National Forest. While broad in nature, they provide the framework for the Project-specific conditions.

License condition No. 1 provides for consultation between the applicant and the Forest Service. During Annual Consultation Meetings, operational and planning information (e.g. planned valve testing, maintenance activities, monitoring, construction, vegetation treatments) can be discussed. The Forest uses this information to minimize user conflicts, particularly for recreation, and to schedule Forest personnel time to administer the ongoing Project.

Most of the standard conditions (No. 2-5, 12-14, 17) address the Forest Service's concerns for operation and maintenance of the Licensee's improvements as they may affect NFS lands. These address approval of changes, maintenance of improvements, review of existing valid claims and rights to the land occupied by the Project, compliance with Federal, State, county and municipal laws and regulations, access, crossings, signs, and landline surveys. The Forest Service is the federal agency responsible for assuring that management of these Project-affected NFS lands is in compliance with the Shasta-Trinity National Forests Land and Resource Management Plan (LRMP), as well as the numerous laws, regulations and agency policies. Including these standard conditions insures that Project operations are consistent with these mandates.

The Surrender of License condition (No. 6) would require the Licensee to restore NFS lands in the event that the license is ever surrendered. This condition minimizes the risk of the Project improvements being abandoned on NFS lands.

While unlikely, there is a possibility that Project features (transmission lines, dams, powerhouses, penstocks, and other appurtenant facilities) could be responsible for damage, injury, death or fires. Since these features are the property of the Licensee and not the Forest Service, license conditions that require the Licensee to indemnify the Forest Service and protect against damage, injury, death, risks and hazards associated with the use and/or occupation of NFS lands authorized by the Project license are appropriate. Project facilities or activities may pose a threat of fires and/or other destruction of habitat with resultant losses of resource values. Therefore, it is prudent that the Licensee is required to take measures to minimize this fire risk to federal land and human life. These standard conditions (i.e. No. 7-10 and Project-specific Condition No. 33 (Fire and Fuels Management Plan) provide an

incentive to the Licensee to seek out and eliminate, or minimize risks associated with their structures and activities and thus protect the public interests.

The remaining standard license conditions (No. 11, 15-16, 18) provide protection for forest resources on NFS land by requiring consideration and limits to pesticide application, modifications if other agencies biological or water requirements change, protection of Special Status Species, and provisions for unanticipated ground disturbing activities. These conditions assist the Forest Service in managing the Federal lands occupied by the Project.

PROJECT SPECIFIC CONDITIONS 19-34

Project-specific license condition rationale (#19-34) consists of two parts:

a. Guidance by resource area from Forest Service comprehensive land use planning and other documents;
b. Specific Section 4(e) rationale by license condition (or grouping of similar conditions) applicable to this Project.

HYDROLOGY/STREAMFLOW MANAGEMENT, WATER QUALITY, EROSION, LWD, DREDGING, GRAVEL, AND AQUATIC BIOLOGY

Conditions No. 19, 20, 21, 22, 23, 24, and 27

Implementing the flow management and water resource conditions would achieve standards, goals, objectives, and direction for the Shasta-Trinity National Forest as provided for in the Land and Resource Management Plan (LRMP), which incorporates the Standards and Guidelines (including the Aquatic Conservation Strategy) from the Record of Decision (ROD) for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (FEIS).

a. Guidance:
Shasta-Trinity Land and Resource Management Plan
Forest Goals

- Provide for continued use and new development of hydroelectric facilities (4-4.18).
- Provide for the protection, maintenance, and improvement of wild trout and salmon habitat (4-4.14).
- Maintain or improve riparian habitat (4-5.25).

Standards and Guidelines:

- Maintain riparian area values, particularly when locating and constructing new roads and trails (4-25.17b).
- Identify and treat riparian areas that are in a degraded condition (4-25.17c).

Management Prescriptions

Riparian Reserves: For fish-bearing Streams, Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest (4-53.1).

Aquatic Conservation Strategy Objectives:

- Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted (4-53.1).
- Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species (4-53.2)
- Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations (4-53.3).
- Maintain and restore water quality necessary to support healthy riparian, aquatic, and wet-land ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities (4-53.4).
- Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport (4-53.5).
- Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected (4-53.6).
- Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands (4-53.7).
- Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability (4-53.8).
- Maintain and restore habitat to support well-distributed populations of native plant, invertebrates, and vertebrate riparian dependent species (4-53.9).

Lands

- For hydroelectric and other surface water development proposals, give priority emphasis to instream flows and habitat conditions that maintain or restore resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During re-licensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize in-stream flows and habitat conditions that maintain or restore riparian resources and channel integrity (4-57.7b).

McCloud River/Pit Management Area Supplemental Management Direction:

- Continue to develop trail access to and along Squaw Valley Creek and the McCloud River (4-123.8).
- Evaluate whitewater boating opportunities (4-123.9).
- In cooperation with private landowners, Licensee and the DFG manage the Upper and Lower McCloud River and Squaw Valley Creek under a CRMP (4-123.11).
- Maintain or improve selected habitats for coldwater and warmwater resident fisheries (4-127.3).
- Manage the Pit River for dispersed, water-oriented recreation opportunities (4-127.5).

Water Quality Management for Forest System Lands in California (USDA Forest Service, Pacific Southwest Region, 2000) Best Management Practices (BMP's):

- Stabilization of Road Slope Surfaces and Spoil Disposal Areas (#2-4)
- Dispersion of Subsurface Drainage From Cut and Fill Slopes (#2-6)
- Control of Road Drainage (#2-7)
- Control of Sidecast Material During Construction and Maintenance (#2-11)
- Bridge and Culvert Installation (#2-17)
- Regulation of Streamside Gravel Borrow Areas (#2-18)
- Disposal of Right-of-Way and Roadside Debris (#2-19)
- Specifying Riprap Composition (#2-20)
- Maintenance of Roads (#2-22)
- Snow Removal Controls to Avoid Resource Damage (#2-25)
- Restoration of Borrow Pits and Quarries (#2-27)
- Surface Erosion Control at Facility Sites (#2-28)
- Water Quality Monitoring of Off Highway Vehicle (OHV) Use (#4-7)
- Watershed Restoration (#7-1)
- Protection of Wetlands (#7-3)
- Control of Activities Under Special Use Permit (#7-5)

- Water Quality Monitoring (#7-6)

b. Rationale to support license condition(s):

Minimum Instream Flow Analysis – Lower McCloud River
The preliminary flow prescription was developed to meet the aquatic and terrestrial ecosystem Goals and Objectives of the Forest Service's Shasta-Trinity Land and Resource Management Plan. The Forest Service flow prescription integrates the findings of relicensing studies, collaborative input, compliance with applicable federal law, and staff recommendations while attempting to meet Forest Service objectives in balancing power production, ecosystem values, and the interests of Relicensing Participants in the development of the Lower McCloud River Section 4(e) Flow Proposal.

The Forest Service Section 4(e) Proposal can be divided into two predominant components: a stable summer/winter base flow of 200 cfs, and a variable base flow period that adjusts to rainfall and snowmelt runoff in the winter/spring to more closely mimic natural hydrologic conditions. The proposal also includes a ramping protocol to down-ramp spill events. The Forest Service flow schedule was predicated on the Shasta-Trinity Land and Resource Management Plan aquatic and terrestrial ecosystem objectives. Besides broad terrestrial and aquatic ecosystem goals to maintain healthy ecosystems, specific Riparian Reserve, Aquatic Conservation Strategy and McCloud River/Pit Management Area Supplemental Management Directions (described above) were also used to determine the Forest Service's preliminary flow prescription.

Specific objectives used to craft the flow proposal include:

Continuity of flow from McCloud Dam to Shasta Reservoir: Currently the compliance point for the instream flow requirement for the Lower McCloud River is 3.6 miles downstream of McCloud dam at USGS gage 11367800 at Ah-Di-Na Campground commonly referred to as MC-1 by Licensee. This point is downstream of the confluence of the McCloud River with Hawkins Creek, Squirrel Creek, and Fitzhugh Creek. Hence flow from these tributaries is currently counted towards meeting the instream flow requirement. This allows Licensee to release flows as low as 40 to 50 cfs from the dam in some time periods since the accretion from Hawkins Creek alone can exceed 150 cfs. As a result, the 1.2 mile section above Hawkins Creek experiences a wider fluctuation of flows than the reaches below the gage. This also diminishes the "natural" variability of flow in the Lower McCloud by utilizing the variable flow of Hawkins Creek (and other tributaries) to meet the instream flow release requirement from McCloud Dam. The Forest Service proposal requires instream flow to be measured as the release from McCloud Dam. This will ensure more natural flow continuity for the entire reach below McCloud

Dam and also allow the flows contributed by Hawkins Creek to contribute to the variability in flow rather than make up the difference in base flow.

Improve the duration, magnitude, and spatial distribution of flows: A review of the current flow patterns below McCloud Dam versus the inflow to McCloud Dam shows that not only has the magnitude of base flow been diminished, as would be expected, but the magnitude and duration of high flow events has been modified. Specifically the duration of flood events has been significantly shortened, and the declining limb of the hydrograph for high flow events has been steepened. As discussed below in the section on Late Winter/Spring Snowmelt Period, these flows are a key component for most aquatic related biological processes. The flow regime generated by the "Flow Rule" was developed to address these concerns.

Flow Rule background:
The primary purpose of the flow rule is to introduce variability to the instream releases in the Lower McCloud River by keying late winter and spring releases to inflow to McCloud Reservoir. In many relicensing efforts, flow variability is managed via a concept of "Water Year Types" based on precipitation/runoff patterns. The McCloud River is strongly groundwater dominated (has a steady baseflow regardless of long term precipitation patterns) but also exhibits a snowmelt runoff characteristic.

In California, the Department of Water Resources (DWR) measures and predicts runoff on a monthly basis through the winter and spring, and has developed a "Water Year Indices" measure for the Sacramento Valley watershed which includes the McCloud River. However, closer inspection of the relationship between the "Indices" and actual McCloud runoff shows that in many years there is no sound correlation during the winter/spring runoff period. For example, in some years, intense precipitation in December and January leads to a classification of a "Wet" water year type, but the actual runoff in February through May is very low. Therefore, a flow rule based solely on the indices would require higher instream flows in the late winter and spring months than would be required if the flow was based on the actual runoff.

To circumvent this problem, the Forest Service developed a flow rule based on "real time" information to more accurately approximate actual runoff patterns. DWR publishes a monthly "Bulletin 120" from February through June each year that includes current snowpack, water content, and precipitation information and an April through July forecast of runoff. This bulletin includes a specific listing for the McCloud River at Lake Shasta. The Forest Service flow rule uses this monthly information to modify flow semi-monthly from February through April. This allows flows to more closely match actual runoff.

Table A-1 (Appendix 1) provides the historic data from Bulletin 120, and Table A-2 (Appendix 1) shows the resulting base flows from this data and application of the rule. Table A-2 provides the median monthly flows for the Forest Service flow proposal over the time frame of Water Years 1974 through 2009. The data for 1974-2006 was developed through the use of a spreadsheet model modifying data generated from the ResSim Model developed by Licensee (*Develop Project Operations Model, TM-47).* For comparison purposes, Table 2-1, below, also includes the monthly median flow for Licensee's flow proposal from the FLA as produced by the ResSim Model, the monthly median flow from the USGS gage data from MC-1 for the period 1967 through 2006 (post dam), and the monthly median flow from the USGS gage data at the Upper McCloud (MC-3 above McCloud Reservoir) for the period of record, 1932 through 2006.

The Forest Service flow proposal generates higher median monthly flows in March and April and slightly higher flows in May and June than either Licensee's FLA proposal or the existing releases. These higher base flows in concert with the slower down ramping of spill events act to buffer high flow events and improve the duration and spatial distribution of flow events.

A review of the Graphs (Appendix 1, Pages 4-36) for water years 1974 through 2006 generated by the Forest Service flow rule, shows that the driest years and very high spill events are nearly identical in results to Licensee's proposed constant flow regime. It is the more moderate flow events when the effects of the Forest Service flow rule are apparent. The chart for WYs 1978 and 1998 shows the Forest Service flow provides both a higher base flow before and after spill events, and a flatter declining flow limb after the event as compared to either the existing flow regime or the FLA proposal. Similar results can be seen in the charts for Water Year (WYs) 1982, 1986, 1989, 1993, 1995, 1996, 1999 and 2000. The greatest difference in flow is seen in the charts for WYs 1980 and 1999 when moderate spills were encountered. Notably in 1999, the Forest Service flow rule provides a much more stable regime with less peaking than the other two (i.e. Licensee's current and FLA proposed) regimes.

Further discussion of this data is provided in the Hydrologic Analysis section below.

Table 2-1. Median Monthly Flows as measured at MC-1 (Ah-Di-Na, 3.6 miles below McCloud Dam) for Forest Service and FLA proposals, compared to actual flows at MC-1 and MC-3 (Above McCloud Reservoir)

Month	FS Proposal	FLA Proposal	Actual MC-1 Gage	Actual MC-3 Gage
October	215	165	214	758
November	220	170	219	767
December	238	248	196	785
January	286	296	178	819
February	334	312	199	850
March	501	352	214	963
April	427	281	190	1065
May	265	191	209	1080
June	229	179	210	909
July	218	168	207	836
August	214	164	205	803
September	214	164	215	782

Fishery Considerations for Summer/fall/winter Base Flow:

The Forest Service summer/winter base flow schedule (July 1 to February 14) has been set at a release of 200 cfs from the McCloud Dam. Three main flow studies (Habitat Criteria Mapping (TM-56), Individual Base Modeling (TM-54), PHABSIM (TM-74) as well as the macroinvertebrate, fisheries, and riparian vegetation studies were considered to determine appropriate flows for aquatic and terrestrial biota.

Examination of the results of the *Habitat Criteria Mapping on Lower McCloud River (TM-56)* indicates that total available juvenile trout habitat for the Lower McCloud River *upstream* of the confluence with Squaw Valley Creek (Upper Reach) is maximized in the range of 190 to 250 cfs, while total available adult habitat is maximized at flows between 190 cfs and 280 cfs as measured at gage MC-1 (Ah-Di-Na).

The total estimated available juvenile habitat at 190 cfs ranges from 3067 x 10^3 ft^2 to 4527 x 10^3 ft^2 (90% Confidence Interval (CI) range), while the total available juvenile habitat at 308 cfs ranges from 2436 x 10^3 ft^2 to 3036 x 10^3 ft^2 (90% CI range). The results of *t*-tests for juvenile trout habitat show a significant difference (α=0.10) between flows of 190 and 308 cfs for juveniles.

The total estimated available adult trout habitat in the Upper Reach at 190 cfs ranges from 3958 x 10^3 ft^2 to 4676 x 10^3 ft^2 (90% CI range), and at 308 cfs, 3195 x 10^3 ft^2 to 3885 x 10^3 ft^2 (90% CI range). The results of *t*-tests for available adult trout habitat show a significant difference (α=0.10) between flows of 190 and 308 cfs.

Total available juvenile trout habitat for the Lower McCloud River *downstream* of the confluence with Squaw Valley Creek (Lower Reach) is maximized in the range of 215 to 330 cfs, while total available adult habitat is maximized in the range of 300 cfs to 420 cfs.

The total estimated available juvenile habitat at 273 cfs ranges from 1983 x 10^3 ft^2 to 3299 x 10^3 ft^2 (90% CI range), while total available juvenile habitat at 358 cfs ranges from 1892 x 10^3 ft^2 to 2984 x 10^3 ft^2 (90% CI range). The results of *t*-tests do *not* show a significant difference (α=0.10) for juvenile trout habitat between flows of 273 and 358 cfs. Variance in the total available habitat area estimates was relatively large at 273 and 358 cfs compared with the other test flows.

The total estimated available adult trout habitat for the Lower Reach at 273 cfs ranges from 2281 x 10^3 ft^2 to 3483 x 10^3 ft^2 (90% CI range) and at 358 cfs 2448 x 10^3 ft^2 to 3930 x 10^3 ft^2 (90% CI range). Both the juvenile and adult predicted available habitat values overlap between measured flows of 273 and 358 cfs. Again, the results of *t*-tests do *not* show a significant difference (α=0.10) between flows of 273 and 358 cfs (TM-56, p. 23).

Repeated habitat criteria mapping surveys associated with the McCloud River Instream Flow Study indicates further precision error of ±9.3% for the mean percent difference of suitable habitat areas between measurements by different sampling crews for adult and juvenile life stages (TM-56, p. 29).

Due to the lack of precision in these results, it is impossible to determine the precise flow value that would maximize trout habitat based solely on the HCM study results. This study would seem to indicate maximal trout habitat somewhere between 190 and 250 cfs in the Upper Reach, and between 250 and 450 cfs in the Lower Reach, but a precise estimate of flows that would provide maximal habitat cannot be accurately determined from this study.

Examining the *Individual-Based Model (IBM) Instream Flow Evaluation Technical Memorandum (TM-54)*, the results are considered uncertain at best. The Forest Service asked that the IBM modeling be performed to corroborate the proposed HCM and 1-D habitat models. The IBM model is still considered experimental but was considered ripe for use for development in understanding the relationship

between habitat and bioenergetics, something that has not been possible with the use of purely habitat based models.

The results of the historic flow record (post-project) and synthesized unimpaired hydrology (pre-project, for years 1990 through 2007) "flow experiment" for IBM-01 and IBM-02 predict significantly lower numbers of both rainbow and brown trout under unimpaired than under the historic flow record "where unimpaired flows were predicted (at IBM-02) to produce near-extinction of trout." A possible hypothesis for this apparent discrepancy, presented in the IBM study results, is the fact that inSTREAM did not include two kinds of movement that could allow adult trout to persist in a higher flow regime: "migration of adult trout up into the river from Shasta Lake, and spawning and rearing of juveniles in tributaries where hydraulics are more favorable."

Information contained in the *Stage 2, Multiple Use Impact Report on the McCloud-Pit Project (Pacific Gas & Electric Company), Shasta-Trinity National Forest, Region 5, U.S. Department of Agriculture, Forest Service* (USDA, 1963a) seems to indicate that fish populations were extremely healthy before the project was built. The report states "The population density of rainbow trout at the time (pre-project) was so high that even by the primitive method of set line capture sufficient brood stock was obtained to supply the heavy demands of the early fish culturists." It also indicates "The estimated total run of kokanee salmon into the McCloud and tributaries is 130,000 fish… The catchable trout fishery that has been developed in the upper section of the McCloud River is of major importance in Northern California … At the present time, fish populations in the lower section of the McCloud River are entirely self-maintained and provide excellent fishing."

Fishing pre-project was also known to be excellent in the Upper McCloud River (Campbell in 1882 claims to have caught one hundred *rainbow trout* in less than two hours at Big Springs on the McCloud River (Ballinger, 1998). While this information is qualitative and not quantitative, it suggests that the IBM study results that predict near-extinction of trout at higher historical flows are inaccurate and do not reflect the status of fish populations that were actually present during the pre-project unimpaired flow period.

The IBM study also contained several simulations (summer target flow, year-round target flow, winter flow experiment) which indicate age 1 and older rainbow and brown trout numbers were generally variable between 100 and 250 cfs as measured at the MC-1 gage. Even given the uncertainties described above, the IBM study does not allow for a precise determination of flow in the McCloud River that would maximize fish populations.

The conclusion the Forest Service draws from the IBM study results is that the IBM simulations did not incorporate processes that were probably important to pre-McCloud, post-Shasta fish population dynamics, specifically stream-network-scale movements of fish between Shasta Reservoir, the mainstem McCloud, and its tributaries. Because of this fact, this study and its results are unreliable for use.

We also considered the *Lower McCloud River 1-D PHABSIM Analysis (TM-74)* in determining summer/winter base flow recommendations. We have questions concerning the validity of the conversion of the three dimensional data collected with the Acoustic Doppler Current Profiler (ADCP) since 1-D models do not use vertical velocity data. This question makes the model as configured questionable as compared to a 1-D model which would have collected data in a two dimensional plane. There were further issues with large negative (upstream) flow velocities at margin habitats in many transects which normally are not seen in the usual 1-D study results. Even with these caveats, we examined the Lower McCloud River 1-D PHABSIM Analysis (TM-74) to see if it would further clarify the uncertainty associated with the *Lower McCloud River Instream Flow Study Technical Memorandum (TM-56).*

This study (PHABSIM Analysis), also included habitat suitability curves (HSC) requested by the resource agencies that were used and approved by the resource agencies for use in the PG&E/NIDs Yuba Bear/Drum Spaulding Hydropower Relicensing Project (YBDS) as a comparison to the binary HCM criteria.

Results from this study show that adult trout habitat in the Upper Reach is maximized at approximately 225 to 250 cfs for HCM binary HSC, and between 175 to 200 cfs for YBDS HSC (TM-74, p. 27). Adult trout habitat in the Lower Reach is maximized at 275 cfs for HCM binary HSC (TM-74, p. 27).

Percent of total WUA varies from 79.95 to 79.28 percent at simulated discharges between 200 cfs and 300 cfs for HCM HSC. At historical base flows of 700 cfs, the total habitat equals 44.78% (TM-74, p. A6-3) using the HCM HSC. Adult trout habitat in the Lower Reach is maximized at 200 cfs for YBDS HSC (TM-74, p. 28).

These results from the 1-D study using the binary HCM HSC and the YBDS HSC show variability between the two data sets. They are also usually within the 90% CI of the HCM study results. Given the variability exhibited, the Forest Service concludes that the study results do *not* provide a more precise definition for optimal flow values in support of the LRMP objectives for aquatic and terrestrial resources.

The study results from *Fish Populations in Project-Affected Stream Reaches Technical Memorandum (TM-18)* describe fish population sampling data (using night snorkeling methods) gathered in the fall for study years 2007 and 2009. Fish sampling was conducted at 8 sites during 2007 and 9 sites in 2009 on the mainstem Lower McCloud River. One fish sampling site was added during 2009 to assess trout recruitment levels between Hawkins Creek and the McCloud Dam.

Trout densities and biomass increased at all but one sampling site (F-McR-19.7, Ad-Di-Na) on the Lower McCloud River mainstem from 2007 to 2009, and trout abundance and biomass was highest at the uppermost site below McCloud Dam (F-McR-23.4). Trout abundance at this site was estimated at 1043.3 fish and 57.6 kg/ac. The two most downstream sites (F-McR-6.0, Tuna Falls and F-McR-1.9, Shasta Lake) had the lowest trout densities and biomass of all nine sites during both years of sampling.

On September 19, 2008 the James B. Black Powerhouse was shut down for emergency penstock repairs. As a result, spill flows were released into the Lower McCloud River between September 22nd and November 5th, 2008, averaging 913 cfs (measured at MC-5) during this period. Peak flows of 1411 cfs were measured on November 2nd, 2008. While no direct correlation can be made between the higher flow releases into the Lower McCloud River from McCloud Dam and higher trout densities and biomass that were found in 2009, circumstantial evidence would seem to indicate that higher flows did not depress fish populations as predicted by the models developed for the relicensing, but instead may have had a positive effect on trout recruitment (especially brown trout in the 75 to 149 mm range (Young Of Year (YOY) length range)) and trout survival during the 2009 water year.

Because of the lack of specificity of the HCM and 1-D PHABSIM model results, the lack of confidence in the IBM for trout, and the possibility/likelihood that higher flows produced greater trout abundance and biomass, no “optimal” set of base flows for the Lower McCloud River could be determined. Consideration instead was given to the “optimal” ranges of flows provided by the models along with changes in power generation relative to current operations. Based on the models one could determine that flows in the range of 175 to 280 cfs in the Upper Reach are adequate. However, the historic record shows that base flows greater than 700 cfs also produced substantial trout biomass. The Forest Service chose to set the base flow for the project at 200 cfs as measured at McCloud Dam, although higher flows may be more protective of aquatic biota. These flows are being set to provide for growth and maintenance of trout abundance and biomass during the summer growth period, to maintain the Lower McCloud River ecosystem, while balancing power production with ecosystem values.

