TES

Analysis of the Continued Use of Diablo Creek Water as a Component of the DCPP Makeup Water System

Prepared by

Nuclear Regulatory Services

and

Technical and Ecological Services

June 2, 1993

Report 420DC-93.462

Pacific Gas and Electric Company
Technical and Ecological Services
3400 Crow Canyon Road, San Ramon, California 94583

EXECUTIVE SUMMARY

At the request of the managers - Support Services and Operations Services, Nuclear Regulatory Services (NRS) has prepared an assessment of the use of Diablo Creek water as part of the DCPP operational water requirement. Three Alternative water supply scenarios have been developed. Each scenario proposes the continued use of Diablo Creek water at some level. In addition, each alternative addresses benefits to PG&E, risks, costs, regulatory compliance, and the protection and enhancement of natural resources within the Diablo Creek watershed.

Power plant water demand is 435 gpm, but 600 gpm must be delivered to the raw water storage reservoirs to offset production losses (i.e., brine rejection, evaporation, etc.). With completion of a proposed blowdown recovery system, raw water requirements will be reduced to approximately 200 gpm. Until then, makeup water must continue to come from the combined seawater reverse osmosis (SWRO) and Diablo Creek watershed facilities.

When comparing the variable costs of running the two different raw water supply systems, the SWRO is more expensive to run than the Diablo Creek pretreatment system (PTS) (see Section 5). This suggests that lower operating costs could be achieved if more water could be made available from watershed sources. However, historic flow records show that the maximum sustained rate at which stream water can be reliably delivered is 200 gpm. Therefore, more than 60% of the total makeup water requirement will continue to come from site wells and sources outside the watershed. If steam generator blowdown modifications are completed, it is conceivable that all of the plants needs could be derived from the SWRO.

We have reviewed existing and future regulatory agency requirements associated with our exercise of riparian rights on Diablo Creek. This includes future permit requirements for maintenance and improvements of water diversion facilities. No obstructions to securing necessary permits are anticipated.

A preliminary assessment of the ecology of the Diablo Creek watershed has been prepared (Appendix C). This environmental data aided the assessment of regulatory permit requirements for diversion of water from Diablo Creek. It also supports the developing Natural Resources and Land Stewardship Plan for PG&E Diablo Canyon properties. A brief summary of our findings follows.

Our studies have shown that surface water flow in Diablo Creek is intermittent seasonally over the lower 3 miles of stream channel. This includes areas below and above the points of diversion. We have also shown that rainbow trout are present in isolated pools throughout the stream. Riparian habitat below the diversions appears to be more extensive now than it was in he 1960s, before power plant construction. Of

those candidate rare plant species that could occur in the watershed, none are associated with riparian habitats. No state or federally listed threatened or endangered wildlife species are thought to occur within the watershed; however, the stream corridor could provide habitat for two state-designated sensitive species, the cooper's hawk and the western pond turtle, one federal candidate species, the California spotted owl, and two fully protected species, the golden eagle and ringtail. Detailed field surveys of all Diablo Canyon lands are currently underway to determine status of potentially occurring sensitive species. Results will be available in late 1993.

In evaluating potential water supply scenarios involving Diablo Creek, we have considered the effect of different withdrawal rates on the stream and near-stream ecology. On March 18, 1991, the project team met in a workshop where considerable attention was focused on this issue. It is our opinion that the aquatic resources of Diablo Creek are limited by low flow rates, particularly in the summer. Reducing or eliminating the diversion of water for power plant use would have some positive environmental effects, but is not expected to change significantly the carrying capacity of the stream for trout, or enhance the growth and vigor of the riparian community except under conditions of severe and prolonged drought. Opportunities for enhancement of natural resources within the watershed have also been identified.

Scenario 1

Scenario 1 calls for maximum flexibility in the use of Diablo Creek water for power plant requirements. Rate of withdrawal would depend largely upon the natural variation in stream flow and would have an upper limit determined by the capacity of the diversion and pretreatment facilities (400 gpm). This scenario differs little from historic water use practices (1968-present). As discussed in Section 3, these practices appear to be in keeping with a lawful exercise of riparian water right.

Continued use of Diablo Creek water, as described above, would significantly reduce the total cost of the makeup water requirement. This benefit must be weighed against the longterm reliability of the creek to supply the maximum volume of water, environmental impacts to the stream below the diversions, and the likelyhood of other property owners exercising their riparian rights to a share of Diablo Creek water.

Scenario 2

Scenario 2 is identical to Scenario 1 until a new blowdown recovery system is online. At that time, withdrawal rates are reduced to not more than one-half the natural flow rate from May 1 to October 31 of each year. Maximum withdrawal rates ($\leq$ 400 gpm) would occur only during the rainy season (November-April). This ensures sufficient water to support aquatic organisms and riparian plants through the summer-fall low flow period, while still allowing six months of least-cost operation.

Scenario 2 strikes a compromise between lower costs of operation and protection of the stream ecology. Scenario 2 also allows continuation of controlled livestock grazing, by continuing the availability of livestock water at three locations within the watershed.

Use of scenario 2 significantly reduces the risk that the permit process, required for planned facility improvements, will result in agency imposed mitigation requirements.

Scenario 3

Scenario 3 is identical to Scenarios 1 and 2 until construction of a blowdown recovery system. After the blowdown recovery system is operational water from Diablo Creek is not needed to meet makeup water volume requirements. Therefore, all diversions from the stream are curtailed and only well water continues to be pumped from the watershed.

This scenario reserves stream water entirely for the support of aquatic organisms and riparian plants throughout the year. The greater reliance on SWRO water makes this the least cost effective scenario. It is however, the most environmentally sensitive alternative.

Prepared by:

Michael E. Fry
Consulting Biologist

Approved by:

John W. Warrick
Supervising Biologist

CONTENTS

FIGURES

TABLES

Section 1

INTRODUCTION

At the request of the Managers - Support Services and Operations Services, NOS/ODES has prepared an assessment of the use of Diablo Creek water as part of the Diablo Canyon Power Plant (DCPP) operational water requirement. In preparing this assessment, the current importance of Diablo Creek in supplying a significant part of the DCPP operational water requirement is fully recognized. It is also recognized that significant repair and maintenance of the existing Diablo Creek water supply system is required to ensure its continued reliability. At present, water supplied by both the SWRO and PTS are just able to keep up with power plant demand. A new blowdown recovery system is being considered. This system will be capable of deferring over 300 gallons per minute (gpm) of makeup water production and associated brine. Therefore, the focus of this assessment has been to evaluate a range of options for continued use of Diablo Creek water, up to and beyond the date when a blowdown recovery system comes on-line.

The following specific goals were established to guide the development of these alternatives:

1. Ensure continued availability of Diablo Creek water for use in power plant operations.

2. Achieve full compliance with all laws, regulations, and permit stipulations relating to the operation and maintenance of PG&E facilities located within the watershed and affecting the natural resources of the watershed.

3. Protect and enhance the watershed and ecology of Diablo Creek.

To accomplish this task, a multi-disciplinary team consisting of PG&E staff professionals from Nuclear Power Generation and ENCON, plus selected experts from outside consulting firms, was formed. Overall project coordination was provided by PG&E's Technical and Ecological Services.

In the process of collecting information on the present Diablo Creek water supply system, we investigated the natural resources of the watershed and the regulatory process (local, state, and federal) that safeguards those resources. We reviewed the historical development of Diablo Creek water for power plant use and considered how today's regulatory and permitting process compares to that existing in 1968, when Diablo Creek water was first developed for use by DCPP.

Acting on the knowledge thus obtained, the team developed three water supply alternatives. These alternatives consist of conceptual plans rather than detailed prescriptions. Each alternative provides for

continued use of Diablo Creek water. Short- and long-term permitting requirements are identified. Required environmental protection and opportunities for enhancement of natural resources are also identified. Each alternative is consistent with our project goals; in turn, these goals are consistent with PG&E's Corporate Goals (May 1990) and the Commitment to Environmental Quality (June 1990), and the Diablo Canyon Land Stewardship Program.

Section 2

POWER PLANT MAKEUP WATER SYSTEM

Operation of DCPP Units 1 and 2 requires a large reliable source of fresh water to operate under recommended design parameters. This water is collected and pumped to the two raw water storage reservoirs from three main sources: Diablo creek, site wells, and a seawater reverse osmosis facility (SWRO) located in Area 10 (Figure 1). The reservoirs can hold 2.5 million gallons each and are capable of storing a six-day supply of water to operate Units 1 and 2 at design capacity. Water is taken from the reservoirs, processed to meet plant water chemistry requirements through the makeup water treatment system and delivered to the plant through the makeup water supply line (Figure 2).

POWER PLANT WATER REQUIREMENTS

Plant design parameters and operating experience have arrived at an ideal delivery rate of 400 gpm of demineralized water from the plant makeup water treatment system. The plant domestic water system requires an additional 35 gpm. Most of the plant makeup water (320 gpm) is used to maintain continuous steam generator blowdown. The balance (80 gpm) is used for miscellaneous plant functions such as regeneration of the condensate polishers, operation of the radwaste laundry facility, and washdown water needs for plant cleanup.

RAW WATER REQUIREMENTS

A delivery rate of 400 gpm demineralized water from the plant makeup water treatment system is considered ideal, based on plant design parameters and operating experience. Operating experience over the past few years has shown a 75% recovery rate of raw water to plant makeup water. The 25% losses are attributed to the use of raw water in the site firewater system, brine rejection from the makeup water plant, and evaporation.

The SWRO is sized to produce a maximum of 400 gpm for delivery to the reservoirs as raw water. At present, the remaining 180 gpm comes from the site wells and Diablo Creek. To provide for occasional maintenance and give a small margin of flexibility, it is the desire of Plant Operations and the system engineer to have a combined minimum of 200 gpm provided by the creek and wells.

EXISTING RAW WATER SUPPLY FACILITIES

SWRO Raw Water Supply Facility

Most of the raw water supplied to the reservoirs comes from the SWRO. This facility is sized to produce a maximum of 400 gpm. Sea water is pumped direct to the SWRO from the power plant intake structure.