Late winter/spring Snowmelt Runoff Period Considerations:
The Natural Flow-Regime Paradigm" (Richter et al., 1996; Poff et al., 1997; Lytle and Poff, 2004 Poff et al., 2006a) has generally been considered appropriate for California streams (Brown and Bauer, 2009). There is also wide consensus among aquatic ecologists that alteration of natural flow regimes often results in negative effects on native biota (e.g. Williams et al., 1993; Webb et al., 1999; Pringle et al., 2000; Moyle and Mount, 2007). Richter and Thomas (2007) suggest that substantial ecological benefits can be derived by modifying dam operations to mimic key aspects of the natural flow regime in situations where the full natural flow regime cannot be restored.

The McCloud River had mean average base flows of approximately 800 cfs pre-project due to the region's geology, which is characterized by high groundwater storage. Late-fall, winter and spring flows are characterized by large rainfall runoff events as well as a well-defined spring snowmelt recession. During this snowmelt recession period, predictable flow conditions coincide with high resource availability, resulting in high reproductive success, growth rates, and survivorship for species adapted to seasonal flow regimes (Gasith and Resh, 1999).

An important component of the February through June flow release schedule is the principle that the spring snowmelt pulse and recession has important effects on stream biota. For species adapted to the strong seasonality typical of California streams, "the spring snowmelt pulse and recession creates a predictable disturbance that not only resets riparian succession through scour, but provides timing cues for reproduction and growth" (Naiman et al., 2008). As a result, aquatic and semi-aquatic vertebrates often coincide their reproductive activities with the spring recession so that suitable habitat conditions, temperature regimes and abundant resources allow for optimal reproduction and growth (Freeman et al., 2001). These riparian and aquatic successional processes, coupled with elevated food resources, create conditions conducive to higher level trophism and niche space for species, such as spring spawning fish and river breeding amphibians (Yarnell, in Press). These cues are primary drivers in population dynamics such that shifts in the timing of the spring recession can alter aquatic community composition and diversity (Jager et al., 1999; Jowett et al., 2005; Marcheti and Moyle, 2001).

In addition to affecting the stream itself, flow alterations from dams affect adjacent riparian habitats, which are necessary for energy flow, nutrient cycling, water cycling, hydrologic function, and associated biotic communities. "The timing of flooding is important to the life cycle of many aquatics and some terrestrial species. A naturally occurring flood pulse enhances survivability of organisms within the riparian zone and promotes species diversity and biological productivity." Additionally, riparian habitat composition, structure, and productivity are

determined by these elements (timing, magnitude, duration) of flows (USDA NRCS, 1996).

While riparian habitats in general, as well as Project waterways (i.e. Lower McCloud River and Iron Canyon Creek) in particular, are limited in both lateral depth and aerial extent, they are extremely productive, and provide the most diverse habitat for wildlife. "This is demonstrated most visibly in the western United States, where riparian habitat comprises less than 1 percent of the total land area at some times of the year but supports most of the terrestrial wildlife" (USDA NRCS, 1996). Because the benefits of riparian habitat are so vital and yet so limited in quantity, the need to restore elements that have been degraded by Project operations becomes even more essential. Disturbing these critical areas has long-term adverse effects. "Building dams across channels, constructing levees, and the channelization of the streams may have the most adverse impact. These modifications significantly alter the movement and storage of water that is so important to the riparian system" (USDA NRCS, 1996).

This resetting of riparian succession, caused by the natural snowmelt pulse, no longer occurs downstream of McCloud Dam, according to study results from *Assess Potential Ongoing Project Effects on Riparian Vegetation Community Types in the Project Area* (BR-S4) (TM-65), which documents ongoing project effects on riparian vegetation community types in the Project area. Findings from this study show that white alder and blackfruit dogwood woody riparian vegetation, which formerly grew along the steeper canyon slopes, has encroached onto the gentler benches that were once under water as part of the McCloud River.

"Migration of species and/or vegetation types from steeper slopes to wider lower slopes in response to project related hydrologic changes have resulted in increases in cover of these species, which include white alder and blackfruit dogwood" (TM-65, p. 58, PG&E, 2009). The river channel, as a result, is narrower and the former shallow-water edge habitats have been colonized by woody vegetation that is no longer scoured away by seasonal flooding.

Among the species encroaching into McCloud River shallows are two very undesirable and aggressive woody species – black locust and Himalayan blackberry. TM-65 documents that black locust was found in 7 plots and 3 transects; Himalayan blackberry was found in 30 plots and 11 cross sections. This makes Himalayan blackberry more common in the study area than one of the dominant woody plants used in the analysis, blackfruit dogwood, which was found in 26 plots and 8 cross sections.

There is no analysis per se in TM-65 of changes in abundance or distribution of black locust or Himalayan blackberry; however the study findings do indicate that the greatest post-project increases are in wetland indicator species in the Facultative Wetland (FACW) and Facultative (FAC) categories:

> *The model indicates 5 to 10 ft^2 per linear foot of river increases of FACW and FAC species based on inundation frequency and much smaller increases based on post-Project changes in the flood recurrence interval. Thus, the overall analysis indicates expansion of FAC and FACW wetland indicator group species under post-Project conditions.* (TM-65, p. 24-25, PG&E, 2009)

Black locust is categorized as a FAC species, and Himalayan blackberry as a FACW species, so these invasives are the kinds of plants whose habitats are documented in TM-65 to have increased under Project operation conditions.

Forest Service concerns associated with significant Project effects to the riparian community are additionally demonstrated by Attachment 3 (TM-65, PG&E, 2009), which shows large reductions in the average number of days flooded per year, as a direct result of constructing McCloud Dam. For example, the number of days of flooding/year for a white alder/mixed herbaceous plant plot (i.e. Plot 4A5) was reduced from 269 days to 27, following Project implementation. Most plant associations showed similar reductions, as summarized (averaged by plant association) in Figure 9 (TM-65).

The Northwest Forest Plan Aquatic Conservation Strategy, as incorporated into the Shasta-Trinity Land and Resource Management Plan (LRMP), provides the direction to restore natural processes adversely affected by the Project. One of the objectives states:

> *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected* (LRMP 4-53.6).

These Aquatic Conservation Strategy (ACS) objectives provide the framework to develop necessary mitigations that address concerns identified in literature, and borne out by relicensing study results. Thus, flow values for the months of February through June were developed to satisfy this direction in the Aquatic Conservation Strategy, and support the ecological principles noted above.

Hydrologic Analysis

Hydroelectric relicensing provides a limited opportunity to restore functionality to these affected systems. The Shasta-Trinity LRMP recognizes the presence of hydroelectric facilities through inclusion of the following direction:

- For hydroelectric and other surface water development proposals, give priority emphasis to instream flows and habitat conditions that maintain or restore resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During re-licensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize in-stream flows and habitat conditions that maintain or restore riparian resources and channel integrity (4-57.7b).

To determine the type of flow impacts that have occurred in the Lower McCloud River reaches due to construction of the Project requires a review of the historic magnitude, timing, duration, and spatial distribution of pre-Project flows. Several tools were used to assist in this examination: the "inflow to McCloud Reservoir" data set created for the ResSim Model for Water (PG&E, 2009) Years 1974 through 2006; an unimpaired, synthetic hydrology data set for McCloud River flow at Ah-Di-Na (USGS gage 11367800 or MC-1) for the same time period; the long term (WYs 1932 though 2009) data set for the Upper McCloud River above the Reservoir (USGS gage 11367500 or MC-3) which was used to construct the other two data sets; and the actual "impaired" data set from MC-1 after the dam was constructed (WY's 1967 through 2006). The "Indicators of Hydrologic Alteration" Version 7 Software package (The Nature Conservancy, 2005) was used to generate comparable statistics for each flow regime. Table 2-2 provides some of the results.

Table 2-2. Hydrologic Statistics for McCloud River (reported as mean daily cfs) Flow values represent the percentile value of flow for the entire record analyzed. That is, the "10%tile" value represents the flow value in the entire data record that is exceeded 90 percent of the time.

	Upper McCloud USGS Gage:	**McCloud Res Model Inflow**	**Ah-Di-Na Unimpaired Synthetic data**	**Ah-Di-Na USGS gage post dam**	**FS Flow Proposal**	**FLA Proposal**
2-year flood event	2,130	3,434	4,664	1,560	3,555	3,599
10-year flood event	5,290	8,153	9,745	8,865	8,954	8,499
Minimum flow	524	585	589	41	202	158
10%tile flow	626	699	714	170	209	159
25%tile flow	734	779	801	185	215	166
median flow	844	929	968	210	230	202
Average flow	920	1,078	1,161	296	369	321
75%tile flow	1,010	1,184	1,267	228	337	300
max flow	11,900	16,540	19,780	25,200	17,380	17,370

The McCloud Reservoir Inflow data includes the synthesis of accretion flows between the Upper McCloud gage (MC-3) and McCloud Dam. This accretion is generally small except with respect to the large flood events. Similarly, the Ah-Di-Na unimpaired synthetic data represents the synthesis of accretion flows between McCloud Dam and the Ah-Di-Na gage, (primarily the impact of Hawkins Creek), and this accretion is also generally low except for large events.

As would be expected, the mean and median or lower flows at Ah-Di-Na are reduced approximately 75 to 80 percent by diversion of the Lower McCloud River (LMR) into McCloud Reservoir and then to Iron Canyon Reservoir, for flows less than or equal to the average value. Similarly, the 10-year flood event and maximum flow are approximately the same for the unimpaired and impaired flows at Ah-Di-Na. The minimum flow value reflects a change in flow requirements over the term of the last license; minimum instream flow at the Ah-Di-Na gage was increased from requiring 40 cfs at the Ah-Di-Na gage initially to the current level.

There is a greater difference between the 2-year flood events and the 75%tile flow values from the USGS data at the Ah-Di-Na gage and the two flow proposals than any of the other flow statistics. This reflects the ability of the project to transfer approximately 1400 cfs of inflow from the McCloud Reservoir to Iron Canyon Reservoir. Thus, the effect of the project has been to not only lessen daily instream flows, but to radically change the "moderate" flood events experienced in the Lower McCloud River. Historically a mean daily flow event of 4,600 cfs occurred every two years on average; now a flow of only 1,560 cfs occurs at that frequency. This change means that the riparian corridor and floodplain margins are much less frequently inundated. The 2-year flood value for the USGS data at Ah-Di-Na is a more than 6 times greater than the 75%tile value. While the two flow proposals tend to restore the 2-year flood, the 2-year flood event is now ten times greater than 75 percent of the flows. The unimpaired Ah-Di-Na data shows the 2-year flood is only 4 times greater and at Upper McCloud, the 2- year flood is just over 2 times greater. Another indicator is that the 75%tile flow for the existing flow and the two proposals is actually less than the average flow for the period of record. This implies that the existing flows are dominated by low flows which would not be expected if flows were not diverted.

Two-year flood events are generally considered "bankfull" events where the flow fills and may overtop the channel. The ecological benefit of these flows is generally associated with supplying organic material and nutrients from river margins to the channel. They can also provide access to shallow margin areas for aquatic biota, important as reproductive habitats. As noted above, the relicensing studies documented changes to the riparian habitat with respect to species composition (more invasive species) and a concomitant narrowing of the channel as riparian woody species now occupy channel margins.

To determine the extent of the change, the IHA statistical package can be used to look at the frequency, timing, magnitude, and duration of "small and large flood" events (flood events that occur at least every two to ten years for small events and events that occur at most every 10-years or more for large events). Since the Upper McCloud gage (MC-3) reflects the approximate inflow to the project and has a very long period of record, it was used to assess the historic statistics for flood events. Table 2-3 presents these results. The table presents the flood events that occurred during the period February 1 through June 30 to represent the most "biologically active" time period. Floods that occurred prior to this period and did not occur during this period are not included.

The analysis selected events that had a peak value of at least 2130 cfs, the two year flood event. Duration of the event is established by determining the first day prior to the event that the flow exceeded the 75% tile flow value (1010 cfs) and the event lasts until the flow drops below the 75%tile flow value. Over the 75 year record analyzed, small or large flood events occurred during the time frame of interest (February 1 through June 30) in 34 years. The majority of events were "small floods" (had a recurrence interval of less than 10 years). Large floods with a recurrence interval greater than 10-years occurred in only 5 years of the record. The minimum duration of any event was 5 days, 75 percent of the events lasted longer than 73 days, 50 percent of the events lasted longer than 110 days (average duration was 118 days), 25 percent of the events lasted longer than 164 days, and one event lasted more than a year (from January 24, 1983 through June 28, 1984).

The final column in the table shows the "rate of change" for the event, defined as the difference in flow from the flood base of 1010 cfs to the peak divided by the time span of the event. For example, this shows that the 1936 flood event rose and fell at an average rate of 264 cfs per day. This is a very "gross" statistic since the rising limb of the hydrograph is often much steeper than the descending limb, but it gives one an idea of the magnitude of rise and fall of these events. The median and mean values are not similar: the median value is 18 cfs per day, the mean value is 51 cfs per day. This implies that the data is "skewed" towards a slower daily change and is not distributed evenly around the mean value.

This data illustrates that the aquatic environment of the Lower McCloud River experienced much longer periods of consistently high flow than occur today from February 1 through June 30. The flood events were "buffered" by originating at a higher base flow and returning to a higher base flow. The current flow regime rises to peak values exceeding 1560 cfs every two years on average, but returns more quickly to base flows of 200 cfs.

Tables 2-4 through 2-6 show the flood events that currently occur as measured at the Ah-Di-Na gage, the flood events that would have occurred if the Licensee's Flow Proposal in the FLA was in place, and the flood events that would have occurred if the Forest Service flow proposal was in place during the period starting February 1 (that is floods prior to February 1 are not included). To provide consistency of analysis, a minimum flow value of 1550 (the current 2 year event at the Ah-Di-Na gage) was used as the minimum peak flood flow, and the flood "base" value was set at 740 cfs which provides a flow range comparable to the Upper McCloud flood flows. Thus, the rate of change for these flows was calculated by determining the difference between the peak flow and 740 and then dividing by the time span of the event.

The summary statistics in Tables 2-4 through 2-6 show that none of these flow regimes retain the "persistence" characteristics of flood events exhibited by the Upper McCloud flows shown in Table 2-3. The duration of flow events is much shorter and the flow change per day is much greater. The Forest Service flow proposal tends to provide slightly longer durations and "lower flow changes" per day than the either the existing flow regime or FLA proposal. The FLA flows which are generated by a constant release from the McCloud dam, still exhibit "pulsing"; peaks separated by a return to a lower flow while the Forest Service proposal dampens some of that by both downramping spills and setting a higher base flow which results in a longer duration event.

Table 2-3. Upper McCloud Gage (MC-3) "Flood" Events above 1010 cfs (from IHA)

WY	Beginning Date	End Date	Type*	Duration (Days)	Peak Flow	Flow change cfs/day
36	2/21/1936	2/25/1936	S	5	2330	264
38	4/4/1938	7/30/1938	S	118	2890	16
40	2/25/1940	5/16/1940	L	82	7540	80
41	2/8/1941	8/5/1941	S	179	3050	11
42	1/23/1942	7/29/1942	S	188	2670	9
53	3/28/1953	7/9/1953	S	104	2130	11
54	3/5/1954	6/27/1954	S	115	3530	22
56	2/201956	7/28/1956	S	160	2750	11
57	2/23/1957	3/26/1957	S	32	3650	83
58	1/29/1958	10/8/1958	S	253	4980	16
59	1/8/1959	6/23/1959	S	167	3830	17
63	3/28/1963	6/30/1963	S	95	2690	18
65	4/5/1965	6/13/1965	S	70	2250	18
67	3/16/1967	7/23/1967	S	130	2150	9
69	3/27/1969	7/14/1969	S	110	2250	11
70	1/13/1970	6/8/1970	L	147	10000	61
71	3/23/1971	7/10/1971	S	110	2130	10
74	1/13/1974	9/2/1974	L	253	10100	36
78	2/5/1978	2/16/1978	S	12	2,350	112
78	3/3/1978	6/9/1978	S	99	2390	14
80	2/17/1980	3/9/1980	S	22	3760	125
82	2/15/1982	7/3/1982	S	139	2910	14
83	1/24/1983	9/30/3983	S	250	4180	13
84	10/1/1983	6/28/1984	S	272	2130	4
86	2/14/1986	4/30/1986	L	76	6490	72
89	3/8/1989	3/20/1989	S	13	2920	147
93	3/16/1993	6/12/1993	S	89	3840	32
95	3/9/1995	4/15/1995	S	38	5050	106
96	2/17/1996	6/3/1996	S	108	3480	23
97	12/28/1996	3/13/1997	L	76	11900	143
98	1/12/1998	9/18/1998	S	250	4420	14
00	2/10/2000	5/31/2000	S	112	2150	10
03	3/14/2003	4/6/2003	S	24	3010	83
04	2/17/2004	3/5/2004	S	18	4070	170
06	2/27/2006	9/30/2006	S	216	2220	6
		min		**5**		**4**
		25%tile		**73**		**11**
		median		**110**		**18**
		mean		**118**		**51**
		75%tile		**164**		**81**
		max		**272**		**264**

*L = Large Flood Event, S = Small Flood Event

Table 2-4. Flood Events above 740 cfs at Ah-Di-Na (MC-1) gage from actual USGS data

WY	Beginning Date	End Date	Type*	Duration (Days)	Peak Flow	Flow change cfs/day
69	5/7/1969	5/20/1969	S	14	1550	58
74	3/26/1974	4/15/1974	L	21	11800	527
78	2/6/1978	2/16/1978	S	11	4320	325
78	3/2/1978	3/23/1978	S	22	4090	152
80	2/17/1980	2/23/1980	S	7	4190	493
82	3/1/1982	3/4/1982	S	4	1940	300
82	4/12/1982	4/19/1982	S	8	3910	396
83	2/9/1983	4/11/1983	S	62	5920	84
86	2/14/1986	2/26/1986	L	13	9110	644
86	3/8/1986	3/14/1986	S	7	2000	180
89	3/9/1989	3/13/1989	S	5	3410	534
93	3/17/1993	3/27/1993	S	11	3940	291
95	3/9/1995	3/24/1995	S	16	6978	390
95	4/6/1995	4/14/1995	S	9	5690	550
96	2/17/1996	2/23/1996	S	7	5280	649
96	5/17/1996	5/21/1996	S	5	3620	576
98	1/29/1998	2/10/1998	S	13	2650	147
98	3/22/1998	3/31/1998	S	10	6580	584
00	2/14/2000	2/17/2000	S	4	2720	495
00	2/24/2000	3/1/2000	S	7	1930	170
04	2/17/2004	2/21/2004	S	5	3890	630
06	2/28/2006	3/7/2006	S	8	1860	140
06	3/25/2006	6/1/2006	S	69	3030	33
		min		**4**		**33**
		25%tile		**7**		**161**
		median		**9**		**390**
		mean		**15**		**363**
		75%tile		**14**		**542**
		max		**69**		**649**

*L = Large Flood Event, S = Small Flood Event

Table 2-5. Flood Events above 740 cfs at MC-1 gage using **Licensee's FLA Proposed Flow**

WY	Beginning Date	End Date	Type*	Duration (Days)	Peak Flow	Flow change cfs/day
74	3/26/1974	4/3/1974	L	9	11950	1246
74	4/6/1974	4/24/1974	S	19	1710	51
78	2/6/1978	2/11/1978	S	6	3774	506
78	3/5/1978	3/13/1978	S	9	2658	213
80	2/17/1980	2/24/1980	S	8	6375	704
82	3/1/1982	3/4/1982	S	4	2062	331
82	4/11/1982	4/26/1982	S	16	4018	205
83	2/9/1983	4/12/1983	S	63	5734	79
84	3/16/1984	3/19/1984	S	4	1771	258
86	2/14/1986	2/26/1986	L	13	8751	616
86	3/8/1986	3/15/1986	S	8	1796	132
89	3/9/1989	3/14/1989	S	6	3816	513
93	3/17/1993	3/26/1993	S	10	4457	372
95	3/9/1995	3/24/1995	S	16	7005	392
95	4/6/1995	4/13/1995	S	8	5057	540
96	2/18/1996	2/24/1996	S	7	4735	571
96	5/17/1996	5/22/1996	S	6	3404	444
98	1/28/1998	2/16/1998	S	20	3658	146
98	3/23/1998	4/3/1998	S	12	5418	390
98	5/25/1998	6/16/1998	S	23	1557	36
00	2/14/2000	2/17/2000	S	4	3559	705
00	2/26/2000	3/2/2000	S	6	2713	329
04	2/14/2004	2/21/2004	S	5	5967	1045
04	2/22/2004	2/28/2004	S	4	2454	429
06	4/2/2006	5/28/2006	S	57	2633	33
		min		**4**		**33**
		25%tile		**6**		**205**
		median		**8**		**390**
		mean		**14**		**411**
		75%tile		**16**		**540**
		max		**63**		**1246**

L = Large Flood Event, S = Small Flood Event

Table 2-6. Flood Events above 740 cfs at MC-1 gage using **Forest Service Proposed Flow**

WY	Beginning Date	End Date	Type*	Duration (Days)	Peak Flow	Flow change cfs/day
74	3/11/1974	5/2/1974	L	53	12140	215
78	2/6/1978	2/17/1978	S	12	3524	232
78	3/4/1978	3/16/1978	S	13	2651	147
80	2/17/1980	3/1/1980	S	14	6069	381
82	3/1/1982	3/10/1982	S	10	2041	130
82	4/11/1982	4/25/1982	S	15	2935	146
83	1/26/1983	2/4/1983	S	10	6367	563
83	2/9/1983	6/12/1983	S	124	5737	40
86	2/14/1986	3/1/1986	L	16	8754	501
89	3/9/1989	3/20/1989	S	12	3821	257
93	3/17/1993	4/2/1993	S	17	3804	180
93	5/31/1993	6/8/1993	S	9	1884	127
95	3/9/1995	3/31/1995	S	23	6660	257
95	4/7/1995	4/17/1995	S	11	3575	258
96	2/18/1996	2/29/1996	S	12	4733	333
96	5/17/1996	5/25/1996	S	9	2682	216
98	2/1/1998	2/17/1998	S	17	3495	162
98	3/16/1998	5/20/1998	S	66	3986	49
98	5/25/1998	6/16/1998	S	23	1553	35
00	2/14/2000	2/24/2000	S	11	3555	256
00	2/26/2000	3/8/2000	S	12	2708	164
04	2/16/2004	2/28/2004	S	13	5717	383
06	3/28/2006	5/28/2006	S	62	2296	25
		min		**9**		**25**
		25%tile		**12**		**138**
		median		**13**		**215**
		mean		**25**		**220**
		75%tile		**20**		**258**
		max		**124**		**563**

L = Large Flood Event, S = Small Flood Event

Fishability/Boatability

Comparison of Forest Service Outfitter/Guide SUP Commercial Angling Data:

The data in the tables below compares actual (current) flows and FLA flows (both from PG&E FLA data) and the Forest Service Preliminary 4(e) flow proposal for dates actually fished during 2002 through 2006 by commercial outfitter and guides under Forest Service special use permits (SUPs). Data from Forest Service records are self-declared by Special Use Permit Holders. Since all commercial anglers are required to have a permit for their use of NFS lands, the SUP data below reflects when and where commercial operators fished the Lower McCloud River for the years indicated. (Non-commercial anglers are not required to have a permit, thus that use is not reflected in the data below). Special Use Permit Holders must supply the location of their angling, but some do so with greater specificity than others. When the specific location of the angling was provided (i.e. Ash Camp = AC, or Ah-Di-Na = ADN) it is indicated below. Otherwise the general Lower McCloud River (LMR) between McCloud Dam and The Nature Conservancy is assumed. Most permitted fishing typically occurs in the vicinity of Ash Camp and/or Ah-Di-Na, although some could have occurred on isolated Forest Service parcels within The Nature Conservancy (TNC) ownership. All of the flow data is provided from, or modeled from, the Ah-Di-Na Gage (MC-1). Further explanation and discussion of this data follows the tables.

Table 2-7. 2002 Fishing Season Data (Dry water year, flows shown in cfs)**:**

Date	Location (per SUP)	Actual Flow (Current) cfs	FLA Flow Proposal cfs	FS Flow Proposal cfs	Fishability Rating by Flow Type		
					Actual FS	FLA	
May 21	ADN	200	189	239	BO -1	BA -2	
July 12	ADN	200	163	200	BO -1	BA -2	
October 12	ADN	221	161	211		BA -2	
October 21	ADN	222	162	212		BA -2	
October 31	ADN	222	162	212		BA -2	
November 1	ADN	222	162	212		BA -2	
November 2	ADN	222	162	212		BA -2	
November 3	ADN	222	162	222		BA -2	
TOTAL					**-2**	**-16**	**0**

Note: no SUP data available for 2003

Table 2-8. 2004 Fishing Season Data (Below normal water year)**:**

Date	Location (per SUP)	Actual Flow (Current) cfs	FLA Flow Proposal cfs	FS Flow Proposal cfs	Fishability Rating by Flow Type		
					Actual FS	FLA	
April 28	LMR	170	288	578	BA -2		AA -2
May 2	LMR	170	213	513	BA -2		AA -2
May 19	Above ADN	200	194	394	BO -1	BA -2	AO -1
May 20	LMR	200	192	392	BO -1	BA -2	AO -1
May 29	LMR	200	186	286	BO -1	BA -2	
June 1	LMR	200	184	284	BO -1	BA -2	
June 4	ADN	200	183	233	BO -1	BA -2	
June 9	LMR	200	182	232	BO -1	BA -2	
June 25	LMR	200	176	225	BO -1	BA -2	
June 27	LMR	200	175	225	BO -1	BA -2	
July 13	LMR	200	170	219	BO -1	BA -2	
July 17	LMR	200	168	218	BO -1	BA -2	
July 22	ADN	200	166	216	BO -1	BA -2	
August 4	LMR	200	164	214	BO -1	BA -2	
August 11	LMR	200	162	212	BO -1	BA -2	
August 15	LMR	200	162	212	BO -1	BA -2	
August 27	ADN	227	167	217		BA -2	
Sept 17	LMR	225	165	215		BA -2	
Sept 18	LMR	225	165	215		BA -2	
Sept 24	ADN	225	165	215		BA -2	
Sept 25	LMR	224	164	215		BA -2	
October 2	LMR	225	165	215		BA -2	
October 3	AC	224	164	215		BA -2	
October 6	LMR	224	164	214		BA -2	
October 8	LMR	224	164	214		BA -2	
October 11	LMR	225	165	215		BA -2	
October 12	LMR	224	164	215		BA -2	
October 15	LMR	224	164	215		BA -2	
October 29	LMR	238	178	228		BA -2	
November 4	LMR	210	174	224		BA -2	
TOTAL					**-18**	**-56**	**-6**

Table 2-9. 2005 Fishing Season Data (above normal water year)**:**

Date	Location (per SUP)	Actual Flow (Current) cfs	FLA Flow Proposal cfs	FS Flow Proposal cfs	Fishability Rating by Flow Type		
					Actual	FLA	FS
April 30	LMR	170	288	378	BA -2		AA -2
May 2	ADN	170	221	371	BA -2		
May 13	LMR	552	532	823	AA -2	AA -2	AA -2
May 20	LMR	1,114	1,116	1,159	AA -2	AA -2	AA -2
June 6	ADN	200	229	279	BO -1		
June 13	ADN	200	213	263	BO -1		
June 18	LMR	200	273	323	BO -1		
June 19	AC	200	256	306	BO -1		
June 24	LMR	200	215	265	BO -1		
June 25	LMR	200	214	264	BO -1		
July 1	LMR	200	204	254	BO -1	BO -1	
July 2	LMR	200	204	254	BO -1	BO -1	
July 8	LMR	200	200	249	BO -1	BO -1	
July 19	AC	200	192	242	BO -1	BA -2	
July 28	LMR	200	185	235	BO -1	BA -2	
July 29	AC	200	184	234	BO -1	BA -2	
August 12	LMR	200	177	227	BO -1	BA -2	
August 19	LMR	235	175	225		BA -2	
August 22	AC	235	175	225		BA -2	
Sept 7	LMR	233	173	223		BA -2	
Sept 8	LMR	234	174	224		BA -2	
Sept 11	LMR	235	175	225		BA -2	
Sept 12	LMR	235	175	225		BA -2	
Sept 30	LMR	232	172	222		BA -2	
October 6	LMR	234	174	224		BA -2	
October 7	AC	234	174	224		BA -2	
October 9	LMR	233	173	223		BA -2	
November 7	LMR	442	382	432	AO -1	AO -1	AO -1
November 15	AC	210	183	233		BA -2	
TOTAL					**-22**	**-38**	**-7**

Table 2-10. 2006 Fishing Season Data (Wet water year)**:**

Date	Location (per SUP)	Actual Flow (Current) cfs	FLA Flow Proposal cfs	FS Flow Proposal cfs	Fishability Rating by Flow Type Actual	FLA	FS
June 9	AC	583	585	589	AA -2	AA -2	AA -2
June 27	AC	267	270	262			
July 13	LMR	200	199	249	BO -1	BA -2	
July 28	LMR	200	185	235	BO -1	BA -2	
July 29	LMR	200	185	235	BO -1	BA -2	
July 30	LMR	200	186	235	BO -1	BA -2	
August 9	AC	200	179	229	BO -1	BA -2	
August 12	AC	200	178	227	BO -1	BA -2	
August 15	AC	200	176	226	BO -1	BA -2	
August 16	AC	200	176	226	BO -1	BA -2	
August 26	LMR	200	174	223	BO -1	BA -2	
August 27	LMR	200	173	223	BO -1	BA -2	
August 29	LMR	200	173	223	BO -1	BA -2	
Sept 8	LMR	210	171	221		BA -2	
Sept13	LMR	210	170	220		BA -2	
October 5	LMR	No data	No data	No data			
October 6	LMR	No data	No data	No data			
October 24	LMR	No data	No data	No data			
October 25	LMR	No data	No data	No data			
October 26	LMR	No data	No data	No data			
TOTAL					**-13**	**-28**	**-2**

Discussion and Summary:

Technical Memo 58 (PG&E, 2009, p. 5) defines fishability (the overall quality of fishing conditions as they relate to flows), based upon information from a 3-person focus group, an off-site survey of 12 experienced anglers, angler registration information from TNC, and reference materials. "Fishability" in this report is partially based on the ability of anglers and their clients to wade the LMR. Fly fishing by wading is the predominant angling technique on the LMR (TM-58, P. 15). Sections 5.4 and 5.5 of TM-58 discuss flow evaluations and flow ranges related to fishability. While this limited group of interviewees had differing opinions on the range of fishable flows, the median responses stated that flows between 200 and 475 cfs were "Acceptable" and flows between 210 and 375 cfs were "Optimal" in terms of fishability (Figure 7). These flow ranges were then used

to rate the fishability of flows shown in the above tables. Values shown in the right hand columns of the tables are defined:

- A blank cell indicates that the flows are within the "optimum" flow range of 210-375 cfs
- -1 indicates the flows are either below the optimum (BO) flow of 210 cfs or above the optimum (AO) flow of 375 cfs, but still within the acceptable range of flows.. (This subjective ranking is based on the fact that not achieving "optimum" is less of a negative effect than not meeting the less stringent "acceptable" fishability flows.)
- -2 indicates the flows are either below the acceptable (BA) flow of 200 cfs or above the acceptable (AA) of 475 cfs. (This subjective ranking is based on the fact that not achieving the less stringent "acceptable" parameter is even further from the fishability goals).

Table 2-11. Summary of Fishability Ratings for three flow proposals (and days affected):

Rating	Actual Flows	FLA Flows	FS Proposed Flows
Below Acceptable	-8 (4 days)	-128 (64 days)	0
Below Optimum	-40 (40 days)	-3 (3 days)	0
Above Optimum	-1 (1 day)	-1 (1 day)	-3 (3 days)
Above Acceptable	-6 (3 days)	-6 (3 days)	-12 (6 days)
Total Score (& days)	**-55 (48 days)**	**-138 (71 days)**	**-15 (9 days)**

Forest Service Interpretation:

- The angling dates reviewed are understandably skewed. For example, anglers did not fish during the early season of wet years such as 2006 when flows were high. The first day commercially fished on NFS lands in 2006 was June 9th. This is supported in TM-58, P. 18, which states: "High flows in May and early June 2006 (ranging from 1,000 to 2,500 cfs as measured at Ah-Di-Na) substantially reduced the number of anglers and hours fished on the McCloud River Preserve (about one-third of the use level in 2005). This information suggests many anglers avoid high flows, but it does not help specify angler preferred flow levels." (PG&E, 2009). This angler preference does not totally account for why in a dry year (i.e. 2002) the first guided angling trip was not until May 21st, when optimum fishability (flows between 210 and 375 cfs) was available from the opening day of angling season that year, almost a month earlier. Obviously factors other than spring flows are considerations in

commercial guiding. Although skewed away from higher flows, this data is valuable in that it represents actual dates angled in the recent past by commercial guides; thus providing an ideal template for comparison of how both the FLA and Forest Service flow scenarios would have actually impacted commercial angling use had they been in place.

- If the Forest Service flows had been in place during the above years, it appears they may have affected the fishability by a rating of -15 (or 9 days) by being either above optimum or above acceptable. However, by looking at the data above (as well as data in TM-58 from Babcock and Fowler at TNC), it is also clear that both commercial and TNC anglers do fish flows that are both above optimum and acceptable. From the Forest Service data, in 2005 these flows and dates included: 552 cfs (May 13), 1,114 cfs (May 20), and 442 cfs (November 7), and for 2006 – 583 cfs (June 9). These four days are part of the nine days that do not meet either the Above Optimum or Above Acceptable criteria in the Forest Service flow proposal. Thus, only five days could have potentially affected fishability over four seasons of actual commercial angling days, had the Forest Service flow proposal been in place. Since each fishing season is 175 days long (TM-58), or 700 days for the four years of data, the five days would have amounted to less than a 1% impact (0.007) to commercial guiding fishability. Since some outfitter/guiders have chosen to fish on days that exceed both optimum and acceptable fishability, the actual impact may be even less.
- On the opposite end of the scenario spectrum, the FLA proposed flows impact the fishability of the LMR with a rating of -138 (71 days). The vast majority of these days (64) are below acceptable. TM-58 (Section 5.7) includes a discussion of anglers concern with low base flows in the summer under the actual (current) scenario where only 4 days are below acceptable, compared to 64 days in the FLA proposal: "There was some discussion about whether higher base flows would increase feeding activity (via lower temperatures or more dissolved oxygen). For ethical and conservation reasons, some anglers stop fishing the McCloud in late July or early August as temperatures rise. Some anglers noted that temperature or oxygen-stressed fish are listless and less fun to catch." Additionally, other text (at 5.6.2) states: "Some interviewees and Ballinger (1998) suggested that lower dam releases may have biological effects (especially warmer temperatures), or diminish the amount of fishable water (due to rocks in drifts)." Although temperature and dissolved oxygen levels were not cited as Project-induced concerns by relicensing participants on the LMR, some anglers have modified summer fishing patterns and expressed concerns based on their observations while angling.

- The actual (current) flow scenario falls between the above two for impacts to fishability with an overall rating of -55 and 48 days being adversely affected. The greatest area of affect is 40 days of below optimum flows.
- It is difficult to assign a specific flow at which the McCloud River is no longer wadeable by anglers because it is dependent upon many factors including: flow velocity, river stage height, anglers height (above mid-thigh wading becomes more difficult), fitness, experience, etc. TM-58 makes no attempt to state a specific wadeable flow, but instead incorporates that factor (i.e. wadeability) into a broader discussion of fishability. For the same reasons, the Forest Service has not attempted to define "wadeable" flow.
- While the current preference for angling technique is wading based fly-fishing, it can, and has been different. Under pre-project conditions with base flows of approximately 800 cfs, the river contained more trout biomass than currently is present, and was also a world-renowned fishery (USDA, 1963a), as it still is today. However, angling techniques and technology pre-Project differ from today. There are ways to fish a river other than by wading, such as shore fishing, which could be utilized during higher spring flows. Additionally, many anglers today utilize small rafts and sophisticated float tubes to access portions of rivers that aren't easily accessible by foot. This is recognized in TM-58, where it addresses that higher flows may increase access-based boating use by anglers. There was also agreement among anglers that new fishing "hot spots" would emerge in response to new higher base flows, and that these might evolve over time (PG&E, 2009, TM-58).
- TM-58 appropriately recognizes and discusses that fishability (fishing conditions) and fish habitat (health) are not the same thing (Section 5.8). Only 25% of the respondents were willing to support improving fishing habitat over fishable flows. However, the majority (58%) agreed with a modified support that stated: "It depends on the flow increase – but I generally support balancing habitat improvement and good fishing conditions." In response to more detailed trade-off questions between higher base flows and habitat/fish population improvements, some conclusions were drawn:
    - Anglers did not support increased base flows if there was a decrease in fish habitat.
    - If higher flows produced fishery benefits, anglers generally supported them for flows that were slightly higher (e.g. flows of 250-300 cfs), but substantially higher base flows (e.g. 400-450 cfs) were less acceptable regardless if there was a 50% or 100% increase in habitat benefits.

    - There was very little difference in evaluation results between 50% and 100% benefits.
- Finally, it became clear during relicensing that since gage data has not been publicly available at MC-1 (Ah-Di-Na) until recently, many anglers do not know the actual flows which they have fished for years. TM-58 Section 5.3 discusses if anglers use the stream gages, and if so, which ones. However, it assumes that anglers know the correlation between the gage reading and the actual instream flow. Since this information was not available until past year or so, some anglers are now saying they had assumed that the flows they were fishing were what was released at the dam. However dam releases do not include tributary accretion, most significantly Hawkins Creek, which can exceed 100 cfs in the spring. Other anglers understand the correlation between dam releases and flows at Ah-Di-Na, while others just estimate flows based on personal knowledge. Therefore, angler survey data in TM-58 was provided from a variety of understandings and perspectives. This may account for the wide range of what mainly commercial anglers said provided the best flows for fishability in TM-58.

One commercial angler who sent the Forest Service several electronic messages concerning an early Forest Service flow proposal provided this comment about the flows at Ah-Di-Na:

> "Without getting into too much analysis it is safe to say that the mean suggested flows for June through November (February if you wish to consider after the fishing season closes November 15th) are clearly much too low for optimum angling and habitat. Flows should be about 50% higher, somewhere between 300 & 400 cfs as I mentioned in my previous e-mail. I have fished it extensively this season at recent flows of 260 and 280 cfs at the Ah Di Na gage and it has made this crystal clear, as it is possible to cross at all the usual places but some pocket water that fishes well at higher flows no longer holds fish so we are losing habitat and angler carrying capacity. I would REALLY enjoy fishing flows at and around 400 cfs (and know what they were at the gage) to better refine the optimum flows for angling carrying capacity and habitat. Chris at the Nature Conservancy tells me that the difference between 200 & 400 cfs at their gage is only about 2".

Previous McCloud recreational test flows were best suited for studying whitewater use and as a result were much too high to get meaningful data on fishing which is clearly the most important and popular recreational use on the McCloud" (Forest Service Project files).

One other concern of anglers is that the implementation of the Forest Service flow proposal would reduce the opportunity to fish on opening day since flows would be

too high. The following table shows the differences in opportunity to fish assuming that flows at MC-1 need to be below 350 cfs to be fishable. The "Days Lost" column lists the number of days that fishing opportunities would have been foregone if the Forest Service proposed flows had been in place. The other two columns either report that flows were below 350 cfs at MC-1, hence fishing was available, or report the flow condition from opening day until flows drop to 350 cfs and fishing becomes available. The value of 350 cfs is arbitrary but appears to be near the upper limit of optimal fishing conditions in the vicinity of MC-1.

Table 2-12 below, shows that the Forest Service Flow Proposal would have affected the opportunity to fish by wading between 25 and 30 days in 3 years (1978, 1984, and 2004), between 10 and 20 days in four years (1980, 1986, 2000, and 2005), between 4 and 9 days in four years (1993, 1995, 1996, and 1997). In 22 years there would have been no loss of opportunity. It should be noted that all of the days shown as lost had flows less than 625 cfs, and most were less 450 cfs, which may actually be fishable according to the commercial guide reports. The other consistent factor is that the Forest Service proposed flows dropped to 350 cfs or less by Memorial Day weekend in all years when existing flows allowed fishing on Opening day of fishing season.

Table 2-12. Changes in Fishing Opportunities Relative to Opening Day based on 350 cfs at MC-1

WY Type	Year	Days Lost	Fishing Condition for Existing flow at MC-1	Fishing Condition if FS proposed flows had been in place at MC-1
W	1974	0	Flow high until June 20	Same conditions
W	1975	0	Flow high until June 11	Same conditions
C	1976	0	Fishing available opening day	Same conditions
C	1977	0	Fishing available opening day	Same conditions
AN	1978	30	Fishing available opening day	Flow high until May 25 (just before Memorial Day); Flow is 625 cfs on Opening day dropping down to 350 cfs on May 25
BN	1979	0	Fishing available opening day	Same conditions
AN	1980	16	Fishing available opening day	Flow high until May 10: Flow is 460 cfs on Opening day dropping down to 350 cfs on May 11
D	1981	0	Fishing available opening day	Same conditions
W	1982	0	Flow high until May 29	Same conditions
W	1983	0	Flow high until July 3	Same conditions
W	1984	27	Fishing available opening day	Flow high until May 24 (just before Memorial Day); Flow is 550 cfs on Opening day dropping down to 350 cfs on May 25
D	1985	0	Fishing available opening day	Same conditions
W	1986	12	Fishing available opening day	Flow high until May 7; Flow is 400 cfs on Opening day dropping down to 350 cfs on May 8
D	1987	0	Fishing available opening day	Same conditions
C	1988	0	Fishing available opening day	Same conditions
D	1989	0	Fishing available opening day	Same conditions
C	1990	0	Fishing available opening day	Same conditions
C	1991	0	Fishing available opening day	Same conditions
C	1992	0	Fishing available opening day	Same conditions
AN	1993	7	Fishing available opening day	Flow high until Apr 30; Flow is 430 cfs on Opening day dropping down to 350 cfs on May 1
C	1994	0	Fishing available opening day	Same conditions
W	1995	5	Flow high until May 13	Flow high until May 18
W	1996	4	Fishing available opening day; spill event occurs May 17 - 26	Same conditions but spill lasts until May 30 due to ramping
W	1997	6	Fishing available opening day	Flow high until May 1; Flow is 420 cfs on Opening day dropping down to 350 cfs on May 2
W	1998	0	Flow high until July 3	Same conditions

WY Type	Year	Days Lost	Fishing Condition for Existing flow at MC-1	Fishing Condition if FS proposed flows had been in place at MC-1
W	1999	0	Flow bounce but are generally high (400-500) until June 3 (10 days are fishable)	Flow consistently high until May 27; Flow is 663 cfs on Opening day dropping down to 350 cfs on May 28
AN	2000	19	Fishing available opening day	Flow high until May 17 - Flow is 500 cfs on Opening day dropping down to 350 cfs on May 18
D	2001	0	Fishing available opening day	Same conditions
D	2002	0	Fishing available opening day	Same conditions
AN	2003	0	Flow high until May 8	Same conditions
BN	2004	27	Fishing available opening day	Flow high until May 20 - Flow is 600 cfs on Opening day dropping down to 350 cfs on May 21
AN	2005	14	Fishing available opening day; spill event May 9 - 27	Flow is 380 cfs on Opening day; then same spill but lasts until May 30
W	2006	0	Flow high until June 20	Same conditions

In addition to fishability, there have been many opinions expressed about whitewater boating flows. According to TM-58, there are three primary opportunities for boating in the Lower McCloud River: Access Boating primarily for fishing access, technical whitewater boating, and big flow whitewater boating. The TM notes that access boating is difficult at flows less than 200 cfs and becomes difficult at flows above 500 cfs. Technical whitewater boating occurs at flows above 700 cfs but below 1000 cfs. Flows between 1000 cfs and 3000 cfs provide big whitewater flows. Flows above 3000 cfs are unsuitable and dangerous for boating. (Flows measured at MC-1). A consensus of boaters picked 800 cfs as the "optimum' flow. Table 2-13 below, compares the number of days available for access boating and whitewater boating under the current flow regime and the Forest Service proposed flows for the period April 1 through July 31. These flows are opportunistic; that is they are not "prescribed" in the Forest Service proposal but are generated as a consequence of the flow regime.

In terms of access boating, since the current regime (and the FLA) allows flows to drop below 200 cfs in some months, those days were scored as not available. The Forest Service proposal always has flows greater than 200 cfs at MC-1. Thus, if the value in the Forest Service access boating column is less than 122 (the number of days in the period reviewed), it implies flows are greater than 500 cfs and not suitable (too difficult) for access boating. The Forest Service proposed flow regime provides many more access boating days than currently exists, especially in drier years. In terms of whitewater boating, the Forest Service proposed flow regime is not significantly different than the current flow regime, however, it does provide a few more days in wetter years. In TM-24, (an earlier version of TM-58) (p. 25) it was noted that whitewater boating for kayaks begins around 500 cfs with optimal flows at 800 cfs. If flows in the range of 500 cfs to 700 cfs were included, there would be more whitewater boating days available in the moderate water years.

Table 2-13. Available Boating days between April 1 and July 31 as measured at MC-1

Year	WY Type	Number of Whitewater Boating days at flows between 700 cfs to 3000 cfs		Number of Access Boating Days at flows between 200 to 500 cfs	
		Forest Service Proposal	Existing Flows at MC-1	Forest Service Proposal	Existing Flows at MC-1
1974	W	32	27	59	62
1975	W	16	16	89	61
1976	C	0	0	122	0
1977	C	0	0	122	0
1978	AN	19	2	81	89
1979	BN	0	0	122	78
1980	AN	0	0	98	78
1981	D	0	0	122	76
1982	W	21	15	81	75
1983	W	73	67	42	42
1984	W	0	0	85	78
1985	D	0	0	122	76
1986	W	0	0	121	77
1987	D	0	0	122	76
1988	C	0	0	122	0
1989	D	0	0	122	79
1990	C	0	3	120	4
1991	C	0	0	122	76
1992	C	0	0	122	77
1993	AN	11	5	95	90
1994	C	0	0	122	0
1995	W	9	13	85	98
1996	W	8	5	109	73
1997	W	0	0	120	76
1998	W	70	54	36	41
1999	W	22	0	79	105
2000	AN	2	4	93	84
2001	D	0	0	122	76
2002	D	0	0	122	76
2003	AN	0	2	119	99
2004	BN	3	0	86	79
2005	AN	13	9	91	76
2006	W	59	58	49	50

A concern was expressed by some relicensing participants that the Forest Service flow proposal gave preference to the boating advocacy group over angling. Both angling and whitewater boating are appropriate uses of NFS lands and are allowed in the LRMP (USDA, 1995). (Commercial whitewater boating is not currently permitted on the LMR following a Forest Service review and decision to deny an application for that use some years ago. This prohibition of commercial whitewater boating was also adopted as a policy by the McCloud River Coordinated Resource Management Group).