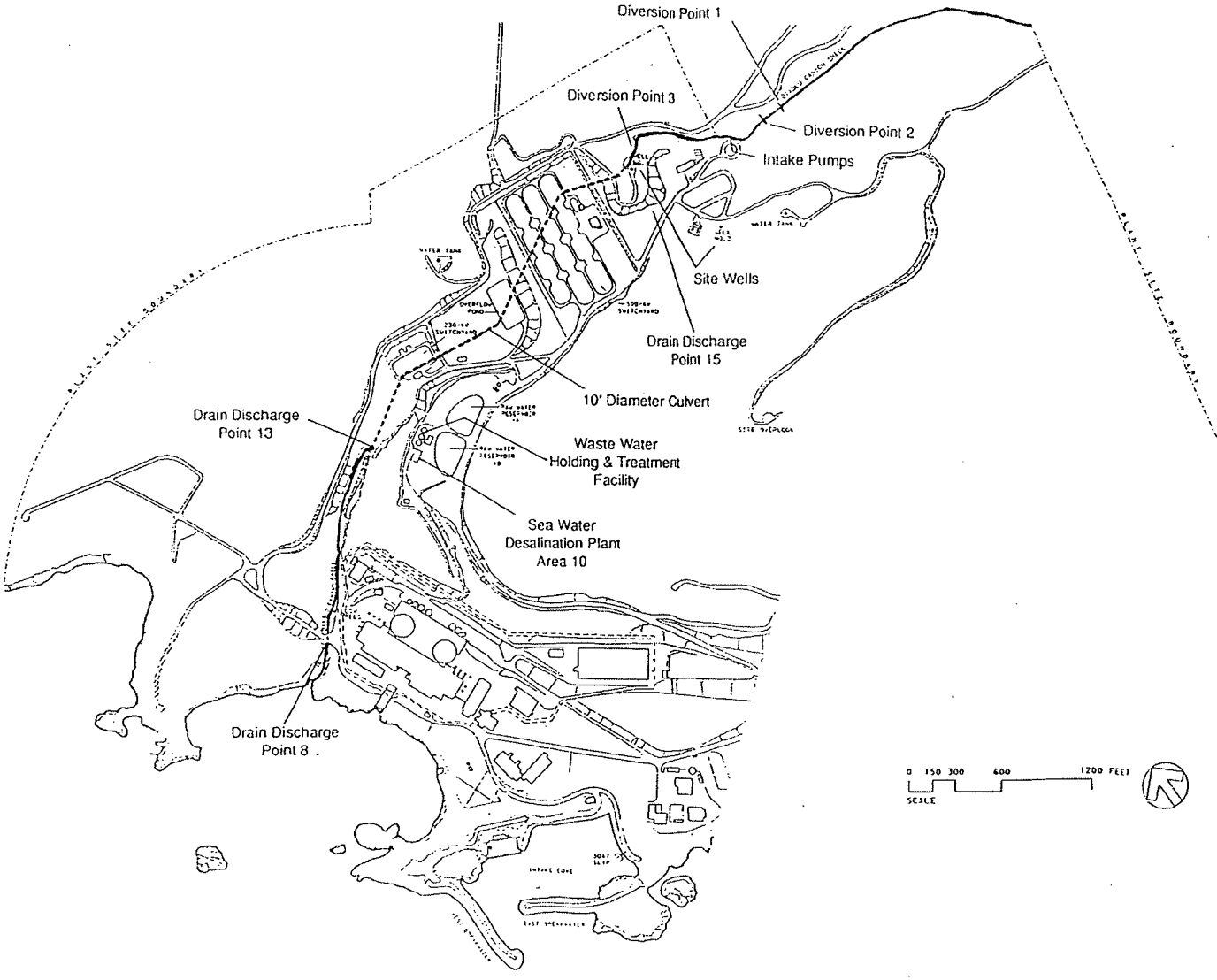


Figure 1. Makeup water system facilities location map.

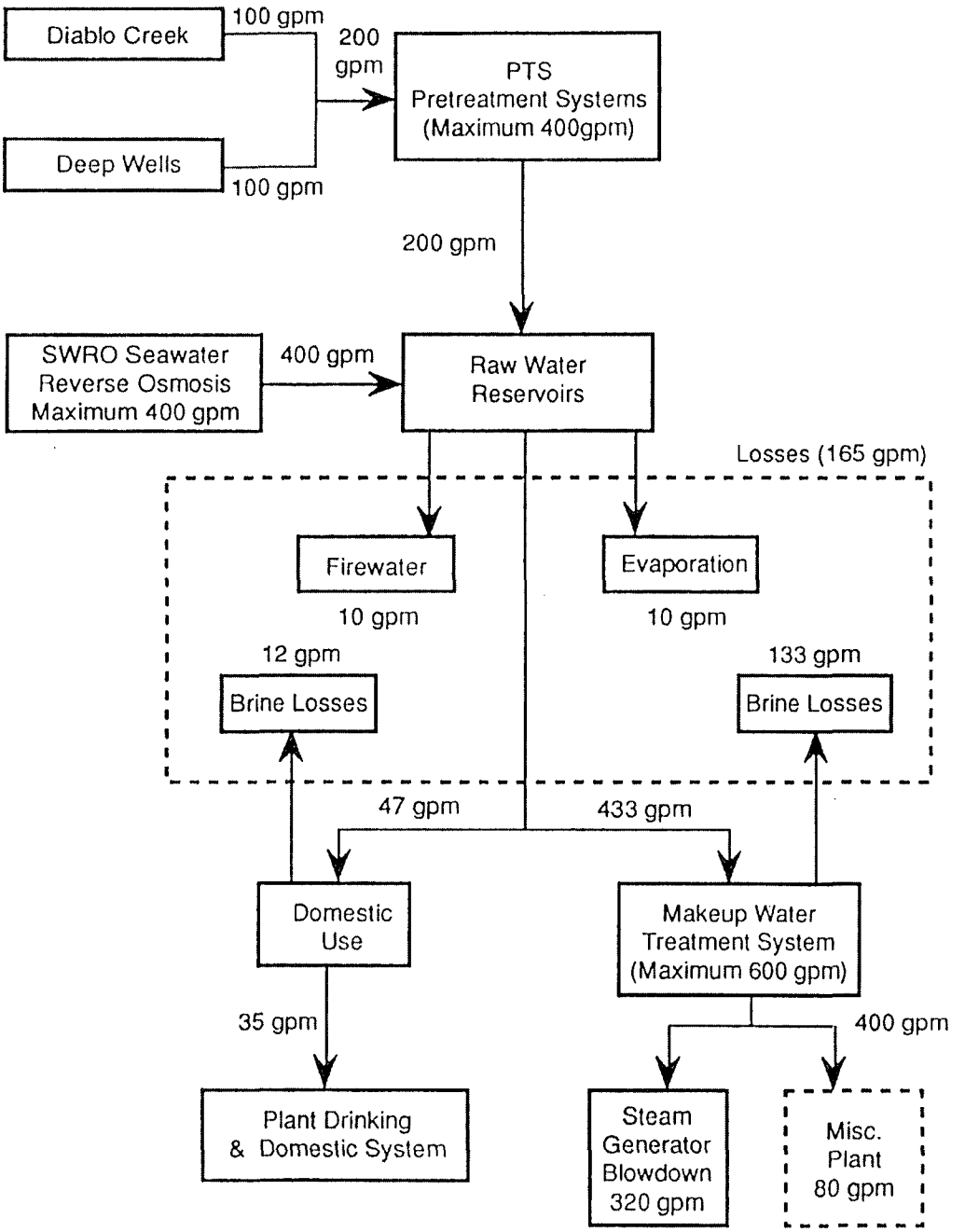


Figure 2. Diagramatic representation of the makeup water supply system, Diablo Canyon Power Plant.

After desalination, the raw water is pumped to the two raw water reservoirs, where, it is combined with creek and well water (Figure 1).

Diablo Creek Facility

Diablo Creek water is collected at Diversion Point 2, located about 900 feet upstream of the 500-kV yard (Figure 1). The dam was constructed in the late 1960s and holds about 1/2 acre feet of water. It is not a storage area, but is used as a settling pond where creek water is collected, the sediment in the water settles to the bottom, and the clean water is siphoned off the top through a gravity flow pipe. The impoundment functions as a settling pond where floating trash and coarse sediments are removed. Clean water is taken from this collection point via gravity flow pipeline approximately 200 yards downstream to a pump station. Water accumulates in either of two large vertical culverts used as pump sumps. Each sump has 200 gpm pump which are used intermittently on a rotating basis to deliver water to a 100,000 gallon storage tank. This pipe takes the water approximately 200 yards downstream to two large vertical culverts embedded in the stream. Each of these culverts contains a 200-gpm pump, which pumps the water to a 100,000-gallon storage tank. The plant drawings pick up the system at these two creek pumps.

The amount of water available from the creek varies seasonally and annually. In late February 1991, there was from 50-80 gpm flowing in the creek at Diversion Point 1. This is assumed to be near the design "low flow." In the mid-1980s, there was 200-300 gpm available year-round.

Site Wells

There are two deep wells and a shallow well located in the lower watershed area (Figure 1). They were installed during the early 1980s as the plant's freshwater operating needs became more apparent for maximum steam generator life expectancy. Water from these wells is also pumped into the 100,000-gallon storage tank. Currently, only one of the wells is capable of producing water as a result of the present five-year drought. Thus far in 1991, output has been approximately 90 gpm. During non-drought periods in the early and mid-1980s, these wells were capable of producing in excess of 200 gpm. If the drought continues, well water reliability will be in doubt.

Raw Water Pre-Treatment System

Raw fresh water collected from Diablo Creek and site wells is not clean enough to be put directly into the reservoirs. It is first gravity-fed from the storage tank into a filter and chlorine injection system. This pre-treatment system is capable of processing a maximum flow of 400 gpm.

Makeup Water Treatment System

The raw water in the reservoirs requires additional treatment before it can be used as plant makeup water or domestic water. It is, however, directly used to fill and maintain the jobsite firewater system. The makeup water treatment system takes water from the reservoirs and runs it through a two-stage reverse osmosis system before delivering it to the plant through the makeup water line. This process, along with firewater use, evaporation, and line losses results in 75% of the raw product water being available for plant and domestic water use.

EXISTING MAINTENANCE PRACTICES

Most of the plant makeup water system is owned and operated by contractors. PG&E will continue to maintain the creek and well water systems. All valves, pumps, and piping below the two pumps on Diablo Creek are operated and maintained by DCPP personnel. However, from the creek pumps to Diversion Point 1, facility design documentation is poor and maintenance is needed to correct existing equipment problems.

The dams at Diversion Points 1 and 2 (Figure 1) create settling ponds. These require annual cleaning to remove the clay, silt, and debris that comes down Diablo Creek. Cleaning at Diversion Point 2 is done by rerouting the stream flow at Diversion Point 1, through an existing pipe, to the downstream culverts where the creek pumps are located. A sump pump located behind Diversion Point 1 is used to reroute the water into the pipe. Any fish found in the pool at Diversion Point 2 are relocated to the upper diversion pool. When the site at Diversion Point 2 is sufficiently dry, a backhoe is driven into the creekbed and the accumulated sediments are removed.

PLANNED FUTURE IMPROVEMENTS

In April 1991, a plastic liner will be installed to control seepage in the pool at Diversion Point 2. This will change the current cleaning practices significantly. Future cleaning will require a vacuum truck to suck up the settled material rather than digging it out. This process will be quicker, more efficient, and allow for greater water retention.