As presented at the beginning of this section, the LRMP provides guidance that focuses the Forest Service's development of aquatic measures for the Lower McCloud River on the achievement of resource objectives outlined in the Aquatic Conservation Strategy. This has been the Forest Service objective throughout this relicensing. While the Forest Service flow proposal will provide for a limited number of whitewater boating opportunity days on the naturally descending spring limb of the hydrograph (slightly increased over current flows), it is by no means a whitewater boating flow proposal. Likewise, while the flow proposal should achieve improved fishability objectives, this is a consequence of the Forest Service goal to achieve improved resource conditions for the aquatic and aquatic-dependent biota. Thus, while this section of the rationale on fishability and boatability provides insight into the Forest Service perspective and considerations in developing the Preliminary 4(e) flow proposal, neither were used as a determining factor for setting the instream flow releases.

Minimum Instream Flow Analysis – Iron Canyon Creek

Iron Canyon Reservoir was constructed primarily to serve as the forebay for the JB Black powerhouse by storing water transferred from the McCloud River. The capture of local instream flow was not a primary purpose of Iron Canyon Reservoir. One could therefore argue that the flows below Iron Canyon Reservoir should be equal to the inflow to the reservoir. Table 2-14 compares the synthesized unimpaired mean monthly flows for Iron Canyon Creek constructed from local creek flow data that was provided in the FLA, with area corrected flow generated from data collected at the Iron Canyon Gage (PH 46) (located above the confluence of Iron Canyon Creek with the Pit River). There is a great discrepancy in this comparison in the winter and spring runoff values, but the low flow months of June through November are relatively similar. These values also show that prior to the construction of Iron Canyon Dam, winter flows were relatively high in Iron Canyon Creek. Anecdotal information from anglers indicate that the fishery was excellent prior to the construction of the dam, hence the flows required by the Forest Service flow proposal should have no deleterious effects on the fishery in the lower reaches where accretion from tributaries will substantially increase the minimum flow release.

Table 2-14. Licensee's Gage PH 46 Mean Monthly Flows vs. Synthetic unimpaired flow for Iron Canyon Creek

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
PH-46	11	13	62	96	153	94	81	39	20	11	7	7
Syn-thetic	6	21	42	67	78	79	46	26	14	8	6	5

The FLA documents that the upper reaches of Iron Canyon Creek are severely encroached by vegetation and also store large amounts of sediment. Much of this sediment is from a Project road (37N78A) eroding into the creek. The Licensee has worked with the Forest Service to implement erosion control measures to remedy the sediment introduction. However, the lack of high flows to move this sediment and the presence of Project-induced vegetation encroachment limits the ability of the creek to move the sediment.

Spill does not occur at Iron Canyon Dam. Flow out of Iron Canyon Reservoir is currently limited by the capacity of the instream flow control release valve, which according to the FLA may be able to release as much as 30 cfs when the reservoir is full. The only other mechanism to increase flows to mobilize sediment is during annual dam safety valve testing operations. The Forest Service flow proposal incorporates both mechanisms to assist with sediment mobilization and some vegetation removal by high flows. The Forest Service instream flow proposal requires the Licensee to fully open the instream flow release valve during March and April in Wet water years, which should release flows of at least 20 cfs up to flows of 30 cfs. The Forest Service instream flow proposal further requires that dam safety valve testing should only occur between March 5th and 15th when the highest instream flows are released to minimize impacts to reproductive success of spring breeding aquatic organisms. These flows should also be kept to the minimum level allowable (possibly in the range of 150 cfs) to minimize channel damage. Ramping rates are prescribed to minimize impacts to mobile aquatic biota.

Two other sources of information assisted in determining the minimum instream flow releases for Iron Canyon Creek: the "effective" habitat analysis of values generated by the PHABSIM model and the channel cross sections collected for the PHABSIM analysis.

The WUA Tables A-3 through A-5 (Appendix 1) show that when considering "effective" habitat (cells with a value of 0.4 or greater) that adult habitat is optimized at any flow greater than 45 cfs, spawning habitat is best at flows between 8 and 38 cfs, and juvenile habitat is optimized at 8 to 80 cfs (as highlighted in green

on the tables). The other consideration is that there is no "most effective" adult habitat in the 0.8 to 1.0 range until flows exceed 6 cfs.

Figure A-1 (Appendix 1) shows channel cross-section 10, a low-gradient riffle generated from the Physical Habitat Simulation Model (PHABSIM) results. Review of all of the cross-sections show that flows need to exceed 8 cfs before the entire channel and its margins are filled to some extent. Flows in the range of 16 to 20 cfs provide some depth of flow in side channel areas.

There is a wide range of possibilities for an Iron Canyon flow regime. Base flow in the range of 7 to 10 cfs would be suitable for juveniles in the summer/fall period of July through October, and a spawning period flow in the range of 20 to 40 cfs is appropriate for March and April.

Minimum Instream Flow Analysis – Pit River

After completion of Shasta Dam, but prior to the completion of the facilities for the Pit 6 and Pit 7 Powerhouses, white sturgeon (*Acipenser transmontanus*) utilized these reaches of the Pit River for spawning. The construction of the Pit 7 Dam blocked this run, thereby preventing the recruitment of new individuals to the land locked sturgeon population residing in Shasta Lake. As the population can no longer spawn, augmenting this population with young fish, as discussed in Recommendation No. 2 (Enclosure 3, P. 2) would provide a continuing supply of sturgeon to the lake, and would improve this sport fishery over time.

For other fish species, the Pit River below the Pit 7 and afterbay dams are a highly modified environment that have altered the native fish assemblage. Allowing for the interbasin transfer of water from McCloud River to the Pit River for hydropower production limits options for restoring the pre-project aquatic environment through instream flow mitigations. Therefore, we support the Licensee's proposal to maintain the current 150 cfs minimum flows below the Pit 7 Dam.

Erosion Control and Monitoring

Inventory and Assessment of Erosion and Sediment from Project Construction, Operation, and Maintenance TM-67 included a comprehensive database of erosion sites and an associated index of erosion severity (i.e., erosion potential, sediment delivery potential, and potential to affect Project infrastructure) at each site. Fifty-six sites were ranked as having high erosion potential. These erosion sites, as well as erosion associated with natural processes and/or Project operation and maintenance, could affect water quality, aquatic habitat, and public health and safety within the Project Boundary. The primary purpose of this measure is to manage existing erosion and minimize future erosion and sediment delivery to stream channels.

The Clean Water Act of 1972, as amended, establishes goals, policies and procedures for the maintenance and improvement of the Nation's waters. The act addresses both point and nonpoint sources of pollution and establishes or requires programs for the control of both sources of pollution.[3]

The Forest Service must be responsive to the environmental intent, goals and objectives provided by the Clean Water Act, as amended.[4] The Forest Service is directed to correct water quality problems on the National Forests and perpetually implement Best Management Practices (BMPs) for all management activities on NFS lands. Best Management Practices have been developed for water quality protection associated with all management activities. Practices particularly relevant to management of the McCloud-Pit Project include the following:

- All 28 BMPs for Road and Building Site Construction Practices. In addition to addressing all road/facility maintenance and construction activities this category also contains BMPs that address restoration of borrow pits and quarries;
- BMPs for Recreation Practices.

[3] USDA Forest Service, Pacific Southwest Region, 2000. Water quality management for Forest System lands in California, p. 2.
[4] USDA Forest Service, Pacific Southwest Region, 2000. Water quality management for Forest System lands in California, p. 3.

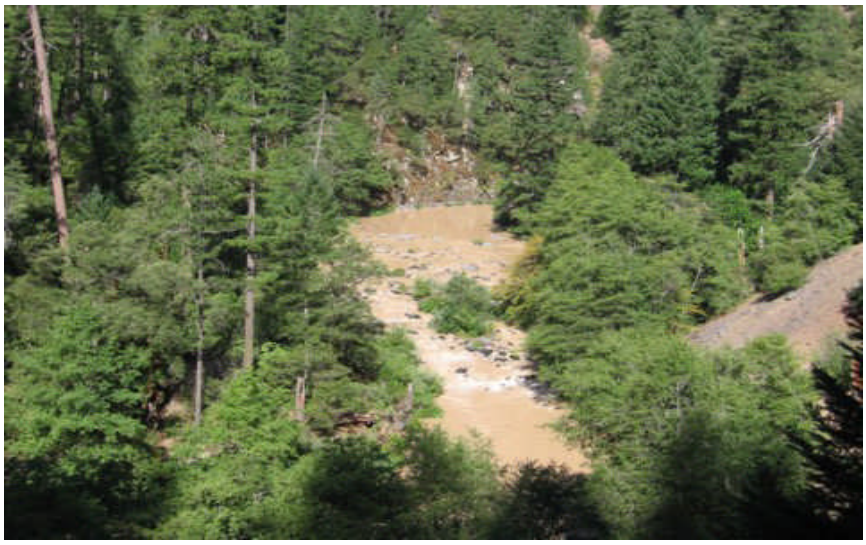
Turbidity Monitoring:

As noted in the FLA: "Project operations influence the volume, rate, and timing of downstream discharges of suspended sediments from McCloud Reservoir, including... (3) alteration of sediment transport characteristics through the reservoir and into the Lower McCloud River…" (PG&E, 2009, p. 3-109). The Licensee has indicated that existing turbidity monitoring at MC-5 fulfills the need for turbidity monitoring on the Lower McCloud River as identified in the Water Quality Monitoring Plan. The Forest Service feels that data from MC-5 could be improved upon by providing real-time turbidity data at or above Gage MC-7 in order to address concerns raised during studies that fishing quality was strongly affected by turbidity. While use of the multi-level gates and valves to manage turbidity from McCloud Reservoir may not be practical, adequate notification of turbidity events could help inform anglers. Adding a turbidity monitor just below the dam would provide real time turbidity information for the portion of the river most actively fished.

Using the October 2007 turbidity event as an example:

Turbidity travel time is 14 hours (20 hours to peak) from Gage MC-7 to MR4A (Claiborne Creek Confluence). Travel time is 32 hours (38 hours to peak) from MR4A to MC-5 (current gage location). Therefore total non-peak turbidity travel time from Gage MC-7 to MC-5 is 46 hours (14 + 32) indicating that an event could be moving through the McCloud River for 46 hours or almost 2 full days before the turbidity monitoring station at MC-5 alerts anglers that an event is occurring. Real-time turbidity data at MC-7 would provide an indication of maximum turbidity levels in the first reach of the River (MC-5 turbidity levels are diluted), and provide an alert of the start of an event (as opposed to 1.5 – 2 days after the event starts) allowing anglers to change their plans and improving the ability of the Forest Service to alert anglers as to the status, duration and intensity of turbidity events in the Lower McCloud River.

Figure 2-1. Lower McCloud River.
Photo taken on August 18, 2008 from the road above Gage MC-7 station looking upstream towards the dam. Turbidity: 271 NTU. **(**FLA Figure A2-21)



Gravel:

The rationale for gravel and coarse sediment augmentation in the Lower McCloud River below McCloud Dam is derived from Forest Service management direction, the Final License Application, and information from *Assessment of Channel Morphology and Fluvial Geomorphic Processes in the Lower McCloud River (GS-S2) TM-68*. The rationale is also supported by a practical approach to introducing gravel and coarse sediment to the river (see below).

This license condition is consistent with the Shasta-Trinity National Forest Land and Resource Management Plan (LRMP) and the Record of Decision (ROD) for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (FEIS). The LRMP provides management direction as well as Standards and Guidelines for Riparian Reserve Management that supports replenishing gravel in the Lower McCloud River below McCloud Dam. Additionally, this condition would achieve Aquatic Conservation Strategy (ACS) Objective #5 from the LRMP, which directs the Forest Service to 'Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport' (LRMP, 4-53).

Forest Standards and Guidelines for the Lands Program contain direction that applies to relicensing hydroelectric projects in non-Key watersheds (i.e. Lower McCloud River Watershed). 'During re-licensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize in-stream flows and habitat conditions that maintain or restore riparian resources and channel integrity' (LRMP, 4-57).
The rationale for the Forest Service to adhere to the aforementioned management direction is strengthened by the location of NFS lands along the Lower McCloud River. The majority of the lower river flows through private lands, however the largest river reach located on NFS lands extends downstream from approximately 0.2 miles above Hawkins Creek confluence to the Nature Conservancy property located less than 0.1 miles above Lady Bug Creek confluence for a total distance of approximately 4 ½ miles. Gravel and coarse sediment augmentation below the dam would have the greatest benefits to this reach of the McCloud River.

Volume II of the Final Application for New License for the McCloud-Pit Hydroelectric Project (PG&E, 2009) provides information that supports the rationale for augmentation of gravel and coarse sediment in the Lower McCloud River below McCloud Reservoir. The FLA provides the following information that characterizes the sediments that have accumulated in McCloud Reservoir. The FLA notes that 'Debris flows originating from the unconsolidated inner gorge slopes of Mud Creek Canyon high on the southeast flank of Mt. Shasta… historically delivered large quantities of fine sediment (sand and finer) to the Upper McCloud River during summer months, and sediment delivery from debris flows in Mud Creek constitutes a large fraction of the sediment currently stored in McCloud Reservoir' (PG&E, 2009, Vol. II, p. 3-3). The FLA also states that 'Tributaries draining steep topography in the Eastern Klamath Terrane and Western Cascades Terrane surrounding McCloud Reservoir (e.g., Angel, Lick, and Star City Creeks) historically delivered the majority of the coarse sediment to McCloud River upstream of McCloud Dam, and sediment delivery from these tributaries constitutes the majority of the coarse sediment (>2 millimeters) stored in McCloud Reservoir' (PG&E, 2009, Vol. II, p. 3-4). These statements indicate that tributaries to the McCloud Reservoir and not the remainder of the watershed area supplied the bulk of the coarse sediments to the lower river. The fact that the Mud Creek contribution constitutes the majority of the material (sand and finer) stored in the reservoir highlights the importance of Star City Creek and the other reservoir tributaries as being the dominant suppliers of coarse sediment to the river in the first 7 to 8 kilometers (4.3 – 5 miles) below McCloud Dam, prior to the Project's inception. If the Star City Creek inlet was chosen as the gravel/sediment source, one of the largest sediment producing tributaries would again be contributing gravel and coarse sediment to the Lower McCloud River.

The FLA also notes that 'Similarity in the size of coarse sediment supplied by major tributaries and the size of mobile deposits in the mainstem Lower McCloud River emphasizes the importance of coarse sediment inputs from major tributaries in supplying the mobile sediment fraction (including spawning gravel size classes) to the McCloud River downstream of McCloud Dam. Bulk sampling results suggested that major tributary sediment inputs fine the bed, and that the mainstem channel bed coarsens with increasing distance from major tributaries' (PG&E, 2009, Vol. II, p. 3-6). Gravel and coarse sediment augmentation below McCloud Dam would likely have a similar effect on the channel bed below the dam and mimic patterns of sediment deposition created below downstream tributary confluences in the Lower McCloud River. Gravel introduction below McCloud Dam would have the effect of adding one more tributary (i.e. Star City Creek) to the Lower McCloud River as a gravel and sediment supplier to the most supply limited reach of the river.

The FLA notes that 'Under unimpaired conditions, the Lower McCloud River was likely supply- limited (i.e., annual bedload transport capacity exceeded annual coarse sediment supply) from McCloud Dam to at least Bald Mountain Creek. However, reaches with relatively low stream power and sediment transport capacity currently store mobile sediment in patches associated with large roughness elements (e.g., boulders and bedrock outcrops), local backwater effects from channel or valley width contraction, local flow expansion from channel or valley widening, and high local sediment supply relative to local bedload transport capacity. Mobile coarse sediment is also commonly distributed in thin, discontinuous, and transitory sheets within a bed of immobile framework grains' (PG&E, 2009, Vol. II, pgs. 3-10 and 3-15). These excerpts from the FLA suggest that, while the McCloud River is supply-limited, there are storage areas that could trap or temporarily hold a proportion of the introduced gravels and sediment.

While the Lower McCloud River would remain supply-limited, the reduced flow regime would likely result in longer retention times for introduced gravel and coarse sediment in the first several miles of the Lower McCloud River below the dam between spill events. Project operations have resulted in a reduction in sediment transport capacities below the McCloud Dam. The reduction in transport capacities is highest at sites near the dam (70% reduction above Hawkins Creek) (PG&E, 2009, Vol. II, p. 3-27). The project has also resulted in a 69% reduction in the 2-year flow immediately upstream of Hawkins Creek (PG&E, 2009, Vol. II, p. 3-27).

The FLA notes that while storage is lowest in the first 5.2 km (3.25 miles) downstream of McCloud Dam, where coarse sediment has been most reduced by impoundment in the McCloud Reservoir, the storage potential in this responsive reach is minimal and the relatively small quantity of coarse sediment supplied by larger tributaries (i.e., Hawkins Creek, Squirrel Creek, Fitzhugh Creek) is efficiently routed downstream (PG&E, 2009, Vol. II, p. 3-31). While it is true that the extent of response reaches below McCloud Dam are limited, it has been noted that there are opportunities for temporal storage of coarse sediment within the transport and response reaches (PG&E, 2009, Vol. II, pgs. 3-10 and 3-15). Study results from *Assessment of Channel Morphology and Fluvial Geomorphic Processes in the Lower McCloud River (TM-68)* also note that 'longitudinal patterns in sediment storage and sediment storage potential (i.e. stream power) suggest that the Project forces or at least exacerbates supply limitation (deficit of coarse sediment supply relative to bedload transport capacity) in responsive reaches in the first 7 or 8 km (4.3 – 5 miles) downstream of McCloud Dam' (TM-68, pg 48).

In addition to the reintroduction of gravels, the reintroduction of coarser sediments would provide some benefit in maintaining/restoring the sediment regime. The FLA notes that '…the reach from McCloud Dam to at least Hawkins Creek is potentially the most degradational due to low regulated sediment supply' because 'the reach is upstream of any significant tributary sediment inputs' (PG&E, 2009, Vol. II, p. 3-31).

Degradation and bed-elevation lowering of the Lower McCloud River below the dam was documented in data collected at the U.S. Geological Survey (USGS) gaging station (1137760) (MC-7) located approximately one-half mile downstream of the dam. The USGS Water Data Report (see chart below) for this station states that the gage was installed and the datum established in 1966. By April 1972 the datum was lowered three feet. The USGS report notes further changes to the channel during water years 1975-1981, with 24 different rating relations (rating curves) developed for this station since its 1966 establishment.

USGS
Water-Data Report 2008
1136770 McCloud River below McCloud Dam, near McCloud, CA
Sacramento River Basin

LOCATION-Lat 41°07'31", long 122° 04'03" referenced to North American Datum of 1927, in SW ¼ NE ¼ sec 27, T.38N., R.2W., Shasta County, CA, Hydrologic Unit 18020004, Shasta National Forest, on left bank, 0.1 mi downsteam from Lizard Creek, 0.6 mi downstream from McCloud Dam, and 9 mi southeast of McCloud.

DRAINAGE AREA. –404 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.—April 1966 to current year (operated as a low-flow station only).

GAGE.--Water-stage recorder. Datum of gage is 2,398.76 ft above NGVD of 1929 (levels by Pacific Gas and Electric Co.). Prior to Apr.7, 1972, at datum 3.00 ft higher.

COOPERATION.—Records were collected by Pacific Gas and Electric Co., under general supervision of the U.S. Geological Survey, in connection with Federal Energy Regulatory Commission project no. 2106.

REMARKS.—Low flow regulated by Lake McCloud (station 11367740) since November 1965. Most of McCloud River runoff is diverted from reservoir through tunnel to Iron Canyon Reservoir (station 11363920) in Pit River Basin. This station records fishwater release. The minimum requirement is 40 ft^3/s at all times. Prior to water year 1974, flow was computed up to 400 ft^3/s. During water years 1975 -81, because of channel changes, flow was computed up to 200 ft^3/s. Currently, because of maximum required release, flow is computed to 220 ft^3/s. See schematic diagram of Pit and McCloud Basins available from the California Water Science Center.

While station datums can be raised or lowered for different reasons, one of the more common reasons is due to channel bed elevation changes. The need to develop different rating curves is typically driven by channel changes that affect width, depth, and/or gradient. It is unlikely that a well-established boulder-step pool channel would change in response to a regulated flow regime. It appears more likely that this channel reach contained and transported a steady supply of mobile sediment (gravel) and that the regulated flow and sediment capture, scoured the stored gravel, degraded the channel, and in effect exhumed the boulder-step pool configuration. These effects may also be exacerbated by the relatively high spill frequency; the Licensee has indicated that McCloud Reservoir spills approximately four out of ten years (PG&E, 2009 p. B-3) which is atypical of many hydroelectric projects, but common on the Lower McCloud River. Due to reservoir size constraints, McCloud Dam is relatively small for the volume of flow in the river and often cannot capture larger events.

As reported in TM-68 (Table 4, p. 14), it is estimated that the pre-dam (unimpaired) McCloud River conveyed 25,028 tonnes (one metric tonne = 2,204.6 pounds) per year from the upper watershed to the mouth of Hawkins Creek located approximately 1.2 miles downstream from the dam. With the Hawkins Creek contribution of 179 tonnes, the unimpaired McCloud River below Hawkins Creek conveyed 25,225 tonnes of sediment annually (TM-68, p. 14).

It is reasonable to conclude that the McCloud River channel and its riparian/fluvial ecosystems below Hawkins Creek were appropriately sized and in dynamic equilibrium with that load of annual sediment. With the upper watershed sediment load captured by the dam, the McCloud River below Hawkins Creek conveys only the 179 tonnes per year or less than 1 percent of the unimpaired sediment load. Farther downstream past the Bald Mountain Creek confluence, the contemporary annual load of sediment conveyed is just 11.5 percent of the unimpaired system. Using sediment transport as an indicator of channel health and fitness in the conveyance of watershed products (i.e., energy and nutrients), a 99- to 88-percent reduction in the conveyance of a primary watershed product (sediment) should be recognized as a potentially significant adverse impact on the physical channel as well as the riparian/fluvial ecosystems that rely on the physical attributes of the channel. Given the long duration of the next license (30 – 50 years), it is appropriate to employ an adaptive management approach for augmenting gravel and course sediments in the Lower McCloud River.

Augmentation Proposal Benefits

The Forest Service recognizes that implementation of a gravel/coarse sediment augmentation plan may pose difficulties for the Licensee. The Forest Service proposes that the Licensee use the Star City Creek inlet of McCloud Reservoir as an initial source of gravel/coarse sediment for augmentation. The use of the Star City Creek inlet would reduce costs by increasing efficiency associated with augmentation operations and provide environmental and recreational benefits as well.

- The location of the gravel/coarse sediment source is approximately 2.5 road miles away from the proposed introduction site below the dam. A staging area for the gravel/coarse sediment may also be available at the tunnel spoils site located on Hawkins Creek approximately 2.25 miles below McCloud Dam. Storing gravel/coarse sediment at the tunnel spoils site could allow for a one time withdrawal of gravel from the Star City Creek inlet during the period of the license (i.e. all of the gravel/coarse sediment required for augmentation during the license period could be dredged from the inlet at one time or several intervals and stored at the tunnel spoils site.
- Dredging the Star City Creek inlet would provide for increased reservoir capacity in the inlet and provide for additional space to capture future sediment inputs from Star City Creek.
- The dredging could assist boat access to the recreation site to be reconstructed at Star City Creek inlet. Currently the gravel deposits (as seen in the photograph below) preclude boating access when reservoir elevations are lower.
- Using Star City Creek inlet as a gravel/coarse sediment source has the added benefit of supplying the Lower McCloud River with the actual

sediment that is missing from the river. Moving this material around the dam has the effect of adding one small tributary with a broad range of coarse sediment size classes that would have been delivered to the Lower McCloud River prior to the Project's inception.