As stated above, most of the makeup water system is owned and operated by two service contractors. By February 1992, one contractor will assume responsibility for the installation operation and maintenance of all new sea water desalination, raw water pre-treatment, and makeup water treatment systems.

There are several pending projects that will change on the DCPP freshwater supply and distribution system. Management has approved a capital project that makes modifications to the steam generator blowdown system. When implemented, this project will result in the recovery of approximately 95% of the

water now vented as steam. Continuous blowdown of the steam generators for both units takes 320 gpm of water. Therefore, a blowdown recovery process could defer the production of over 300 gpm of makeup water and associated brine.

Management has also approved installation of improved seawater desalination and makeup water treatment systems. These improvements will not result in greater availability of water. A pending project to replace the existing dam, wier, and piping located on Diablo Creek between the culvert pumps and Diversion Point 1, was reviewed by management in June 1991. When implemented, this work will improve the availability and reliability of the fresh water collection system and simplify maintenance requirements.

Section 3

REGULATIONS GOVERNING WATER USE, STREAM ALTERATION, AND STREAM PROTECTION

WATER RIGHTS

The question of whether the Company is entitled under California law to divert riparian water from Diablo Creek for use in the Plant has been reviewed (PG&E 1985a, 1985b) and the practice affirmed. The elements of this common law right are:

1. Land abutting a watercourse, unless separated by title, is qualified to benefit from the water in the watercourse. All owners of qualified land must share the water. If the owners cannot agree on an allocation, it can be imposed by the courts.

2. Among riparian users, priority of use is generally unrelated to priority of right, nor is a riparian right usually lost by non-use. If there is insufficient water for all riparian uses, the owners must share the available supply.

3. Water diverted under riparian right must be put to beneficial use on qualified riparian land within the watershed of the watercourse.

4. Water diverted under riparian right (as distinguished from water diverted under permit from the State Water Resources Control Board (SWRCB) cannot be seasonally stored.

In addition to these common law rules, the State Constitution requires that riparian water cannot be used in a wasteful fashion. A Water Code provision mandates the triennial reporting of riparian diversion and use on a Statement form to the SWRCB.

PG&E began diverting water from Diablo Creek in 1968. Entitlement to the water was based on the terms of a lease agreement between PG&E and the Marre family. The lease allowed PG&E to exercise the owner's riparian right to divert water from the stream. Later that year, PG&E purchased 168 acres adjoining Diablo Creek on the north, from the Field family. The Field family, as a condition of the sale of its property, retained a riparian entitlement to divert water from the stream for use by livestock (Recorder's Office, San Luis Obispo County, Vol. 1468, Page 49, March 4, 1968).

An agreement between PG&E and the Field family (undated) for shared use of Diablo Creek water was reached prior to March 4, 1968. The forfeiture of the Field family's riparian entitlement occurred in 1986,

when it sold the balance of its property to PG&E. However, this water continues to be provided for livestock as an unstipulated aspect of the lease agreement between PG&E and its Pecho Ranch cattle tenant.

At present, PG&E owns approximately 1569 acres of the Diablo Creek watershed and controls through long-term lease agreements an additional 563 acres. Another 1049 acres exist in other ownership (Figure 3). To the best of our knowledge, only PG&E and its livestock tenants divert water from the stream. Based on Item 3 above, other riparian landowners not currently diverting water are free to do so at any time in the future. This fact contributes to the risk of relying on Diablo Creek as a source of makeup water.

REGULATORY AGENCY PERMITS AND COMPLIANCE

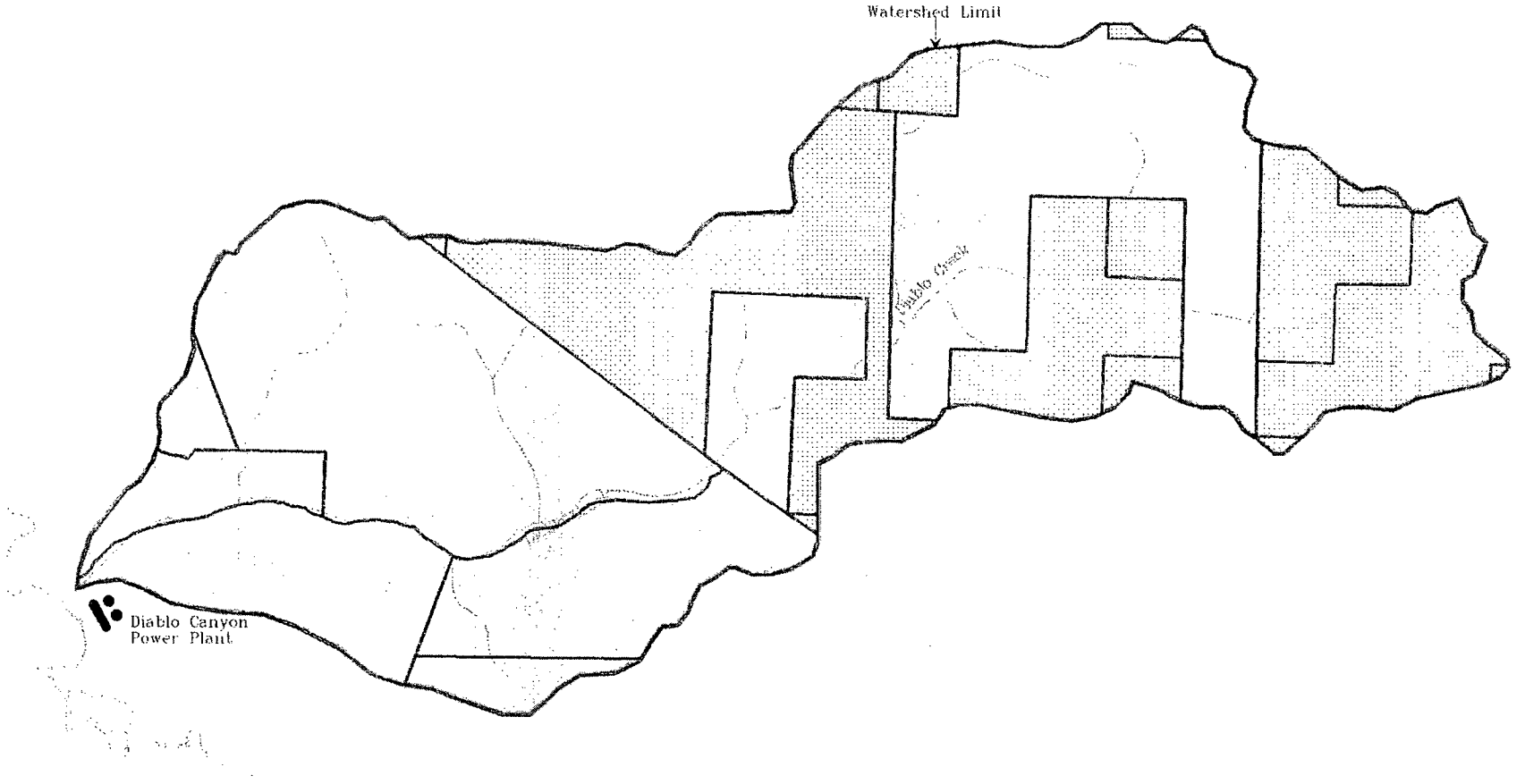
The use of Diablo Creek water by riparian right does not require a permit; however, through the Statement of Diversion and Use, the SWRCB must be notified every three years and told of the water diversion volumes for the previous three years. Furthermore, legal entitlement to the water does not include the right to install structures to take water from the creek. Placing structures in the stream channel for the purpose of diverting water requires a Streambed Alteration Permit from the California Department of Fish and Game (CDFG), and may require a federal permit for the placing of fill in wetlands and waters of the United States (Section 404, Federal Clean Water Act 1972). Though changes in the regulatory process have occurred over time, review of file documents shows that PG&E has maintained a record of compliance while developing the water resources of Diablo Creek.

SWRCB Notification of Riparian Water Use

The first notification to the SWRCB concerning PG&E's riparian diversions was made in 1974. Since then, the Hydro Generation Department has been responsible for filing a report every three years. To the best of our knowledge, this process continues to operate satisfactorily.

Figure 3

PG&E CONTROLLED PROPERTY IN THE DIABLO CREEK WATERSHED



LEGEND

- PG&E Controlled Property
- Non-PG&E Controlled Property

July 30, 1992

Total Watershed Acres = 5700

Streambed Alteration Permit

The CDFG is responsible for in part protection of the state's natural resources. In the case of water diversion projects, the CDFG accomplishes this through the Streambed Alteration Permit process. Any activity resulting in a temporary or permanent physical change to a stream channel, regardless of the seasonal nature of flows in that stream, may be subject to a Streambed Alteration Permit. An application for a Streambed Alteration Permit is submitted to the CDFG. The application describes, in detail, the nature of the proposed project and its location. The CDFG must begin processing the application within 30 days. A CDFG representative may arrange a site visit to verify proposed operations and anticipated environmental impacts. In the case of diversion works, CDFG review may result in recommended modifications to the proposed project (e.g., provision for instream flows adequate to support aquatic life and riparian vegetation below the diversion). Such recommendations may become conditions of the permit. An applicant has 14 days in which to respond to proposed conditions of the permit. If an applicant finds the conditions unacceptable, the CDFG may call a meeting to further discuss the matter. If a mutually acceptable approach cannot be found, a panel of arbitrators may be called to assist in resolving the dispute.

This permit process did not exist in the late 1960s during initial development of the Diablo Creek water supply system. At that time, PG&E worked with staff biologists from the CDFG in evaluating plans for construction of the switchyard complex and other facilities directly affecting the stream. The CDFG's primary concern was for protection of the coastal anadromous fishery. It was concluded that no significant anadromous fishery occurred in Diablo Creek, and therefore, the CDFG did not oppose these facility developments (letter on file, July 15, 1968). More recently, PG&E applied for and received Streambed Alteration Permits in 1982 and again in 1990 to allow sediment removal from behind our diversion dams on Diablo Creek.

Section 404 Permit

The U.S. Army of Engineers (COE) was authorized by Congress to implement Section 404 of the Clean Water Act which regulates the discharge of dredged and fill material in waters of the United States. "Discharge of fill material" generally means placement of any structure, temporary or permanent, composed of either native or foreign material, in a waterway. Typical structures associated with company operations for which PG&E acquires Corps' permits include dams, diversions, wiers, coffer dams, sea walls, riprap, piers, transmission towers, gas lines, and intake and outfall structures. "Waters of the U.S." includes all rivers, streams, creeks or tributaries with a flow of 5 CFS or greater, all bays, harbors, sloughs, estuaries and tidelands subject to tidal actions, and lakes and wetlands.

The COE regulates activities affecting waters of the U.S. through the issuance of Letters of Permission, Nationwide Permits and Individual Permits. These permits often contain conditions to minimize construction

impacts and mitigation requirements. During the permit process, the COE also insures that projects will not have significant effects on riparian vegetation and its dependent wildlife, fisheries, endangered species or cultural resources.