- If Star City Creek gravel/sediment is utilized, no washing of sediment would be required. This gravel source is effectively inundated by McCloud Reservoir every year by the same water that flows through the Lower McCloud River so further washing would provide no added benefits; once sorted, the stockpiled sediment could be deposited in the Lower McCloud River. If Star City Creek sediments are not utilized, the material would need to be sorted and washed to meet the license condition (i.e. clean, rounded and ranging in size from approximately 8-128 mm). The Licensee expressed concerns with having to obtain two separate Water Quality Certifications for the removal, washing and sorting of gravels, as was their experience on the Pit 3, 4, 5 project. The Water Board has indicated that this was an anomaly and that the gravel/coarse sediment removal and placement could be covered in the Project 401 Water Quality Certification process.
- The existing volume of sediment currently deposited in the Star City Creek inlet is expected to meet the minimum recruitment needs of 150 tonnes per year for the period of the license. While this estimate needs to be refined, it appears that the Star City Creek sediment delta is about 9,000 m^2. Assuming an average depth of one meter results in an estimated supply of 9,000 m^3, or about 11,790 tonnes of sediment (assumes 1.31 tonnes river rock per m^3). Additional recruitment of sediment in the Star City inlet would occur during the course of the license term.
- In order to remove sediment from the Star City Creek inlet, a dredging plan would be required (see Condition No. 24 - Reservoir Dredging).

Figure 2-2. Star City Creek Delta – McCloud Reservoir

<u>Rationale for selecting 150 t yr^{-1} gravel/coarse sediment introduction rate.</u>

The amount of gravel/coarse sediment recommended for augmentation was determined based on data provided in the FLA as well as practical considerations.

Step 1: Determine unimpaired annual coarse sediment contribution to McCloud Reservoir.

The total estimated coarse sediment input from the Upper McCloud River including reservoir tributaries (but excluding Mud and Huckleberry Creeks) = **21,518 t yr^{-1}** (TM-68, p. 14). Adding in the small amount of coarse sediment generated from Mud and Huckleberry Creeks results in an unimpaired coarse sediment contribution of **25,028 t yr^{-1}** (TM-68, p. 14) to McCloud Reservoir. All of this sediment is presumed to originate from the total connected source area draining into McCloud Reservoir. This number compares well with information in the FLA that states that between 1964 and 2007, approximately 4,134,500 m^3 of sediment accumulated in McCloud Reservoir, of which an estimated 937,400 tonnes is coarse sediment > 2 mm (PG&E, 2009, p. 3-4). The cited value of 937,400 tonnes of coarse sediment accumulation was derived by adjusting the estimated proportional volume by a density of 1.31 tonnes per m^3 (PG&E, 2009, p. 3-538). Over this 43 year period the average annual input of coarse sediment equates to 21,800 m^3 yr^{-1}.

Step 2: Adjust annual coarse sediment contribution to approximate total amount contributed by Star City Creek Watershed.

Because the Star City Creek delta is proposed as the gravel/coarse sediment source and the conceptual idea for gravel/sediment augmentation is based on adding one additional tributary to the Lower McCloud River below the McCloud Dam, the total amount was adjusted to determine the amount of gravel/coarse sediment sourced by the Star City Creek Watershed.

Star City Creek Watershed (Hydrologic Unit Code (HUC) 7) area = 8,344 acres or 13.04 square miles.

The total connected source area (Upper McCloud River including reservoir tributaries and Mud/Huckleberry Creeks) 300.8 km^2 = 116 mi^2.

Star City Creek accounts for 11.2% of connected source area.

11.2% of 25,028 t yr^{-1} = **2,803 t yr^{-1}** of sediment is delivered to McCloud Reservoir assuming uniform contributions.

Step 3: Adjust Star City Watershed annual input by Project flow regime.

The estimate of 2,803 t yr^{-1} is adjusted to reflect the current flow regime in the Lower McCloud River. The unimpaired average summer base flows in the McCloud River below the McCloud Dam in August were equal to 869 cfs (PG&E, 2009, p. 3-50).[5] The total volume of gravel/sediment from the Star City drainage area calculation is then adjusted for the new flow regime, assuming that the post-license average August base flow will be near 200 cfs or 23 percent of the original August unimpaired flow.

Adjusting the Star City Creek input of 2,803 t yr^{-1} by a factor of 0.23 equates to a proposed gravel introduction rate of **645 t yr^{-1}**. This number is comparable to the amount of gravel being introduced to each reach for the Pit 3, 4, & 5 Project (FERC No. 233). This amount was rounded down to 600 t yr^{-1} which represents the maximum amount of gravel/coarse sediment that could be introduced to the McCloud River in any given year.

Step 4: Practical adjustment to reflect small target reach and economic considerations.

The general concept is to add one tributary to the Lower McCloud River to augment gravel/sediment in the reach of river below the McCloud Dam. The Pit 3, 4, 5 Project requires introducing 600 t yr^{-1} to 3 different target reaches that total about 5 miles in length. Because the McCloud is a smaller river with a small contributing source area, the minimum introduction rate was adjusted downward to **150 t yr^{-1}**.

[5] The month of August was chosen randomly from the unimpaired flow data.

Size Class	Size Range (mm)
Sand	<2
Very Fine Gravel	2-4
Fine Gravel	4-6
Fine Gravel	6-8
Medium Gravel	8-11
Medium Gravel	11-16
Coarse Gravel	16-22
Coarse Gravel	22-32
Very Coarse Gravel	32-45
Very Coarse Gravel	45-64
Small Cobble	64-90
Medium Cobble	90-128
Large Cobble	128-180
Very Large Cobble	180-256
Small Boulder	256-512
Medium Boulder	512-1024
Large Boulder	1024-2048
Very Large Boulder	2048-4096

From Wolman Pebble Count Protocol

Large Woody Debris:

Project effects on transport of LWD on aquatic habitats were identified as a potential resource management issue. Although this entire reach is heavily forested, existing LWD inventories show that little LWD is stored in the Lower McCloud River channel between McCloud Dam and Shasta Lake (CRMP 2001; personal communication, S. Bachmann, Hydrologist, USFS, McCloud, CA, and J. Fitzgerald, Engineering Geologist, North State Resources, Redding, CA, September 10, 2008). Given the existing and expected amounts of LWD in this portion of the river, LWD primarily functions as:

- Aquatic habitat along the channel margins;
- Riparian habitat where it rafts up onto surfaces above the low-flow channel;
- Aquatic habitat, in rare cases where wood is retained in the active portion of side channels.

The primary purpose of this measure is to provide a framework and guidelines for removal of LWD from McCloud Reservoir and placement into the Lower McCloud River to increase the amount of habitat in these areas.

TERRESTRIAL WILDLIFE AND BOTANY

Conditions No: 25, 26

a. Guidance:

Shasta-Trinity National Forest Land and Resource Management Plan
Forest Goals

- Integrate multiple resource management on a landscape level to provide and maintain diversity and quality of habitat that support viable populations of plants, fish and wildlife (4-4.2).
- Monitor and protect habitat for federally listed threatened and endangered, (T&E) and candidate species. Assist in recovery efforts for T&E species. Cooperate with the State to meet objectives for State-listed species (4-5.32).
- Manage habitats for sensitive plant and animals in a manner that will prevent any species from becoming a candidate for T&E status (4-5.33).
- Cooperate with Federal, State, and local agencies to maintain or improve wildlife habitat (4-6.44).
- Maintain natural wildlife species diversity by continuing to provide special habitat elements within Forest ecosystems (4-6.45).

Standards and Guidelines

- Survey and Manage will provide benefits to amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens and arthropods (4-12).
- Manage known sites; Survey prior to ground disturbing activities; Extensive surveys (4-12).
- Manage Recreation Areas to minimize disturbance to species (4-13).
- Cliffs, Caves, Talus and Rock Outcrops. Manage these unique habitats on a site-by-site basis to protect their existing micro environments and the viability of dependant animal and plant species. Manage nearby water sources to perpetuate natural cave processes (4-14.2b).
- Provide connecting travel corridors for wildlife species, particularly late-successional dependent species, by using Riparian Reserves and silvicultural prescriptions (4-14.2h).
- Map, record, and protect essential habitat for known and newly discovered sensitive and endemic plant species until conservation strategies are developed (4-14.4a).
- Analyze the potential effects of all ground-disturbing projects on sensitive and endemic plants and their habitat. Mitigate project effects to avoid a decline in species viability at the Forest level (4-14.4b).

- Monitor the effects of management activities on sensitive and endemic plants. If monitoring results show a decline in species viability, alter management strategy (4-14.4c).
- Coordinate sensitive plant inventory and protection efforts with the CDF&G, the U.S. Fish and Wildlife Service, the Nature Conservancy, the California Native Plant Society, and other concerned agencies, organizations, and adjacent landowners (4-15.4e).
- Maintain riparian area values, particularly when locating and constructing new roads and trails (4-25.17b).
- Identify and treat riparian areas that are in a degraded condition (4-25.17c).
- Minimize accidental electrocution of raptors by ensuring that newly constructed overhead power lines meet safe design standards (4-29.25a).
- Manage habitat for neotropical migrant birds to maintain viable population levels (4-29.25c).
- Develop interpretive view/sites for wildlife viewing, photography, and study (4-29.25d).
- Maintain and/or enhance habitat for TE&S species consistent with individual species recovery plans (4-30.h).
- Survey and evaluate habitat for TE&S species at the project level in coordination with the USFWS. Place in Prescription VII or Prescription IX and/or require limited operating periods or other restrictions as appropriate (4-30.i).
- Manage and protect potential bald eagle and peregrine falcon sites for future occupancy (4-30.j).
- Require limited operating periods adjacent to active goshawk nesting sites until the young have fledged (4-30.k).

Management Prescriptions

Late-Successional Reserves

- Shasta salamander- this species is very narrowly distributed, occurring only in localized populations on the Shasta-Trinity National Forest. Only a small part of its range is included with Habitat Conservation Areas identified by the Interagency Scientific Committee. It occurs in association with limestone outcrops, protected by an overstory canopy. All known and future localities must be delineated and protected for timber harvest, mining, quarry activity, and road building within the delineated site, and a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, should surround the outcrop. Additional surveys conducted using a standardized protocol must be undertaken to identify and delineate all occupied sites within the species range (4-41).
- Evaluate impacts of nonnative species (plant and animal) currently existing within reserves, and develop plans and recommendations for eliminating or controlling nonnative species that are inconsistent with Late Successional Reserve objectives. These will include an analysis of the effects of

implementing such programs to other species or habitats within Late Successional Reserve (4-41).

Bald Eagles

- Maintain and/or enhance the habitat necessary to provide for 32 pairs of bald eagle (4-4.6).
- Survey populations and habitat annually to determine status and trend (4-44.7).
- Update or develop and implement management plans for all known and newly discovered nesting and roosting sites. Such plans will have site specific management direction established for the benefit of the bald eagles and will be coordinated with the bald eagle Recovery Plan (4-44.8).

Peregrine Falcons

- Maintain and/or enhance the habitat necessary to provide for 9 pairs of peregrine falcons (4-44.9).
- Survey populations and habitat annually to determine status and trend (4-44.10).
- Develop and implement specific territory management plans for all known and future sites necessary for population viability. These plans will be coordinated with the Peregrine Falcon Recovery Plan (4-44.11).

Goshawks

- Exclude management activities within occupied nest stands during the nesting period (4-44.12).

Sensitive Plants

- Known sensitive plants and those identified in the future, will be afforded the protection necessary to maintain or increase populations. Suitable habitat will be maintained or increased at a level that will assure the successful survival of the species throughout their range (4-44.14).

Riparian Reserves and Key Watersheds

Aquatic Conservation Strategy

- Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species (4-53.2).

- Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations (4-53.3).
- Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands (4-53.7).
- Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability (4-53.8).
- Maintain and restore habitat to support well-distributed populations of native plant, invertebrates, and vertebrate riparian dependent species (4-53.9).

Lands

- For hydroelectric and other surface water development proposals, give priority emphasis to instream flows and habitat conditions that maintain or restore resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During re-licensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize in-stream flows and habitat conditions that maintain or restore riparian resources and channel integrity (4-57.7b).

General Riparian Area Management:

- Herbicides, insecticides, and other toxicant, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy Objectives (4-58.8c).

McCloud River/Pit Management Area Supplemental Management Direction:

- Maintain or improve selected habitats for black bear, spotted owls, deer, elk and turkey (4-123.12).
- Maintain or improve selected habitats for deer, elk, turkey, bear, bald eagles, peregrine falcons, and spotted owls (4-127.8).

Monitoring Action Plan:

- Evaluate Forest plant communities for botanical diversity and health including threatened, endangered and sensitive (TE&S) plants (5-5).
- Inland coldwater fish population surveys; Instream fish habitat improvement structures; warmwater fish habitat improvement structures (5-9).
- Effectiveness monitoring of management indicator assemblage populations: late seral stage, opening and early seral stage, multihabitat, snag and downed log,

riparian, aquatic, hardwoods, and cliffs, caves, talus and rock outcrop assemblages (5-16).

- Determine trends of bald eagle breeding populations; Evaluate trends in habitat capability for nesting birds (5-17).
- Determine Goshawk population and habitat trends (5-17).
- Verify Peregrine Falcon nesting and reproductive success (5-17).
- Ensure compliance of Forest Projects with spotted owl standards; Determine population and habitat condition trends (5-18).
- Determine Furbearers population and habitat trends within designated fisher and pine marten habitat (5-18).

b. Rationale to support license condition(s):

Wildlife

While the Project lies within Late Successional and Administratively Withdrawn land prescriptions (LRMP Land Allocation map) and should experience less disturbance from many of the land management activities (wood-cutting, timber harvest, etc.) more common on Matrix lands, Project recreation use is expected to grow by as much as 350% (TM-37, Tables 17-20, p. 23-25) over the next license term, which could create additional noise and activities near roosting, foraging or nesting sites. As a result, the previously listed Peregrine Falcon and Bald Eagles will require monitoring to assure populations remain stable or continue to grow as recreation use increases. Regular monitoring and periodic survey throughout the new license period will capture any changes or trends in the populations or individual nest sites, and allow for modifications, if needed, to protect these species.

The Project facilities and reservoirs attract roosting bats, as documented in *Special Status Bats in Proposed Construction and Other Project Areas (TM-71)*. Study results indicate that 13 species of bats were identified during Study Plan surveys, including three species of Forest Service sensitive bats (pallid bat; *Antrozous pallidus*, Townsend's big-eared bat; *Corynorhinus townsendii townsendii*, and western red bat; *Lasiurus blossevillii*) (TM-71, p. 9). Key sites were located around the McCloud Reservoir and near the Pit 7 dam and Afterbay. Under the new license, existing and proposed recreation development and on-going maintenance and construction at the Project facilities will create disturbance at these sites (e.g. new recreation day-use sites around McCloud Reservoir, micro-hydro generation at Pit 7 dam), and could result in impacts to the existing populations. These areas will require regular monitoring and periodic survey both to avoid impacts to day and night roost sites and foraging patterns, and to map track any changes in populations and/or roosting locations. While natural roost sites will be protected, it is possible that facility modifications at the dams could impact man-made roost sites. In these instances, new roosting locations may be required to provide alternate roost sites before existing facility can be changed or removed. Monitoring will ensure that alternate sites are adequate and occupied.

Similar concerns exist for sites near roadways, powerlines and Project infrastructure that are maintained or replaced during the new license term.

Additional threatened, endangered, sensitive and special status species present with the Project area include: northern spotted owl, terrestrial mollusks, northern goshawk, northwestern pond turtle, shasta salamander, and habitat for willow flycatcher, valley elderberry long-horned beetle, and various forest carnivores. Recreation development, facility reconstruction, and road maintenance and reconstruction is proposed under the new license conditions near locations where shasta salamanders were found and goshawks were detected. Previous dispersed use has occurred in and near suitable willow flycatcher habitat around Iron Canyon reservoir, and other riparian species are subject to effects from erosion, sedimentation, recreation use, and flow changes.

As changes within the Project area occur (both construction and use increases) potential exists for unintended consequences to these species. Regular monitoring and periodic survey will allow impacts to be detected, and mitigations developed before species or habitat is affected. Laws and regulations require special mitigation measures for listed and special status species.

Botanical:

The Licensee and the Forest Service are required to comply with the Endangered Species Act, the National Environmental Policy Act, the National Forest Management Act, and current Forest Service policy direction when operating on NFS lands. There are a number of special status botanical species within the Project and Project-affected area, and potential Project effects on these species must be considered.

During the spring and summer of 2007 and 2008, multiple surveys were conducted to locate and map terrestrial plant populations potentially affected by the Project: *Data Summary for Special-Status and Special-Interest Plant, Lichen, and Fungi Species in the Study Area (TM-12), Invasive Plant Species Data Summary (TM-13), Summary of Vegetation Mapping Survey Results in the Project Area (TM-19), Vegetation Mapping Survey Results in the Proposed New Construction Project Areas (TM-64), Assess Potential Ongoing Project Affects on Riparian Vegetation Community Types in the Project Area (TM-65).* The study found and mapped nine special-status plant species at 47 locations, including one newly described taxon: long-fruit jewelflower.

In addition to sensitive species, invasive and noxious species are widespread in the Project area and are concentrated along access roads, around powerhouses and at recreation facilities due to regular contacts with vectors such as vehicle and equipment tires and recreationists. Invasive species were those identified as

"noxious" and have a pest rating by the California Department of Food and Agriculture (CDFA), those species identified and rated on the California Invasive Plant Council list (Cal-IPC), and those identified as a Forest Service Species of Concern by the Shasta-Trinity National Forest (TM-13 p. 6). Licensee recorded and mapped 25 invasive plant species at 1,155 locations in the Project area during surveys in 2007 and 2008.

With the relicensing of the McCloud-Pit Project, ground disturbing activities (recreation developments, road maintenance, micro-hydro construction) and flow modifications will be on-going in the Project area creating potential impacts to the existing populations of special status species, and the possible introduction or spread of invasive species. While new impacts are possible, previously disturbed areas (borrow areas, tunnel spoil piles, etc.) are also a concern and have not received appropriate revegetation resulting in erosion, and colonization by invasive species that crowd out native plants and provide additional vectors for spread. Introduction of invasive species may occur through the use of inappropriate plant material during replanting efforts, or by inadvertent introduction on equipment and tires. Culturally significant plants should also be used to protect continued traditional use where these plants were historically found.

In addition, Licensee vegetation management under/along Project power and transmission lines has conflicted in the past with Forest Service direction for vegetation treatment (including fuels), and treatments in riparian reserves. It will be necessary for the Licensee to have an approved plan to address all construction, reconstruction and maintenance work.

Forest Service sensitive species found during the 2007-2008 surveys include:

- Shasta eupatory (*Ageratina shastensis*),
- Butte County morning glory (*Calystegia atriplicifolia* ssp. *buttensis*),
- Northern clarkia (*Clarkia borealis* ssp. *borealis*),
- Butte County fritillary (*Fritillaria eastwoodiae*),
- English Peak greenbriar (*Smilax jamesii*);

Special interest species documented in the study area include:

- Howell's lewisia (*Lewisia cotyledon* var. *howellii*),
- woolly meadowfoam *(Limnanthes floccosa* ssp. *floccosa*),
- silvery false-lupine (*Thermopsis gracilis var. gracilis*)
- long-fruit jewelflower (*Streptanthus longisiliquus*),

High and Medium Priority Invasive species documented in the study area include:

- Yellow star-thistle (*Centaurea solstitalis*)
- Bull thistle (*Cirsium vulgare*)
- Perennial sweet pea (*Lathyrus latifolius*)
- Black locust (*Robinia pseudoacacia*)
- Himalayan blackberry (*Rubus discolor*)
- Pale yellow iris (*Iris pseudacorus*)
- Spreading hedgeparsley (*Torilis arvensis*)
- Puncturevine (*Tribulus terrestris*)
- Tree of heaven (*Ailanthus altissima*)
- Spotted knapweed (*Centaurea maculosa*)
- Field pepperweed (*Lepidium campestre*)
- Dyers woad (*Isatis tinctoria*)
- Cut-leaved blackberry (*Rubus laciniatus*)
- Cheat grass (*Bromus tectorum*)
- Canada thistle (*Cirsim arvense*)
- Wooley mullein (*Verbascum Thapsus*)
- Scotch broom (*Cytisus scoparius*)
- Common St. Johnswort (*Hypericum perforatum*)
- Gypsyflower (*Cynoglossum officinale*)
- Wild teasel (*Dipsacus fullonum*)
- Tall fescue (*Festuca arundinacea*)
- English ivy (*Hedera helix*)
- Purpleanther field pepperweed (*Lepidium heterophyllum*)
- Spanish broom (*Spartium junceum*)

For the 47 populations of Special-Status or Special Interest plant species within the Project or Project-affected area, monitoring and periodic surveys are necessary in order to meet Forest Service requirements to maintain viable populations and their habitat for the purpose of eventual de-listing. Mapping and monitoring will also provide information necessary to minimize or eliminate direct and indirect impacts from management activities on Special-Status or Special Interest plants unless the activity is designed to maintain or improve plant populations, and to evaluate all proposed projects for potential Threatened, Endangered, or Sensitive plant habitat.

The Forest Service is required to control the spread of invasive species by completing inventories based on Regional protocols, evaluate treatment options relative to the risk of spread, and monitor invasive species populations. Monitoring and periodic surveys will be needed to track the 25 known populations of invasive species and control their spread. Treatment options should be developed where populations can be eliminated. All projects activities involving ground disturbance and revegetation (planting or seeding) must adhere to regional native plant policies. The "Vegetation and Invasive Weed Management Plan" license condition will assist in meeting this requirement on NFS lands affected by the Project.

ROADS, FACILITIES, HAZARDOUS SUBSTANCE

Conditions 28-29

a. Guidance:

Shasta-Trinity Land and Resource Management Plan
Forest Goals

- Manage the Forests' transportation system to facilitate resource management activities, protect wildlife, meet water quality objectives and provide recreational access (4-4.8).
- Maintain or improve soil productivity and prevent excessive surface erosion, mass wasting, and cumulative watershed impacts (4-5.29).
- Maintain or improve water quality and quantity to meet fish habitat requirements and domestic use needs (4-6.39).
- Maintain water quality to meet or exceed applicable standards and regulations (4-6.40).

Standards and Guidelines

- Perform road maintenance activities to meet a variety of management objectives. Schedule road maintenance activities according to the following priorities:
    1. to provide for user safety;
    2. to meet contractual and legal obligations;
    3. to protect natural resources; and
    4. to provide an efficient transportation system (4-16.7a).
- Assign road maintenance levels to each system road or road segment based on traffic management and use objectives. Maintain all roads to at least Maintenance Level 1(4-17.7b).
- Construct or reconstruct roads so that a stable road prism is established. This includes road cuts and fills and the road surface. Minimize sedimentation by employing construction practices such as:
    1. placing surfacing on the roadway;
    2. establishing a vegetative cover on slopes; and
    3. installing proper drainage structures (4-17.7c).
- Use a full range of vegetative management techniques along roads, trails, and transmission corridors with emphasis on non-chemical means (4-17.7d).

- Coordinate road improvement and maintenance projects with other Forests, State and local agencies and cooperators as needed (4-17.7h).
- Upgrade the surfacing on the Forests' road system as necessary to protect the road and other resource values (4-17.7i).
- Use landslide hazard information, in addition to that obtained during necessary on-site geologic investigations, in the design and location of any facility or structure (4-20.w).
- Implement Best Management Practices (BMP's) for protection or improvement or improvement of water quality, as described in "Water Quality Management for National Forest System Lands in California" for applicable management activities. Determine specific practices or techniques during project level planning using information obtained from on-site soil, water, and geology investigations (4-25.18c).
- Assess the potential impacts of vegetation management, road construction and related activities on slope stability and watershed condition for areas identified as moderately or highly unstable (4-25.18i).

Management Prescriptions
Late Successional Reserves

- Road maintenance may include felling hazard trees along rights-of-way. Leaving material on-site should be considered as an alternative to felling (4-39).

Riparian Reserves and Key Watersheds
Aquatic Conservation Strategy

- Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must retain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities (4-53.4).
- Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage, and transport (4-53.5).
- For each existing or planned road, meet Aquatic Conservation Strategy objectives by:
    1. Minimizing road and landing locations in Riparian Reserves;
    2. Completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new

roads or landings in Riparian Reserves;

3. Preparing road design criteria, elements, and standards that govern construction and reconstruction;
4. Preparing operation and maintenance criteria that govern road operation, maintenance, and management;
5. Minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow;
6. Restricting sidecasting as necessary to prevent the introduction of sediment to streams;
7. Avoiding wetlands entirely when constructing new roads (4-54, 55.2b).

- New culverts, bridges and other stream crossings shall be constructed, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved, to accommodate at least the 100-year flood, including associated bedload and debris. Priority for upgrading will be based on the potential impact and the ecological value of the riparian resources affected. Crossings will be constructed and maintained to prevent diversion of streamflow out of the channel and down the road in the event of a crossing failure (4-55.2.d).
- Minimize sediment delivery to streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping will increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes (4-55.2.e).
- Provide and maintain fish passage at all road crossings of existing and potential fish bearing streams.
- Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives. As a minimum, this plan shall include provisions for the following activities:

    1. Inspections and maintenance after storm events;
    2. Inspections and maintenance during storm events;
    3. Road operation and maintenance, giving high priority to identifying and correcting road drainage problems that contribute to degrading riparian resources;
    4. Traffic regulation during wet periods to prevent damage to riparian resources;
    5. Establish the purpose of each road by developing the Road Management Objective (4-55.2.g).

Monitoring Action Plan

- Cumulative impacts on stream channel condition and water quality (5-12)
- Implementation of best management practices (BMPs) (5-12).
- BMP's monitoring for effectiveness of BMPs for the protection of water quality, riparian areas, soil erosion, and slope stability (5-12).

Best Management Practices

Road and Building Site Construction

1.1 General Guidelines for the Location and Design of Roads
1.2 Erosion Control Plan
1.3 Timing of Construction Activities
1.4 Road Slope Stabilization (Preventative Practice)
1.5 Road Slope Stabilization (Administrative Practice)
1.6 Dispersion of Subsurface Drainage from Cut and Fill Slopes
1.7 Control of Road Drainage
1.8 Constraints Related to Pioneer Road Construction
1.9 Timely Erosion Control Measures on Incomplete Road and Stream crossing Projects
1.10 Construction of Stable Embankments
1.11 Minimization of Sidecast Material
1.12 Servicing and Refueling Equipment
1.13 Control of Construction in Riparian Management Zones
1.14 Controlling in-channel Excavation
1.15 Diversion of Flows Around Construction Sites
1.16 Stream crossings on Temporary Roads
1.17 Bridge and Culvert Installation
1.18 Regulation of Riparian Gravel Borrow Areas
1.19 Disposal of Right-of-Way and Roadside Debris
1.20 Specifying Riprap Composition
1.21 Water Source Development Consistent with Water Quality Protection
1.22 Maintenance of Roads
1.23 Road Surface Treatment to Prevent Loss of Materials
1.24 Traffic Control During Wet Periods
1.25 Snow Removal Controls to Avoid Resource Damage
1.26 Obliteration of Temporary Roads
1.27 Restoration of Borrow Pits and Quarries
1.28 Surface Erosion Control at Facility Sites

Watershed Management

1.3 Protection of Wetlands
7.6 Water Quality Monitoring
7.7 Management by Closure to Use (Seasonal, Temporary, and Permanent).

Forest Service Traffic Levels:

	A	B	C	D
Flow	Free flowing with adequate parking facilities.	Congested during heavy traffic such as during peak logging or recreation activities	Interrupted by limited passing facilities, or slowed by the road condition.	Flow is slow or may be blocked by an activity. Two-way traffic is difficult and may require backing to pass.
Volumes	Uncontrolled; will accommodate the expected traffic volumes	Occasionally controlled during heavy use periods	Erratic; frequently controlled as the capacity is reached.	Intermittent and usually controlled. Volume is limited to that associated with the single purpose.
Vehicle Types	Mixed; includes the critical vehicle and all vehicles normally found on public roads.	Mixed; includes the critical vehicle and all vehicles normally found on public roads.	Controlled mix; accommodates all vehicle types including the critical vehicle. Some use may be controlled to vehicle type.	Single use; not designed for mixed traffic. Some vehicles may not be able to negotiate. Concurrent use traffic is restricted.
Critical Vehicle	Clearances are adequate to allow free travel. Overload permits are required.	Traffic controls needed where clearances are marginal. Overload permits are required.	Special provisions may be needed. Some vehicles will have difficulty negotiating some segments.	Some vehicles may not be able to negotiate. Loads may have to be off-loaded and walked in.
Safety	Safety features are a part of the design.	High priority in design. Some protection is accomplished by traffic management.	Most protection is provided by management.	The need for protection is minimized by low speeds and strict traffic controls.
Traffic Manage-ment	Normally limited to regulatory, warning, and guide signs and permits.	Employed to reduce traffic volume and conflicts.	Traffic controls are frequently needed during periods of high use by the dominant resource activity.	Used to discourage or prohibit traffic other than that associated with the single purpose.
User Costs	Minimize, transportation efficiency is important.	Generally higher than "A" because of slower speeds and increased delays	Not important; efficiency of travel may be traded for lower construction costs.	Not considered.
Align-ment	Design speed is the predominant factor within feasible topographic limitations.	Influenced more strongly by topography than by speed and efficiency.	Generally dictated by topographic features and environmental factors. Design speeds are generally low.	Dictated by topography, environmental factors, and the design and critical vehicle limitations. Speed is not important.
Road Surface	Stable and smooth with little or no dust, considering the normal season of use.	Stable for the predominant traffic for the normal use season. Periodic dust control for heavy use or environmental reasons. Smoothness is commensurate with the design speed.	Many not be stable under all traffic or weather conditions during the normal use season. Surface rutting, roughness, and dust may be present, but controlled for environmental or investment reasons.	Rough and irregular. Travel with low-clearance vehicles is difficult. Stable during dry conditions. Rutting and dusting controlled only for soil and water protection.

Forest Service Road Maintenance Level Descriptions

Maintenance levels 1-5 (operational and objective) are described in the following paragraphs. Roads assigned to maintenance levels 2-5 are either constant service roads or intermittent service roads during the time they are open to traffic.

Level 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate." Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

Level 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log-haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles.

Level 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Level 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Level 5. Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage."

For the Project and Project-affected roads, the Forest Service has completed a review of the Road Management Objectives. Final Objectives were designated and signed on December 29, 2009

b. Rationale to support license condition(s):

At the time of Project development in 1961, much of the Project area (McCloud Reservoir, Lower McCloud River, Iron Canyon Reservoir, Pit 6, and Pit 7) was inaccessible to the public due to the checkerboard ownership with large private landholders, and the lack of cooperative roads serving the land base. In the 45+ years since the Project was built, the public has enjoyed recreation opportunities via the road system developed for Project construction. Much of the surrounding land is still held by large private landholders, and timber remains the primary focus for private land uses. In addition to the Rationale provided below, the Forest Service May 19, 2009, response to Licensee's Draft License Application provides substantial discussion on Project roads and the need for mitigations, and is incorporated here by reference.

Project and Project-affected roads itemized below are from Table 1-3 in the Road and Transportation Facility Management License Condition No. 29.

McCloud Reservoir Roads

General Road Information for McCloud Reservoir and Vicinity:
In these preliminary conditions, the Forest Service, in cooperation with the Licensee, has developed a proposal to increase the number of developed recreation sites around McCloud Reservoir to accommodate the dispersed use that has been occurring. The proposal includes three new day uses sites in addition to the Boat Ramp, and three additional water access sites. This should encourage those who currently travel to the Boat Ramp for non-boating use, to use other sites where amenities (toilets, parking, picnic tables) will be developed. This should help to balance traffic around the reservoir and reduce impacts from unmanaged use.

Roads 38N11 - Hawkins Creek (Segment 1), and 38N04Y - Star City:

In August of 1963, the Hearst Corporation granted permission to the Licensee to construct and/or relocate portions of the International Paper (IP) road down the west side of the McCloud River. This road was used for logging Hearst Corp. lands. Documents indicate that roughly six miles of the road would be inundated by the McCloud reservoir under construction at the time. In addition, Hearst granted permission to the Licensee to construct a second access road on the east side of the reservoir for Project development (see TM-63, documents 2439-02-0002, 2438-02-0012, and 2439-02-0005). Because alternate access did not exist to the north, Hearst allowed temporary use of their private road #1 leading north to Highway 89, for Licensee construction and logging needs associated with the Project. While use of portions of the Eastside (now designated 38N04Y) and Westside (now designated 38N11) roads were perpetual, use of road #1 was temporary, until alternate access could be developed from Tarantula Gulch to the end of the County Road in Squaw Valley.

To the south, the Hearst Corporation granted permission to the Licensee to construct a connecting road from the end of the existing road near Hawkins Creek, to the junction of the eastside and westside roads at the top of McCloud Dam. This new segment of road provided access for the Licensee to their stream gage at MC-7, and connected the two road systems (north and south) for the first time.

Development of the reservoir coincided with a large Land-for-Land Exchange being negotiated with the Forest Service. In 1955, the Hearst Corporation and the Forest Service began negotiations to consolidate their respective ownerships to allow for ease of timber management. (USDA, 1963b) Because the Forest Service did not hold any legal road access to the McCloud River corridor, the Forest Service chose to select lands in the Lower McCloud River (below the future reservoir) and Squaw Valley Creek drainage where limited road access was possible from the Squaw Valley Creek road. As the timber appraisal for the land exchange noted: “There have been no public roads into this area in the past but, as a result of this exchange, rights of way are being obtained…”

With the filing of the FERC license, the planned land exchange would have eliminated all public land and the possibility of public access to the new reservoir. Because recreation was a condition of the license, the Hearst Corporation and the Forest Service agreed, in a 1963 Memorandum of Understanding (MOU,) that the Hearst Corporation would donate approximately 95 acres of land (with associated public road rights) around the newly formed reservoir to the Forest Service in order to provide for public access and recreation at the new reservoir. This MOU allowed the negotiated Land Exchange to proceed consistent with the license, and was included in the Exchange documentation (USDA, 1963b).

As a result of the land-exchange, all lands, except the donated 95-acre strip of NFS land surrounding the southern half of the reservoir, are privately held by the Hearst Corporation, who blocks public access with locked gates. Visitors entering the Reservoir area from the north have six options, five of which are Project destinations (Tarantula Gulch boat ramp and locations around the reservoir edge, Ah-Di-Na, Star City, the base of McCloud Dam, or Ash Camp). Surveys conducted for the re-license of Project 2106 recorded over 18,000 vehicles traveling to the Reservoir for the 2007/08 season, with less than 6% traveling beyond the Project to the south (TM-22, A5-5 to 9). While the McCloud Boat Ramp is by far the most popular destination, with as much as 68% of all use, Star City, Ah-Di-Na and Ash Camp have a roughly equal share of the remaining Project traffic.

The Final License Application notes that "roads are categorized consistent with FERC's criteria that Project roads are only those used primarily for Project purposes" (PG&E, 2009 p. 3-404). The Forest Service agrees with this standard and believes that several additional roads meet this criteria based on the studies conducted for the relicense.

While the eastside road to Star City (38N04Y) is designated as a Project Road in the Final License Application, the Licensee asserts that the westside road (38N11 Segment 1) is only Project-related since visitors may only stop to view the Project on their way to other destinations. The study data does not support that conclusion, as less than 6% of the users travel or enters south of the Project. Because locked gates block access to the few remaining roads around the reservoir, and Hearst employees have alternate access to their lands, the vast majority (94%) of vehicles are traveling "primarily for Project purposes."

For reasons above, the Forest Service has determined that the portion of Forest Road 38N11 (Segment 1) from the County road junction to the Tunnel Spoil Pile (14.25 miles) is a Project Road and should be designated as such. The Star City road (38N04Y) is currently designated a Project Road within the Project boundary and should remain as such.

Road 38N81 - Brown Trout (a.k.a. McCloud or Tarantula Gulch Boat Ramp)

When the Forest Service completed the final connecting segment from Tarantula Gulch to the end of County Road MC1N01, the public had road access to view the newly minted McCloud Reservoir. However, it was not until 1969 that the Hearst donation of 95 acres around the southern half of the reservoir was completed (Grant Deed, dated 5-29-1969, recorded Shasta County Book 991, p. 566), and legal access was available to the reservoir edge. In 1975 the Licensee granted an easement to the Forest Service to construct a Boat Ramp at Tarantula Gulch so the public could access the water surface (TM-63, #2438-02-0049). This road is currently designated

a Project Road and within the Project boundary and should remain as such. Maintenance for this road may be shared between the Hearst Corporation (who has access beyond the ramp through a locked gate) and the Licensee, however the Forest Service believes that all public use is for Project purposes, and therefore the responsibility of the Licensee.

Road U38N11X – Road to Base of McCloud Dam

Although this access road has historically been strictly for Licensee use, study data has shown that the dam is a popular fishing location and occasionally used as a boating put-in for whitewater trips on the Lower McCloud River. As a result, the Licensee, in collaboration with the Forest Service and other parties, has agreed that this location will be developed for public recreation use under the new license. The road is currently designated a Project Road and will remain as such, but will be used as a public access road for recreation purposes in addition to facility maintenance needs.

Lower McCloud River Roads

General Road Information for Lower McCloud River and Vicinity:

The March 1963, MOU between Hearst and the Forest Service included the assurance of road easements across roads previously constructed by the Licensee, as well as the connecting route to the Lower McCloud River via Battle Creek and Skunk Hill.

By August 1963, the Hearst Corporation had granted rights-of-way to the Licensee to access stream gages along the McCloud River drainage near Big Springs, Angel Creek, the Wyntoon estate, and Ah-Di-Na. After acquiring lands along the Lower McCloud River in the land exchange, in 1966 the Forest Service issued a Special Use Permit to the Licensee for the Ah-Di-Na gage, and a fence to protect the site from the soon-to-be-developed campground.

With the completion of McCloud Dam and the development of public access below the reservoir to Hawkins Creek, and over Skunk Hill to Ah-Di-Na, the Forest Service understood that facilities would be needed to accommodate the new public use that would follow Project development. In 1963, the Forest Service completed the "Stage 2 Multiple Use Impact Report (MUIR) (USDA, 1963a) on Pit-McCloud Project" to evaluate and plan for the changes the Project would bring.

As noted above under the rationale for Recreation, the Forest Service identified Ah-Di-Na and Ash Camp as key recreation development sites for campgrounds to serve the Project recreation needs. Roads to both sites were developed by this time, and

the proximity to the reduced flows of the McCloud River below the dam was anticipated to be a strong draw for fishing. As the document notes:

> "Hawkins Creek would become accessible to anglers over the project access and maintenance roads." "Access resulting from the construction of roads for the project will no doubt have the effect of increasing the recreational use of the area many fold" (USDA, 1963a, p. IV-C-3,4).
>
> "This area includes the southern portion of the McCloud Reservoir, about three miles of the McCloud River and Hawkins Creek. All this area, previously closed to public access, is partially dependent for development upon completion of the pending land exchange with Hearst Corporation."
>
> "Initial development would consist of a 15-unit campground at Butcherknife Creek and a 15-unit Campground at Ah-Di-Na."
>
> Since the road over Skunk Hill to Ah-Di-Na will be a public road and connected to the west side road at Battle Creek, if the Hearst exchange is completed, excellent campground sites will become available for Forest Service development on the McCloud River. It would only be a three to four mile drive to the reservoir if the camper tires of the excellent river fishing." (USDA, 1963a, p. IV-E-16 to 18).

Roads U38N11Y (Ash Camp) and 38N53 (Ah-Di-Na):

Both the Ash Camp (U38N11Y) and the Ah-Di-Na (38N53) roads end at the McCloud River. In addition to the campground, the Ash Camp road also serves as access to the Pacific Crest Trail which remains a non-Project feature that is Forest Service responsibility. For Ah-Di-Na, in addition to the campground and stream gage, the road also serves Hearst Corporation lands, and the Nature Conservancy. While most of the traffic use is Project-related according to traffic studies conducted for the relicense (TM-22, p. A5-7 and A5-9), the Forest Service has agreed to share maintenance of these two roads with the Licensee under a Road Maintenance Agreement to be developed prior to license issuance.

As requested by the Licensee, the Forest Service is willing to work with them outside of the licensing process and prior to development of our Final 4(e) License Conditions on a road agreement for the Ah-Di-Na road (FS road #38N53). This is because road maintenance responsibilities should also involve other parties such as the TNC, Hearst Corporation, and potentially others. Involvement of such a large group of people within the constraints of a FERC license issued solely to the

Licensee can be cumbersome. However, should agreement not be reached, as discussed with the Licensee, this condition will be combined with other Project-affected roads in the Memorandum of Understanding (or other appropriate authorization) discussed in Road Condition No. 29, Part 5.

Iron Canyon Roads

General Road Information for Iron Canyon Area:

Documents developed at the time of the original Project license indicate that the main road from Big Bend north to the site of the new Iron Canyon Reservoir was a private road (now 38N11 Segment 2) constructed by Zamboni Lumber Company in cooperation with R.G. Watt and Rayner (USDA, 1963a, p. III-A-1).

Lands around the site of the proposed Iron Canyon Reservoir were mixed ownership with NFS land, R.G. Watt, Alice McCourt Lamm, and the estate of W.E. Lamm. Development of the reservoir inundated portions of the existing logging road used to log the R.G. Watt lands, and construction of a new road around the reservoir by the Licensee was necessary to replace landowner access. As a result, in 1963, the Licensee secured easements from both R.G.Watt et. al. and the Forest Service to construct connecting segments of a road leading from the Hawkins Creek Road (38N11) to the Oak Mountain Road (37N34).

This Iron Canyon Loop Road (37N78) provides access to the Hawkins Landing campground and boat ramp on Licensee lands, Deadlun Campground, 22 dispersed campsites on NFS lands, the Iron Canyon dam and MC-10 stream gage, the borrow pits for dam construction, and the dam control building. While the adjacent land owner is now Sierra Pacific Industries (SPI), private logging remains the only additional use served by this loop road around Iron Canyon Reservoir.

Road 38N11 - Hawkins Creek (Segment 2):

While it is clear that Segment 2 of the Hawkins Creek road (38N11) serves the Project, it also serves points north and south, and the private in-holdings on the east side of the reservoir. The Forest Service believes that this is a Project-affected road and will share maintenance with the Licensee under a MOU for the portion of this road from Kosk Creek Bridge, to the turn-off to the Iron Canyon Loop Road (37N78).

Road 37N78 – Iron Canyon Loop Road:

Traffic surveys conducted for the re-license, show fewer public visits to Iron Canyon Reservoir than McCloud Reservoir, with only 6,000 vehicles traveling up from the town of Big Bend (TM-22 p. A5-11). Unlike McCloud Reservoir, two un-gated roads lead from the loop-road to SPI lands to the west (see Figure A5-6, TM-22). Traffic entering the loop-road either from the north or south from 38N11, could be traveling to a non-Project destination. However, a review of both the traffic counter data and visual observation data indicates that for the matching dates, over 90% of the traffic is headed to Project facilities, while less than 10% travels up the two private SPI roads (TM-22, p. A5-13, March 2008 version*)[6].

Because nearly all traffic (over 90%) that turns off the Hawkins Creek Road (38N11) to either the south or north shore of the reservoir is traveling to a Project facility, and for other Project reasons discussed above, the Forest Service has determined that the Iron Canyon loop road from the junction with Hawkins Creek road (38N11) to the junction with the Oak Mountain Road (8.54 miles) is a Project Road and should be designated as such.

37N27Y - Deadlun Road, 37N66Y -Hawkins Landing Road, 37N78A- MC-10 gage:

These roads are currently designated as Project roads and will remain as such. Contrary to the FLA (PG&E, 2009, Table 3.7.2-1, p. 3-405), maintenance responsibility for each of these roads will belong to the Licensee.

[6] Note that the January 2009 version of table A5-5 appears to contain errors in traffic counter data for the Hawkins Landing and two SPI roads. While number of matching days and total vehicle counts remain the same for the three points of entry (Hawkins Creek Road, Oak Mountain Road, or the penstock road to James B. Black), the vehicle counts for several columns appear to more than double or triple between the 2008 DLA and the 2009 FLA documents.

Oak Mountain Roads and Vicinity

37N34- Oak Mtn. Road, 37N93, 37N93A, 37N93C- Ridge Road and spurs:

All of the roads serving this area of the Project were built by the Licensee for construction and operation of the Project infrastructure. They are currently designated as Project roads and will remain as such with maintenance responsibility by the Licensee. The Licensee currently and will continue to conduct snow removal on the Oak Mountain road throughout the year to access the Iron Canyon Dam operations. Because public comments and documented use from the study plan data show a strong public desire for a longer season of use at the reservoir, a new boat ramp is planned for the dam area that will provide access to the reservoir across Oak Mountain road during the fall and spring months when other access may be blocked by snow (see Recreation portion above).

Pit 6, Pit 7, Fenders Flat and Hogback Mountain

Road 34N17 – Fenders Ferry:

Traffic counters on the Fenders Ferry road leading into the Project recorded over 6,000 vehicles during the study period, with 29% heading past the Project facilities to points north (TM-22 Table A1-1, p. A1-4). While the Licensee notes that upgrades to Pit 7 Powerhouse and the Hogback Communication Site occurred during this period and therefore increased the volume, it is also true that these sites are Project facilities. The Forest Service proposes shared maintenance of this road with the Licensee under an MOU proportionate to the share of each parties use.

Roads 35N46 – Reynolds Basin, and 35N93 – Hog Back Mtn:

In 1963, a fire lookout was proposed on the Hogback Mountain site to provide visual fire detection in the newly developing Pit 6 and Pit 7 areas where Licensee's hydroelectric construction was occurring. The 1963 Multiple Use Impact Report states that:

> "Little Round Mountain Lookout, although relatively close to the project area, is completely blocked out from viewing any of the critical areas by a ridge close to the lookout. Studies have been made of Hogback Mountain as a possible replacement site and results indicated this would be a highly desirable move to make. The U.S.F.S. and the State are in agreement that a lookout station should be built on Hogback Mountain as early as possible. A low standard road now exists to the proposed site" (USDA, 1963a, p. III-B-3).

Construction of the fire lookout was followed by installation of Communication equipment by the Licensee for regulation of the dams. Since Project construction in the 1960's, fire detection techniques have changed and lookouts have been abandoned, including the Hogback lookout. While the Licensee communication site remains, the Forest Service has no further need for the site. Authorization for the Communication equipment is by Special Use Permit to the Licensee. The Forest Service proposes shared maintenance of these access roads (35N46 and 35N93) with the Licensee under an MOU proportionate to the share of each parties use.

Pit 6 Powerhouse Road, Road 35N23 – Pit 7 Road, Road 35N66 – Fenders Flat:

The road to Pit 6 and Pit 7 powerhouses are currently designated as Project roads and will remain as such with all maintenance by the Licensee. A limited amount of recreation development is planned for the Pit 7 reservoir (small parking area and trail) to allow for fishing access to the reservoir.

The access road to the Fenders Flat Afterbay dam (35N66) is a popular fishing access to the river and Afterbay below the dam, and new recreation facilities are proposed to manage this use. Improvement of the site with picnic tables, pedestal grills, vault toilet and trash receptacle and Project Patrol will improve the site and limit trespass onto the v-notch weir. This road is currently designated as a Project road and will remain as such with all maintenance by the Licensee.