California Coastal Commission

Another agency with jurisdiction over the Diablo Canyon area is the California Coastal Commission. The California Coastal Act of 1976 granted the Commission authority to regulate development, projects, changes in land use and lot splits occurring within the 3 to 5 mile coastal zone. San Luis Obispo County's Local Coastal Program has been approved and the County has assumed permitting authority from the Commission. It is generally agreed that the County will have a stricter interpretation of the Coastal Act's regulations than did the Commission.

Section 30610(d) of the Act allows for the in-kind repair and maintenance of existing facilities and structures, without a permit, unless there is a "risk of substantial adverse environmental impact." Paragraph II, E of the Commission's guidelines state further that the repair and maintenance of existing utility facilities shall not require a permit "provided that the level or type of use or size of the structure is not altered."

The principal Diablo Canyon Project structures and features were plotted on a map in 1976 and granted "vested rights" for the continued operation and maintenance of these facilities. The Diablo Creek facilities do not appear on this map. In general, it appears that in-kind repair and replacement of the Diablo Creek facilities will not trigger Coastal Act review or permitting.

Maintenance and Repairs

The most recent work (fall 1990, continuing) to remove sediment from the pool at Diversion Point 1 is being conducted according to conditions of an acquired Streambed Alteration Permit (Appendix A). During this work, removal of material from the stream resulted in "puncture" of a semi-impermeable stratum of the natural channel bed. Consequently, the basin is now unable to hold water. The excavation also weakened the footing of the weir. The weir and the lining of the catchment basin are in need of repair. The report titled *Diablo Canyon Creek Water Diversion Dam Assessment* (Appendix B) presents recommendations for both short- and long-term solutions. One short-term solution calls for installation of a synthetic liner.

PG&E has received verbal approval from the CDFG for such an approach and work to install the liner is expected to begin by end of April 1991. We do not believe that a COE 404 Permit is required for this work (PG&E, 1991).

Proposed Stream Diversion Improvements

A new concrete cutoff wall to replace the damaged structure at Diversion Point 2 and removal of the old structure has been proposed. Design specifications for the new structure have not yet been prepared, however, no increase in the size of the diversion pool is expected. Other improvements to the Diablo Creek raw water delivery system may also be necessary (see Section 3, Existing Maintenance Practices). Any such improvements will require a new Streambed Alteration Permit from CDFG. Furthermore, it is our opinion, based on consultation with the permitting staff of Building and Land Services Department, that replacement of the existing dam at Diversion Point 2 will require a COE 404 Permit. In addition, locally administered building permits from San Luis Obispo County will also be required. A Coastal Commission permit may not be required as the new cutoff wall will not create a larger diversion pool, and the action can be viewed as maintenance of existing facilities.

Conditions of the Permits

Requirements for environmental protection and/or mitigation are sometimes associated with the federal and state permits identified above. These requirements are often influenced by the attitudes and perceptions of the local agency personnel who process the permit application. For this reason, the requirements tend to vary from local area to local area, and on a case-by-case basis.

It is our judgment that the state's principal concern will be protection of aquatic and riparian life during the construction process, and that conditions imposed will not be significantly different than those experienced in the past (see Appendix A). The COE will be most concerned about the protection of wetlands. Wetlands are rather broadly defined and include all lands characterized by a prevalence of hydrophytic plants, hydric water regime, and hydric soils. Criteria have been established by the COE, U.S. Fish and Wildlife Service, Environmental Protection Agency, and U.S. Soil Conservation Service for delineation of jurisdictional wetlands. These criteria, published as a joint agency document in 1989, are designed to support the 404 permit process. It is our opinion that COE may require the delineation of jurisdictional wetlands in the area of the new dam, prior to issuing a permit. Further, it may be necessary to ensure no net loss of wetlands following construction of the new facilities.

The issue of impacts to riparian vegetation below the points of diversion on Diablo Creek could be raised during the permitting process (local, state or federal). PG&E has examined this question in detail with respect to numerous points of diversion throughout our hydroelectric power system (PG&E 1988).

Findings show that riparian vegetation response to diminished flow is variable and can result in increased riparian growth or loss of riparian vegetation. Archival photographs of Diablo Creek prior to construction of the 500- and 230-kV switchyards have been examined and found to show a near total lack of woody riparian vegetation in the lower stream reaches (lower access road upstream to switch yard culvert). Today, this reach is characterized by a substantial growth of willow and other riparian plant species. Improved conditions for establishment and growth of riparian vegetation in this area are apparent. There is presently no basis for concluding that reduced flow brought about the apparent change in riparian condition. Other factors, such as removal of livestock and change in distribution of residual flows, may have contributed significantly.

Section 4

OTHER EXISTING COMMITMENTS FOR ENVIRONMENTAL PROTECTION

A number of plans and procedures to ensure environmental protection and health safety are in place at DCPP. The plans and procedures satisfy federal and state Code of Regulation requirements. In the event of an accident, these procedures identify appropriate lines of communication and authority, and our obligation for notification of state or federal agencies. Accidental spills and discharges are recognized as a potential threat to Diablo Creek. Three response plans relevant to the protection of Diablo Creek are identified below:

1. The Spill Prevention Control and Countermeasure Plan (SPCC) contains the procedures, methods, equipment, and requirements to prevent oil discharges from nontransportation-related onshore facilities into or upon the navigable waters of the United States, or adjoining shorelines, pursuant to the Environmental Protection Agency, Oil Pollution Prevention rules and regulations.