RECREATION, SIGNS, AND VISUAL QUALITY CONDITIONS

Conditions 30, 30a, 31 and 32

a. Guidance

Shasta-Trinity National Forest Land and Resource Management Plan
Forest Goals

- Manage the Shasta-Trinity National Forest land base and resources to provide a variety of high quality outdoor recreation experiences (4-5.22).
- Encourage use of the Forests by the disadvantaged, physically challenged, and minorities (4-5.24).
- Develop or expand opportunities for scenic drives and vista points (4-5.37).
- Emphasize sport fisheries as a major recreation activity by expanding recreational fisheries opportunities (4-4.12).
- Maintain a diversity of scenic quality throughout the Forests, particularly along major travel corridors, in popular dispersed recreation areas, and in highly developed areas (4-5.38).

Standards and Guidelines:

- Trails will be maintained as needed for specific management objectives. Erosion control and primary access will receive priority (4-17.7j).
- Trails and trail bridges will be located, designed, constructed, and maintained so that they are suitable for the type of travel being served (4-17.7l).
- During licensing procedures, require Licensees to develop, operate, maintain, or replace recreational facilities. The need for these actions will be generated by the Project in proportion to its size (4-20.k)
- Bury penstocks and powerlines, where feasible and desirable, for resource mitigation. This mitigation will be determined by environmental analysis (4-20.o).
- Ensure that Environmental Impact Statements (EIS's) and/or Environmental Assessments (EA's) for hydroelectric projects evaluate and propose mitigation measures for secondary, and/or side effect of projects, such as crew housing, recreational needs, and law enforcement problems (4-20.p).
- During the project planning phase, consider the need for construction of trails, roads, and/or recreational facilities. The intent is to maintain or

enhance current use and mitigate adverse impacts during construction (4-20.q).

- Licensee will adopt the Forests' design motif and standard details to coordinate recreational/visual standards (4-20.r).
- Manage activities and projects to meet adopted Visual Quality Objective (VQO's) of: (1) preservation (P); (2) retention (R); (3) partial retention (PR); (4) modification (M); or (5) maximum modification (MM). On rare occasions the adopted VQO may not meet management's objectives (i.e., catastrophic events). Any proposed modification to adopted VQO's must go through the NEPA process and be approved by the Forest Supervisor (4-27.21a).
- Manage developed recreation sites according to the Recreation Opportunity Spectrum (ROS) classes (4-23.a).
- Provide barrier free recreation facilities that are accessible to physically challenged individuals (4-24.c).
- Prepare objectives and prescriptions for managing vegetation in and around developed recreation sites (4-24.d).
- Provide interpretive services to direct visitors to their recreation destinations, to facilitate understanding of resource management activities, and to acquaint them with unique or special features on the Forests and the function of forest ecosystems (4-24.g).
- Continue to improve access to rivers, streams, and lakes for water-oriented recreation activities consistent with the Aquatic Conservation Strategy. Continue to provide access to hunting, fishing and wildlife viewing (4-24.m).
- Mitigate the physical impacts of increased, dispersed recreation use. Rehabilitation efforts should respond to resource damage to soils, water and vegetation (4-24.o).
- Encourage the private sector to help provide needed recreation sites, facilities, and services with a development level consistent with the environmental setting and appropriate studies (4-24.t).

Riparian Reserves and Key Watersheds:

- New Recreation facilities within Riparian Reserves, including trails and dispersed sites, should be designed to not prevent meeting Aquatic Conservation Strategy objectives. Construction of these facilities should not prevent future attainment of these objectives. For existing recreation facilities within Riparian Reserves, evaluate and mitigate impact to ensure that these do not prevent, and to the extent practicable contribute to, attainment of Aquatic Conservation Strategy objectives (4.56.a).
- Adjust dispersed and developed recreation practices that retard or prevent

attainment of Aquatic Conservation Strategy objectives. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities and/or specific site closures are not effective, eliminate the practice or occupancy (4-56.b).

McCloud River/Pit Management Area Supplement Management Direction:

- Where the opportunity arises, acquire public access along the McCloud River and Squaw Valley Creek (4-123.7).
- Continue to develop trail access to and along Squaw Valley Creek and the McCloud River (4-123.8).
- Evaluate whitewater boating opportunities (4-123.9).
- In cooperation with private landowners, Licensee and the DFG manage the Upper and Lower McCloud River and Squaw Valley Creek under a CRMP (4-123.11).
- Manage the Pit River for dispersed, water-oriented recreation opportunities (4-127.5).

Monitoring Action Plan (5-10, 11)

- Implementation of Recreation Opportunity Spectrum (ROS).
- Determine if recreation management direction meets expectations of visitors.
- Determine if critical recreation resource attributes for each ROS class are protected from degradation.
- Determine if actual use compares with projections.
- Condition of developed sites
- Recreation Management and facility costs.
- Determine effectiveness of off-highway vehicle plan in protecting Forest resources.

b. Rationale to support license condition(s):

Surveys and studies conducted for the relicensing of the McCloud-Pit Project support the Forest Service belief that an increasing number of Project users is translating into a strong demand for more and improved facilities with an extended season of use at the Project reservoirs and facilities. In addition to the Rationale provided below, the Forest Service May 19, 2009 response to Licensee's Draft License Application provides substantial discussion on Project nexus and the need for recreation mitigations, and is incorporated here by reference.

General

Many of the responses note the inadequate toilet facilities and lack of Project patrol. All day-use facilities should have restrooms, potable water, animal proof trash receptacles, and regular Project patrol to keep sites clean, safe and sanitary.

Fishing is the number-one use at the McCloud and Iron Canyon Reservoirs, much of it boat based. While the McCloud boat ramp is over capacity and the Hawkins Landing ramp lacks adequate slope, study results indicate that all reservoirs are still under capacity for surface use. For the McCloud Reservoir, results indicate that boat-based fishing concentrates in the upper arm of the reservoir (RL-S3, TM-23) while higher speed boating occurs in the main body of the reservoir. Occasional high-speed use on the upper reach of the McCloud Reservoir generates complaints from fishing boats, and several respondents requested slower speed limits in the upper reach to prevent conflicts and increase safety in the future. Higher speeds are not uncommon on Iron Canyon reservoir and conflicts may develop as facilities improve.

Winter storm debris on the reservoir surfaces accumulates at access points and at the boat ramps partially blocking access. Large floating debris also creates a boating hazard on reservoir surfaces.

Better management of reservoir surfaces with various access points, surface speed restrictions, and debris removal would allow surface use to continue to grow safely.

McCloud Reservoir

Surveys (RL-S1) indicate that nearly half of Project users are older (>55) day-use boaters who fish for over three hours at least twice a week. They are mostly from locations within Siskiyou County (McCloud, Mt. Shasta, Weed, etc.). While use was highest in the summer (80%), there is steady use during the spring (54%) and fall (44%), and even some winter use (10%). Several comments noted the congested ramp, limited parking, lack of potable water, lack of shoreline trails, and the need for a longer season of use. Results of the capacity study (TM-44, Table 1) confirmed this impression that the parking lot and boat ramp are over capacity in the summer months, and at or approaching capacity during the shoulder seasons.

Over-flights in 2007 and 2008 show boating use on McCloud Reservoir nearly every month of the year. Boats were observed all flight days from April – October and additionally on 50% of the flight days in February, and 60% of the flight days in March. Single flights were conducted in November and January and boats were recorded both days. If the season of available use is extended to include snow-free days in spring, fall and winter, it is clear that visitors will come.

Lack of facilities and limited access has also created conflicts at the single available dock. Several responses (RL-S1, TM-24) note the conflict between swimming, fishing, and boat launching at the McCloud Reservoir loading dock. Development of alternate day use sites, with access to the water, should alleviate the pressure and conflicts at the McCloud ramp from non-boating use.

In conjunction with fishing, camping is the next most desirable use for reservoir development. (RL-S1, TM-34). Despite the lack of facilities around McCloud Reservoir, the public still camps regularly at various dispersed sites, including Star City. Several sites receive steady use for both overnight camping and day use access for swimming and wading. Past use and comments received show a strong desire for an overnight facility at McCloud reservoir that is clean, safe and well maintained, as well as developed day use areas where visitors can swim or fish from shore or a dock.

Iron Canyon Reservoir

Iron Canyon Reservoir experiences fewer users than McCloud Reservoir and mostly from Shasta County (Redding, Burney, etc.). Congestion at Hawkins Landing boat ramp is less severe, however, very limited parking is available above the high water line. When vehicle travel below the high water mark is restricted by the Forest Service Travel Management Plan and License conditions, additional parking must be developed to accommodate both historic and anticipated future use. The shallow slope and large fluctuations of the reservoir do not lend themselves to improvements at this site. A new ramp must be developed where slope conditions are favorable and where the water does not recede so dramatically from the shoreline. A location near the Iron Canyon Dam would also allow for an expanded season of use since snow removal takes place by the Licensee all winter over the Oak Mountain road. When the ramp is snow-free, plowing the parking area at the new ramp would allow some recreation use of the reservoir outside of the peak spring/summer season. Lighting at both ramps (McCloud and Iron Canyon) would provide more safety for surveyed users who fish early or late in the day when fish are more active, especially in the shoulder seasons when daylight hours are limited.

Existing dispersed camping around Iron Canyon reservoir points to a demand for shoreline development near portions of the reservoir where drawdown is less dramatic. Although the two existing campgrounds (Deadlun and Hawkins) provide nearly 40 campsites, occupancy is at or below capacity during the recreation season (TM-44, p. 4). In contrast, recreation surveys found 22 dispersed use campsites around the shoreline of the reservoir (TM-16, p. 22). Many of these included signs, campfire rings, and hand-built toilets. The pattern indicates a need to relocate the camping opportunities away from the shallow fingers of the lake and towards the deeper areas where water remains accessible during most of the recreation season. When alternate facilities are available, closure of some or all areas to dispersed

overnight use should be considered to alleviate on-going resource concerns including soil erosion and compaction, sanitation, visual, loss of vegetation, cultural impacts, etc. If current dispersed use is eliminated without providing desired shoreline facilities, public dissatisfaction, law enforcement issues, and additional resource damage would likely result.

Although exact locations to move Deadlun Campground need field verification next year (and prior to Final Section 4(e) conditions), past field reviews identified likely suitable locations along the north shoreline where deeper water is in close proximity to NFS land. These sites were identified in Licensee's 1972 "Revised Recreation Use Plan Iron Canyon Reservoir McCloud-Pit Project FPC No. 2106". These areas would best serve the recreating public because they are adjacent to the main reservoir where waters are deeper, rather than at the end of the arms where reservoir elevation fluctuates greatly. Deadlun Campground was only constructed beyond the terminus of the Deadlun Creek Arm because at the time of construction this was the only NFS land with topography that allowed construction of a campground. Since then, a land exchange around Iron Canyon Reservoir has resulted in much better sites for a campground(s), and are in fact locations the public currently uses for dispersed camping. Thus, reconstructing Deadlun Campground in its existing location, as proposed by Licensee, would result in continued under-utilization, not meet public demand, not achieve Forest Service recreation management objectives, nor address current resource concerns.

Pit River

Use on Pit 6 and Pit 7 reservoirs remains very light due to steep slopes and limited access. Options exist for expanded access to Pit 7 reservoir either from the Pit 6 access road or from the Pit 7 dam. If surveys show that use has grown at this site during the next license period, additional options (such as new trails or hand-launch boat access) may be considered. Because of the low Recreational Opportunity Spectrum on much of the two reservoirs, development would continue to be low and of a primitive nature.

Fishing is the primary use at the Pit 7 Afterbay site, both at the v-notch weir and as access to the Upper Pit River arm of Shasta Lake. Improvement of the small boat launch should help to move use below the v-notch and direct use to authorized areas. Trespass onto the v-notch weir remains a safety concern and the proposal to develop an alternate site near the base of the Pit 7 dam with development of the micro-hydro is intended to offer an alternate, safer opportunity to fish the Afterbay. Monitoring results during the next license will be used to evaluate other options if trespass continues and use remains high.

McCloud Reservoir Constraints

When the 2106 Project license was issued in 1961, the Forest Service and the Hearst Corp. were completing a land exchange to consolidate ownership in a checkerboard area of the Forest. The Forest Service did not intend to manage recreation in the McCloud River area, and was disposing of NFS lands around what would become McCloud reservoir. To provide for public access to the newly created reservoir, the Hearst Corp. donated roughly 95 acres of land around the southern shore to the Forest Service. While it is clear that the public has benefited from both the Project and the donation, the Project boundary and deed covenant have been problematic.

Public pressure to reach the water has grown and has lead to site damage, trespass, and sanitation concerns, especially at Star City. The Hearst Corp. has raised concerns regularly about wildfires and unmanaged public use (correspondence Hearst Corp to District Ranger, various years). Closure of the Star City site to overnight camping would require constant policing, would be questionably successful, and would not meet the intent of managing Project-induced recreation. Alternate facilities are not available to McCloud recreation users. Results from the recreation inventory (RL-S2, TM-16) identified nine user-created dispersed recreation sites around this reservoir. The data confirmed information from Forest Service Law Enforcement and Recreation staff regarding popular dispersed locations around the reservoir. The Forest Service recommends redefining the Project (and private property) boundary to the outside edge of the two roads circling the south half of the reservoir (38N11 and 38N04Y roads). This would allow the Project to include all of the public recreation sites and their access roads, and reduce the potential for trespass. Development of overnight and day-use areas around the southern shoreline would provide a managed opportunity with resource protection on NFS land, and security for the adjacent private lands.

Project Nexus to Lower McCloud River

The Forest Service believes that a clear Project nexus exists to the Lower McCloud River based on documents developed at the time the Project was issued a license in 1961, and that the Project had a direct affect on access and use of the Lower McCloud River once the Forest Service acquired the land and associated access in the mid to late 1960's. Additionally, the Forest Service believes relicensing study results support the nexus, as does the anglers on-going concerns that changes to Project instream flow below McCloud Dam will adversely affect their angling experience. Thus, the Forest Service disagrees with Licensee's statements in the July 27, 2006 Pre-Application Document (PAD), February 2009 Draft License Application (DLA), and the July 2009 Application for New License (FLA), where Licensee concluded that no Project nexus exists with the Lower McCloud River, and

concludes that Ash Camp and Ah-Di-Na Campground could become Project facilities within the new license. The Forest Service is willing to work on developing an alternate agreement outside of relicensing between the Forest Service and the Licensee, and approved by the Forest Service for rehabilitation and management of these facilities, as discussed in Condition No. 30a.

Specifically, on P. E1-11-12 of the July 2009 License Application their argument states:

> "The road to the Ah-Di-Na area was originally constructed to access a homestead. Later the USFS improved the road (designated Forest Road 38N53) and built Ah-Di-Na Campground and Ash Camp to address the recreation that was occurring on the Lower McCloud River, long before the Project was constructed."

The discussion of facts below shows why the above statement is incorrect.

FERC License 2106 was issued to Licensee in 1961 when the National Forest ownership did not include the Ah-Di-Na or Ash Camp areas, and public access to the lower river corridor did not exist. Contrary to the Licensee's assertion, acquisition and consequent Forest Service construction followed (not predated) license issuance. Historical records from the period of construction indicate that the campgrounds were built in order to accommodate increased and projected public use as a direct result of Licensee's McCloud-Pit hydroelectric Project.

<u>Project Chronology:</u>

1955: Initiation of Hearst Land for Land Exchange with U.S. Forest Service
1961: Federal Power Commission issues License 2106 to PG&E
1963: Forest Service prepares 5430 Hearst Exchange Report and MOU
1963: Forest Service prepares Multiple Use Impact Report for Pit-McCloud Project
1965: Deed recorded for Hearst/USA Land Exchange
1965: Date of Commission Unit No. 2 @ James B. Black Powerhouse
1966: Forest Service begins recreation developments at Ah-Di-Na
1966: Date of Commission Unit No. 1 @ James B. Black Powerhouse
1969: Hearst donation to USA for land around McCloud Reservoir

In 1955, the Forest Service and the Hearst Corporation began negotiating a land-for-land exchange in the McCloud River drainage that included lands below what would become McCloud Reservoir. The goal of the exchange was to "consolidate within the upper portion of the Hearst holdings for their land management, and to consolidate National Forest land in the southern portion." (Chapter I. Introduction, <u>Hearst Corporation Exchange Land for Land</u>, USDA, 1963b).

During this period, the FPC issued license 2106 to Licensee for construction of the McCloud Pit Project. The land exchange package appraised both the offered and selected lands in light of the new McCloud reservoir and the opening of public access to the river below the dam. The exchange report states:

> "Of impact on the exchange area, is the current development of the Pacific Gas & Electric Pit-McCloud hydroelectric power project. As a part of this project, the McCloud Reservoir is being constructed within the southern area of the selected lands. In order to protect the public's interest in this Reservoir, agreement has been reached with the Hearst Corporation on access to the Reservoir and the use of the Reservoir by the public. Of prime importance in consideration of the exchange are the recreational aspects. Currently all the area south of the town of McCloud, that is, along Squaw Valley Creek and along the McCloud River to where it enters Shasta Lake, for many years has been closed to public access." (USDA, 1963 b).
>
> "With development and completion of the McCloud Reservoir… this area, too, will provide fishing and boating recreation for the public. With the consummation of the exchange the area south of the Reservoir will also be open to public fishing. Because of the terrain, the area immediately adjacent to the McCloud Reservoir is considered unusable from a recreation development standpoint. However, an area south of the Reservoir offers one of the more desirable sites….This area, located at Ah-Di-Na, is immediately adjacent to the McCloud River" and "represents the bulk of the potential recreation land in the vicinity of the McCloud Reservoir." (Chapter IV-3 Physical Description, USDA, 1963b. IV-3).
>
> "Releases from the lake are fixed at a minimum of 160 cubic feet per second. This will result in considerably less flowage in the Lower McCloud River than currently exists….This in effect will enhance the value of the Lower McCloud River by reducing the volume of water and thereby the threatening nature of the McCloud River itself." (Chapter IV-3, USDA, 1963b. IV-3).
>
> "The area located at the junction of the McCloud River and Hawkins Creek consists of 96 acres, a portion of which is located on the opposite side of the McCloud River from the access. The accessible area would provide sufficient room for several overnight campsites." (Chapter IV-3, USDA, 1963b. IV-3).

The land exchange appraisal established three separate values for the identified lands; 1) Timber value, 2) Natural land value, and 3) Special or Recreation land value. Of the total acres offered, 608 acres were appraised reflecting additional

values by their location with respect to the McCloud Reservoir. Recreation lands included potential recreation land at Ash Camp and Ah-Di-Na. The 1963 Land Exchange report states:

> "McCloud Reservoir will be a major attraction in this area and with its completion access to this area will be much improved. Development in the Ah-Di-Na area will benefit both by the reservoir and by the Lower McCloud River. The reduction in volume of the McCloud River from its existing volume to 160 cubic feet-per-second minimum will undoubtedly enhance the value of this river area. Many recreationists (sp) prefer to associate with a smaller, not so threatening stream, rather than the existing McCloud River" (Chapter IV-4, USDA, 1963b). IV-4).
>
> The report concluded, "Offered Unit #7 is the most desirable site in the entire exchange area. It consists of 187 acres of excellent recreation land at Ah-Di-Na. Its proximity to the McCloud Reservoir dictates that it will ultimately serve the recreation pressures resulting from the construction of the Reservoir." (Chapter IV-9-4, USDA, 1963b. IV-9)

With the land exchange, all public lands around the reservoir were traded. Under the terms of FPC license 2106, the project called for a "comprehensive plan for improving and developing the McCloud and Pit Rivers …and for other beneficial uses, including recreational purposes." (United States of America, Federal Power Commission, Project No. 2106, Order Consolidating Proceedings and Issuing License (Major). Issued August 18, 1961, Condition 9, P. 8).

In order to provide for these "recreational purposes," in March of 1963, the Hearst Corporation and the Forest Service signed a Memorandum of Understanding identifying how this condition would be met. The two parties agreed that the Hearst Corporation would donate to the Forest Service roughly 95 acres of land in a strip between the 2680-foot contour (high water mark) and the Project boundary along the southern shore of the reservoir to provide for public recreation access. The MOU identified likely recreation sites (Star City and Tarantula Gulch) and the necessary road rights of way to access these sites. The MOU included provisions to lease additional areas of private land to the Forest Service for developed recreation facilities. The donation was contingent upon signature of the Patent Deed (signed June 10, 1965) and was consummated in 1969.

In a May 16, 1963, letter from Regional Forester Chas. A. Connaughton to the Chief of the Forest Service, the Regional Forester lays out the reasoning behind the Memorandum of Understanding and future donation between the Hearst Corp. and the USA:

> "The exchange proposal was initiated before the F.P.C. license was issued to Licensee. At that time, COPCO's application for license was still pending with Squaw Valley as the impounding reservoir and with a series of diversions and power plants down the river. With the change of the licensee and project plans, certain changes were made in the land adjustment or exchange proposal. The present plan is to provide for full public use of the south half of the reservoir by making available the project lands south of Star City and Tarantula Creeks… The parcels of non-project National Forest lands around the reservoir are in the exchange proposal. Thus, the public would be restricted to the water surface and to the National Forest land within the project boundaries south of the two Creeks. In effect, the "Understanding" is to provide two public access routes to the south half of the water body with access from the town of McCloud on the north as well as from the Pit River area to the south, and in addition, access to the lower McCloud. The campgrounds will be along the lower McCloud and Hawkins Creek, the nearest over a mile south of the dam."

On December 12, 1963, the Shasta-Trinity Forest Supervisor signed the Pit-McCloud Project Multiple Use Impact Report (MUIR) (USDA, 1963a). The Impact Report identified: Project impacts to the National Forest; consistency with current management plans; and recommendations to limit or mitigate the McCloud-Pit Hydro Project impacts on each resource area, including recreation. The Impact Report states:

> "In consequence of the nearly complete private control of the project area, no public recreation or fishing exists on or in the vicinity of the project area on the McCloud River from the [McCloud] Falls to Ah-Di-Na, a distance of approximately 15 miles…." (USDA< 1963a, p. I-5).

In 1963, the McCloud District Multiple Use Management Plan proposed that the area around the future McCloud Reservoir be dropped from further consideration for public use and be managed strictly for timber. All public permits were canceled in preparation for the change. (USDA, 1963a, p. I-6).

With development of the Project, the Forest Service made several recommendations in the Impact Report to modify the current management plans and protect resources within the Project area. The Impact Report states that a field survey was completed in the spring of 1963 to identify all sites suitable for recreation development. That inventory identified three general areas: A) Fenders Ferry Recreation Area, B) Iron Canyon Recreation Area and C) McCloud Lake Recreation Area, which is described as:

> "… the southern portion of the McCloud Reservoir, about three miles of the McCloud River, and Hawkins Creek. All this area, previously closed to public access, is partially dependant for development upon completion of the pending land exchange with Hearst Corporation." (USDA, 1963a, p. IV-E-16).

Estimated recreational development includes 16 specific sites (12 on the Lower McCloud River or Hawkins Creek) including the Ah-Di-Na and Ash Camp Campgrounds. (USDA, 1963a, p. IV-E-20-22).

The Impact Report describes the McCloud River as "one of the most famous trout streams in the world" (MUIR p. IV-C-1). The "Project is located in a relatively undeveloped section of the Shasta-Trinity National Forest…Private control of access in the McCloud and Iron Canyon areas, and the steep topography of the Pit have kept these areas remote to general public use" (USDA, 1963a, p. III-A-1).

Documents completed during Project planning in the 1960's provide clear evidence of a nexus between the McCloud-Pit Hydro Project and recreation on the Lower McCloud River. The Forest Service (and other parties involved in these documents) clearly understood that Project impacts extended well beyond the inundation line of the reservoir and would significantly change the recreation use patterns in the Lower McCloud River. Because lands in the vicinity of the proposed McCloud Reservoir and lower McCloud River were in private hands at the time of License issuance (1961), the License did not require the development of a Recreation Plan similar to the one created for the Iron Canyon Reservoir and Pit 7 Afterbay portions of this Project. It is clear, however, that with the impending land exchange, the immediate need for recreation facilities was expected and anticipated.

Appraisal rates were modified for the specific areas at Ah-Di-Na and Ash Camp to account for their increased recreation value. Reduced flows from Project operations were expected to draw fishing enthusiasts and create a demand for overnight use along the river once public access was open. The Forest Service modified the Multiple Use Management Plan in order to emphasize public recreation in these locations rather than timber management as previously expected. The 1963 Impact Report specifically addresses campgrounds to be constructed on the lower McCloud River as a result of the land exchange induced by the McCloud-Pit Hydro Project.

Current use of both Ash Camp and Ah-Di-Na Campgrounds, and the publically managed lands along the Lower River is high. The campgrounds are at or approaching capacity (TM-44, Tables 2 and 3) during popular periods of the stream fishing season (April – June, and October-November), and user-created trails have developed along the river corridor between the two sites. In addition, a small but steady amount of whitewater boating occurs on the river even without support

facilities or specific access (RL-S3). Both the quality of the rapids and the clear, clean water draw boaters looking for more remote wilderness experiences. Existing facilities along the lower river are reaching or have reached their useful life and upgrades are needed to continue to serve the public demand.

Protection of significant Native American resources is a key component in management and maintenance of the developed sites and use of dispersed sites.

FIRE MANAGEMENT AND RESPONSE

Condition 33

a. Guidance

Shasta-Trinity Land and Resource Management Plan
Forest Goals

- Restore fire to its natural role in the ecosystem when establishing the Desired Future Condition of the Landscape (4-4.10).
- Achieve a balance of fire suppression capability and fuels management investments that are cost effective and able to meet ecosystem objectives and protection responsibilities (4-4.11).

Standards and Guidelines

- All wildland fires, on or threatening private land protected by agreement with the State of California, will receive a "control" suppression response (4-17.b).
- Activity fuels that remain after meeting wildlife, riparian, soil, and other environmental needs will be considered surplus and a potential fire hazard. The amount and method of disposal will be determined in the ecosystem analysis (4-17.c).
- Plan and implement fuel treatments emphasizing those treatments that will replicate fires natural role in the ecosystems (4-18.d).
- Natural fuels will be treated in the following order of priority: (1) public safety; (2) high investment situations (structural improvements, powerlines, plantations, etc.); (3) known high fire occurrence areas; and (4) coordinated resource benefits, i.e., ecosystem maintenance for natural fire regimes (4-18.e).
- Consider fuelbreak construction investments when they compliment Forest health/biomass reduction needs, very high and extensive resource values are at risk and to protect Forest communities (4-18.f).
- Design the fire prevention efforts to minimize human-caused wildfires commensurate with the resource values-at-risk (4-18.g).

Management Prescriptions
Late Successional Reserves (4-40)

- Fuels management in Late-Successional Reserves will utilize minimum

impact suppression methods in accordance with guidelines for reducing risks of large-scale disturbance. Plans for wildfire suppression will emphasize maintaining late-successional habitat.

- In Riparian and Late-Successional Reserves, the goal of wildfire suppression is to limit the size of all fires.

Riparian Reserves and Key Watersheds (4-56, 57)

- Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.
- In Riparian reserves, water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with Aquatic Conservation Strategy objectives.

McCloud River/Pit Management Area Supplement Management Direction

- Utilize natural fuels reduction to protect special habitat areas and forest investments (4-127.2).

b. Rationale to support license condition(s):

The Fire Response and Prevention Plan license condition would provide protection for Forest resources by requiring the Licensee to plan and prepare for responding to wildland fires as well as implementing fuel treatments around recreation sites where potential fire risk is greater. If a fire occurs, the Licensee response would minimize damage to NFS land and resources, especially in Late Successional Reserves and Riparian Reserves.

Survey results from RL-S7 (Project Wildfire Hazards) did not find any documented fires within the Project boundary. Management in the Lower McCloud River and Iron Canyon regions must be consistent with the goals of Late Successional Reserves and Riparian Reserves while management in the Pit River Canyon must be consistent with the guidelines for Administratively Withdrawn Areas. Both designations favor low impact fire suppression tactics, and fuelbreak development around specific resources, recognizing that the limits to land management activities in the past may present higher fuel loading in the region surrounding the Project. The 4(e) condition is intended to provide for shaded fuel breaks, and fuel treatment where the risk from Project-induced human caused (recreation, vehicles,

maintenance) fires may be higher, while protecting the late successional qualities of the surrounding landscape. The condition is also intended to facilitate communication between the Licensee, private landowners, and affected agencies in fire emergencies.

HERITAGE RESOURCES

Condition 34

a. Guidance:

Shasta-Trinity Land and Resource Management Plan
Forest Goals:

- Preserve and interpret significant historic and prehistoric sites for the benefit of Forest visitors (4-4.5).
- Provide archeological research opportunities for the professional community (4-4.6).
- Develop partnerships with Native American tribes and organizations to enhance those cultural resources that reflect their heritage (4-4.7).

Standards and Guidelines:

- Provide for Native American needs for collection and/or use of traditional resources (4.16.a).
- Protect traditional Native American rights and practices (cf. P.L. 95-341) to ensure that access to sacred sites will continue and use will not be impaired (4-16.b).
- Manage heritage resources, including "Archaeological Interest"- 36 CFR 296, not covered by Forest Standards and Guidelines or Prescription XI, according to the Shasta-Trinity National Forests' Manual Supplement to Forest Service Manual (FSM) 2361(4-16.c).
- Evaluate heritage resources that might be effected by Project activities for eligibility to the National Register of Historic Places (NRHP). This will be done in consultation with the State Historic Preservation Office as well as interested parties (4-16.e).
- Identify sites that will require protection (e.g., by signing and/or flagging) prior to implementation of management activities adjacent to the site (4-16.f).
- Sign Heritage Resources in areas of recreation only if visitor use is impairing the site's values or if the site is to be interpreted (4-16.g).
- Historic sites, unless assigned to Prescription XI, will not be enhanced or interpreted. They will be managed so that the site is not adversely affected and no hazard is caused to the public. Modifications to historic structures must be compatible with standards and guidelines issued by the Department of the Interior and the Advisory Council on Historic

Preservation (ACHP) (4-16.h).

- Mitigate adverse effects to heritage resources that are eligible for the NRHP, according to direction issued by the Department of the Interior and the ACHP (4-16.i).

Prescription XI. Heritage Resource Management

- Heritage Resources will be protected primarily by locating trails and camp sites away from sensitive areas. Recreational activities and development will be limited in such a way that visitor use does not take place on or in the immediate vicinity of cultural resources, unless it is an interpretive activity (4-50.1).
- Archaeological and ethnographic surveys will be designed to inventory the area so that all cultural resources are located and recorded (4-50.2).
- All cultural resources associated with this prescription will have a protection plan that specifies the need for signing, patrolling, flagging, etc. Periodic monitoring of sites will also be conducted as needed, to determine success of protection efforts (4-50.3).
- Consult with Native Americans so that management direction can be developed for those areas having cultural importance and that they may participate in watershed/project planning to assure that Native American concerns are addressed as part of the process (4-50.4).
- No new road or trail construction will be allowed unless approved by the Forest Supervisor. Reconstruction will be allowed only if adverse effects are not created (4-51.6).
- Off-highway vehicle (OHV) use will be prohibited (4-51.8).
- Management activities should be compatible with Semi-Primitive Non-Motorized or Semi-Primitive Motorized Recreation Opportunity Spectrum (ROS) guidelines dependant on the level of interpretation proposed for the sites (4-51.10).
- All projects, proposals, and activities must proceed in full compliance with Section 106 of the National Historic Preservation Act, including Special Use Permits (4-51.12).

McCloud/Pit Management Area Supplemental Management Direction

- Conduct a thematic study of the archaeological sites representing the Native American uses of the McCloud River. Emphasize sites that are being disturbed by dispersed recreation activities such as Ash Camp, Camp 4, Four Mile Flat, and Ah-Di-Na. Pursue partnerships with Shasta College, California State University Chico, or other institutions (4-123.1).
- Interpret archaeological sites along the McCloud River in areas where

visitors are already being directed (4-123.2).

- During project level planning, identify cultural and historical values. Manage significant sites under Management Prescription XI (4-127.9).

Monitoring Action Plan (Table 5-1)

- Investigate disturbances of Native American religious/sacred places (5-6).
- Investigate disturbances of Native American traditional resource areas (not religious) (5-6).
- Check adequacy of site protection measures (5-6).
- Determine thoroughness of field identification of sites; datum tagging (5-6).

b. Rationale to support license condition(s):

In developing the cultural resource terms and conditions, the Forest Service gave due consideration to the current condition of these resources as demonstrated by relicensing study results, other reasonably available data, and literature. Much of this information is contained in the McCloud-Pit Hydroelectric Project Application for New License (July 2009).

Since many of the historic properties are on lands managed by the Shasta-Trinity National Forest, the Forest Service retains legal responsibilities for management of those historic properties. Federal historic preservation laws and regulations include but are not limited to the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR 800, AIRFA (American Indian Religious Freedom Act), ARPA (Archaeological Resources Protection Act), and NAGPRA (Native American Graves Protection and Repatriation Act). Existing recreation use has created impacts to many of these sites and mitigations will be needed to further protect these resources as recreation use grows during the next Project license term.

Study results from CR-S1 have determined that there are approximately 33 archeological sites within the project APE, 22 of which lie on federal land managed by the Shasta-Trinity National Forest. Study results from CR-S2 for the Pit River Tribe have determined that there are approximately 22 ethnographic sites within the project APE, nine of which lie on federal land managed by the Shasta-Trinity National Forest. Completion of CR-S2 for the Winnemem Wintu Tribe is likely to reveal additional ethnographic places.

Many of these sites were previously known and recorded and three sites along the Lower McCloud River (Ash Camp, Ah-Di-Na, and Fitzhugh Gulch) are designated as Prescription XI sites (i.e. heritage resource management emphasis) in the Shasta-

Trinity Land and Resource Management Plan. Existing recreation use has created impacts to many of these sites and mitigations will be needed to further protect these resources as recreation use grows.

Data collected for the relicense has included many areas along the Lower McCloud River that have not been evaluated in several decades and now benefit from the larger picture of known resources along the river. The high density and quality of these sites may support the consideration of a larger Historic District that would connect these sites in time and space to a distinct period of occupation. The prehistoric resources on public lands, combined with the resources on the McCloud River Club and Nature Conservancy give added weight to this discussion. In addition, new information suggests that there may have been up to four Indian Allotments near Claiborne Creek, within the expanded APE.

Pre-construction surveys, with routine monitoring, are necessary to determine if degradation is occurring at known sites, and to develop mitigations to protect these resources.

Comments on Draft Heritage Properties Management Plan (HPMP) (PG&E, 2009 Volume IV, July 2009, Privileged)

General Comments:

This draft document does not contain complete study results, fails to incorporate previous Forest Service input, has not yet included formal consultation with Tribal Governments, and does not include collaborative development of Project-specific mitigations based on study results and other necessary components. It therefore needs to be labeled as a "Draft" document until approved by the Forest Service, tribes, and the Commission.

The bound copy of CR-S1 Part 2 is not paginated nor are the sites grouped geographically. Though requested during a cultural meeting September 23, 2009 with the Pit River Tribe in Burney, no cross walk has been provided for Part 2.

Directions to many of the sites in Iron Canyon Reservoir and datum descriptions are inadequate. Standard protocol on the Shasta-Trinity National Forest is to provide approximate mileage to a site from a given point on a road, and walking directions to the site if the site cannot be reached solely by road. Likewise, site datum's are usually described and their diameter (if a standing tree) is usually approximated.

ALB-12 (F.S. 05-14-61-601 (Old Bridge). Site record does not show location of bridge footings on new site map from 2009.

Specific Comments:

Page 1-8, Table 1.6-1. See also Page 7-1
There is no schedule for completion of the Draft HPMP for review by affected parties and approval by the Forest Service and the Commission. Collaborative meetings with the Forest Service and affected Tribes to complete the HPMP should continue during this period of license development until final completion of the document, as needed and should be facilitated. Changes should be made to the document on a laptop projected on a screen for collaborators to view. The Final HPMP must include complete and accurate site records as approved by the Forest Service on NFS lands, completion of the CR-S2 ethnographic Winnemem Wintu study or equivalent data, the identification of where current or proposed projects may affect historic properties, and specific mitigations to prevent impacts to these resources.

Page 3-2
See Forest Service rationale for Ah-Di-Na and Ash Camp as Project related recreation developments (Enclosure 2, p. 43-47), and Forest Service Section 4(e) conditions for Recreation Development and Management Plan (Enclosure 1, p. 42-43). Because both campgrounds contain Prescription XI sites, which are determined eligible to the National Register of Historic Places, the effects of the Section 4(e) conditions proposed and appropriate mitigations must be addressed. The Forest Service is proposing re-construction of these campgrounds to further enhance recreation while providing site protection through a recreation improvement strategy.

Page 3-3. Vandalism
Forest Service also provided this same comment in May 19, 2009, Forest Service response to Draft License Application. Change the word "only" to "major" in first sentence.

Page 4-2
First sentence at top of page, "All surveyed areas and areas that could not be surveyed are identified in Appendix C", change to "on maps in Appendix C."

Page 4-7, Table 4.1.2-1
Add FS number 05-14-61-39 to CA-SHA-969

Page 4-3
The Draft HPMP listed 55 sites within the APE. This list does not appear to include the new site found on the McCloud River. The Forest Service attempted to re-locate CA-SHA-969 (F.S. 05-14-61-39); during our search we found a new site and sent

preliminary information, with a GPS location point, to Albion in an e-mail on June 5, 2009. The Forest Service also provided this same comment in the May 19, 2009 response to the Draft License Application. Change all figures accordingly for number of prehistoric sites, number of new sites, etc.

Page 4-7
Add Forest Service Number 05-14-61-39 to the Table underneath CA-SHA-969. In text description of sites on McCloud River Club property, add F.S. 05-14-61-601 after aka ALB-12. Based on site records, Draft HPMP should approximate which sites are within the Project APE.

Page 4-7 through 4-10. Section 4.1.2.
The number of sites potentially within the expanded APE is erroneous based on the information from site records obtained from the Northeast Center of the California Historical Resources Information System. There are approximately 10 sites (though this number should be double-checked within the project APE). It may be possible to determine potential eligibility of some of the prehistoric sites on McCloud River Club property based on site descriptions and impacts described.

Page 4-14: Resources Identified within the APE
Results of the correlation between TCP's and archaeological resources should be addressed in the Draft HPMP as a separate chapter.

Page 5-1 General Treatment Measures
A Table is needed to summarize all of the general treatment measures that could be applied to historic properties, ethnobotanical gathering areas, and ethnographic places. A sample Table is provided here:

Table 2-15. Sample General Treatment Table

Site Type	General Treatment Measure Options
Prehistoric and Historic Archaeological Sites	Annual Site Monitoring or Scheduled Monitoring Erosion Control/Stabilization Padding/Filter Cloth Road Closures/Barriers Restrictive Signage Interpretive Signage
Ethnobotanical Gathering Areas	Prohibit use of herbicides Use of ethnobotanical or native plants for revegetation
Ethnographic Places	Annual Monitoring Restrictive Signage Redesign or realignment of existing infrastructure Restrictive Signage Interpretive Signage Road Closures/Barriers

Page 5-1
Third paragraph: "Because the McCloud-Pit Project is located.…" Add the word "partially."

Page 5-2
Title of Section 5.2 should be changed to "Current and Proposed Recreation Development/Improvement." Text already acknowledges proposed development or improvements.

Page 5-4
Another potential location for interpretive signs is at Ash Camp and Ah-Di-Na campgrounds.

Page 5-9: Management of Ethnobotanical Resources
CR-S2 dated September 2009, identified two gathering areas: ETH-50 and ETH-132. These should be addressed in the Draft HPMP, including proposed management of these areas since they are now documented. Because one area is on NFS lands, management should be in consultation with Forest Service. Forest Service requires that access is protected and herbicides are not used.

Page 5-13. Monitoring of Erosion/Siltation
The Forest Service supports the Licensee's proposal for an erosion/monitoring program. This program should be part of an appendix in the Draft HPMP and a reference for these types of studies cited in the Draft HPMP.

Page 5-14. Monitoring and Reporting Protocols
Blank or master Monitoring Log should be included in an Appendix to the Draft HPMP.

Page 5-15. Site Specific Monitoring
After baseline conditions are established, the Draft HPMP should document (in tabular form) proposed monitoring frequencies for each site, after consultation with affected parties.

Page 5-22 Curation of Recovered Cultural Materials:
Licensee should provide additional funding for curation of artifacts from any archaeological sites within the Project APE from Project-related activities to the two curation facilities, where appropriate: Pit River Tribe curation facility and the Shasta College Laboratory.

Page 6-2
Second paragraph: Additional information and discussion is needed to determine if there is compelling evidence for an archaeological and/or ethnographic historic

district along the Lower McCloud River. A District usually ties the sites and ethnographic places chronologically and contextually, and has a tangible/defined boundary. Since there is a cluster of sites that appear to have late period context with midden and house pits, and there is a plethora of ethnographic information, and Indian allotment information from a new thesis, an in-depth examination and thorough review of all documentation for this area is warranted to determine if a Historic District is warranted.

Table 6.1.0-1 should list the sites below the McCloud dam for proposed management.

Section 6. Site Specific Treatment Measures
General comments –

Update tables to reflect proposed treatment measures in text. Example: Page 6-20-CA-SHA-252 includes bank stabilization in text but not in Table.

The Forest Service recently re-visited a majority of sites around the Iron Canyon Reservoir. It appears that the location of three sites on the west side of McGill Creek may have been incorrectly located on new documents based on the locations in the original site records. In addition to the comment the Forest Service provided in our May 19, 2009, response to the Draft License Application, the Forest Service additionally notes that all of the sites within the reservoir pool area around Iron Canyon are being eroded and are subject to artifact dispersal due to Iron Canyon Reservoir operational fluctuations. Site specific treatment measures should be based on their potential eligibility to the National Register. The Forest Service proposes that all of the sites directly in the pool area be evaluated for their potential significance to the National Register through test excavations.

Page 6-25, Table 6.1.0-5
ALB-12, F.S. 05-14-61-601 (Claiborne Creek) – Project related effects include boater pull out and use by the McCloud River Club. The Forest Service proposes long-term photographic monitoring of this site. The Forest Service will also require McCloud River Club to obtain a Special Use Permit for an unauthorized bridge and trails on NFS lands.

Page 6-27, Table 6.1.-0-5
CA-SHA-686/H F.S. 05-14-61-08 (Ah-Di-Na) – Project related effects include the Licensee's gaging station that was built on top of an archaeological site. Thus, maintenance of the gage station and road access to it has effects on the archaeological site that require mitigation(s) to be included in the Draft HPMP.

Page 6-46, Traditional Cultural Properties
The results of CR-S2 for the Pit River Tribe are now available and should be incorporated into the Draft HPMP and not an amendment.

Appendix F
Resource Location Maps should include the Ethnographic data. Isolated find data are not necessary in the Draft HPMP.

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ENCLOSURE 3:
PRELIMINARY 10 (a) LICENSE RECOMMENDATIONS AND RATIONALE
IN CONNECTION WITH
THE McCLOUD PIT HYDROELECTRIC PROJECT
FERC NO. 2106,
PACIFIC GAS AND ELECTRIC COMPANY

Since the Forest Service authority does not extend to the entire Project, we are submitting terms where there are no direct or indirect effects to National Forest resources as 10(a) recommendations.

RECOMMENDATION NO. 1 - FOOTHILL YELLOW LEGGED FROG MONITORING PLAN

Within one year of license issuance the Licensee should develop and file with the Commission, a Foothill Yellow Legged Frog (*Rana boylii)* (FYLF) Monitoring Plan. At a minimum, the Plan should include: 1) An initial five-year study period to include both wet and dry season flows following initiation of the new flow regime. 2) Incremental monitoring of FYLF every four years (or period recommended by the CDF&G) after the completion of the initial study period. At a minimum, the study should include:

- Surveys for FYLF distribution within the McCloud River from Claiborne Creek to the intersection with Shasta Lake during the spring and summer to determine presence and life stage development.
- Descriptions of the physical features of all identified frog breeding sites including substrate, water temperatures at the onset of egg deposition, vegetative cover, water velocities at egg deposition sites, canopy categories, patch size, channel habitat type, evidence of predation, etc.
- Determination of whether changed instream flows result in breeding in newly inundated margins, or utilization of old sites that may now be deeper.
- Assessments of whether the new breeding sites: 1) connect with the summer lower flow channel; 2) remain as disconnected off channel water bodies; or 3) dry up entirely.
- Return visits to breeding sites and adjacent low flow areas that may be tadpole-rearing habitat to assess survival of tadpoles to metamorphosis. Beginning after hatching of larvae, revisit a subset of breeding sites every 3 weeks to determine survival and time of metamorphosis. To ensure comparability of density estimates, time and area constrained searches shall be used. This monitoring data will also be relevant to determining timing of young of the

year population metamorphosis (full tail reabsorbtion).

- Estimates of the number of adults at the onset of breeding at each breeding site.
- Monitoring of the time from egg deposition to hatching.
- Monitoring of tadpole numbers and life stage development using K.L. Gossner (1960) life stage categories.
- Monitoring of water temperatures annually in March through May to determine at what temperature breeding initiates and terminates. This information shall be developed into a predictive tool in future years to avoid untimely spills or flow fluctuations that could detrimentally affect FYLF recruitment.
- Take advantage of non-planned spring/summer high flow events to determine any correlation between these spill events and changes in tadpole or metamorph numbers from years when these spill events did not occur.
- Take advantage of the naturally (or Project induced) receding spring hydrograph to determine flow vectors at known breeding sites and their changes with flows.
- Reporting of survey results.

Rationale:

In order to ensure that flows proposed under the new license are not detrimental to existing or potential Foothill Yellow Legged Frogs (*Rana boylii*, Forest Service sensitive species), the Forest Service concurs with Licensee's proposal for a FYLF monitoring plan.

RECOMMENDATION NO. 2 – WHITE STURGEON AUGMENTATION PLAN

Within six months of license issuance Licensee should provide at least $5,000 annually for a program that would augment the existing stock of white sturgeon within Shasta Lake with small/young fish. The means by which this is to be done is to be determined by the Dept. of Fish and Game.

When and if the moratorium on the release of cultured white sturgeon into state waters is lifted, and in lieu of the above annual funding, the Licensee shall enter into a partnership with the Forest Service and the Dept. of Fish and Game for the purpose of rearing white sturgeon for release into Shasta Lake. The Forest Service would provide up to 10 fish cages, the Licensee would provide yearling sturgeon (up to 350 fish per cage) and supply the fish food annually. The Dept. of Fish and Game would provide the fish culture and fish disease expertise as well as transportation for the sturgeon from the aquaculture facility to the cages. The sturgeon would be raised for a period of 6 months. The agreement would cover a ten-year period, after which it could be renegotiated or terminated as needed, as determined by the Dept. of Fish and Game and Forest Service.

Rationale:

After the completion of Shasta Dam, but prior to the completion of the facilities for the Pit 6 and Pit 7 Powerhouses, white sturgeon (*Acipenser transmontanus*) utilized these reaches of the Pit River for spawning. The construction of the Pit 7 Dam blocked this run, thereby preventing the recruitment of new individuals to the land locked sturgeon population residing in Shasta Lake. As the population can no longer spawn, augmenting this population with young fish would provide a continuing supply of sturgeon to the lake, and would improve this sport fishery over time.

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