2. The Emergency Plan Implementing Procedure, Oil Spill Contingency Plan (EP M-7), describes the responsibilities, actions, and reporting required by DCPP personnel in response to a release or threatened release of oil.

3. The Emergency Plan Implementing Procedure, Hazardous Material Contingency Plan (EP M-9), delineates the responsibilities and actions to be taken to minimize hazards to human health and the environment in the event of fire, explosions, or unplanned releases of hazardous materials.

In addition to the above, there are operational systems to reduce the likelihood of spills reaching Diablo Creek. For example, many of the tanks and containers used for storage have secondary containment areas for added safety. There are two underground sumps in the plant yard, which can be used for containment of spills. In addition, yard storm drains 8 and 15 (Figure 1) are linked with an oily water separator, as these areas drain pavement where spilled oils are most likely to occur.

National Pollutant Discharge Elimination System (NPDES) monitoring requirements of yard and storm drain runoffs provide a mechanism for determining whether excessive amounts of grease and oils reach Diablo Creek. Monitoring of drinking water quality is conducted biweekly and includes samples taken at the pumping station downstream of Diversion Point 2. These results along with results of analyses performed at other regulated points within the drinking water supply and distribution system, are reported to the Office of Health Services, San Luis Obispo County. (See Appendix C, Water Quality section, for more information on NPDES and Title 22 monitoring.)

Section 5

PROPOSED SCENARIOS FOR THE CONTINUED USE OF DIABLO CREEK WATER

Three water supply scenarios were developed. Each proposes the continued use of Diablo Creek water at some level. In addition, each scenario addresses benefits to PG&E, risks, costs, regulatory compliance, and the protection and enhancement of natural resources within the Diablo Creek watershed. We also considered the short- and long-term effects, since improvements to existing water supply facilities and installation of new facilities are planned.

DCPP water demand is 35 gpm, but 600 gpm must be delivered to the raw water storage reservoirs to offset production losses. With completion of the blowdown recovery system in 1993, raw water requirements will be reduced to approximately 200 gpm. Until then, makeup water must continue to come from the combined use of the SWRD and the Diablo Creek watershed facilities. After 1993, the fundamental benefits to continued use of Diablo Creek water are its lower cost of production. Figure 3 graphically illustrates the cost relationship of raw water provided by a combination of SWRD and PTS sources. Cost Savings increase in linear proportion with increasing use of Diablo Creek water.

Scenario 1

Scenario 1 calls for maximum flexibility in the use of Diablo Creek water for power plant requirements. Rate of withdrawal would depend largely upon the natural variation in stream flow and would have an upper limit determined by the capacity of the diversion and pretreatment facilities (400 gpm). This scenario differs little from historic water use practices (1968-present). As discussed in Section 3, these practices appear to be in keeping with a lawful exercise of riparian water rights.

Table 1 presents information on seven factors associated with this scenario. Continued use of Diablo Creek water, as described above, would significantly reduce the total cost of the makeup water requirement. However, this benefit must be weighed against the longterm reliability of the creek to supply an adequate volume of water, environmental impacts to the stream below the diversions, and the likelyhood of other property owners exercising their riparian rights to Diablo Creek water. These risks can not be quantified at this time and must, therefore, remain speculative.

No specific benefits to the natural resources of the watershed are recognized with Scenario 1.

Table 1

Maximum Stream Withdrawal, Scenario 1

Description of Water Use Scenario	Benefits to PG&E	Risks to PG&E	Identified Cost Categories	Regulatory Compliance	Benefits to Natural Resources	Opportunities for Protection and Enhancement of Watershed Natural Resources
Continue present withdrawal rate of 200 gpm (110 gpm from stream 90 gpm from site wells) after steam recovery system comes on-line.	Essential short-term water needs are met (1991-1993)	Dependence on Diablo Creek water puts PG&E at risk from drought and the potential effect of future competing riparian users within the watershed.		Must continue tri-annual reporting to SWRCB for riparian water diversion.	None	Reduce erosion associated with transmission tower access roads and fuel management prescribed fires.
Install liner to correct leakage at Diversion Point 2, March 1991.	Continued use of Diablo Creek water reduces total cost of makeup water requirement; amount of reduction unknown.	Current offstream water storage practices may not comply with riparian water right common law doctrine.	Costs for temporary repairs at Diversion Point 2.	Must acquire streambed Alteration Permit from CDFG for new dam and piping, and all future maintenance of diversion pools.		Work with fuel management program to identify ways of maximizing wildlife benefits associated with chaparral burning.
Seek management approval for and construct new dam and piping at Diversion Point 2 by late 1991.	Continued use of Diablo Creek water ensures a higher margin of safety on makeup water supply.		Costs for capital improvements at Diversion Point 2.	Nationwide 404 Permit required from COE to construct new dam at Diversion Point 2.		Identify specific measures for the enhancement of stream and riparian habitat along Diablo Creek.
		Agency review during permit process could result in required mitigation.	Costs associated with securing necessary permits.	Building Permits required from San Luis Obispo County to construct new dam at Diversion Point 2.		Develop a plan for enhancement of oak woodland habitat that addresses long-term recruitment of young age class trees.
Discontinue diversion of stream water for livestock to enhance reliability of supply for power plant uses.		Existing livestock grazing leases may be compromised by removal of watering sites.	Costs associated with adjustment to grazing lease agreements.	Must investigate nature of off-stream water storage to determine compliance with riparian water right common law doctrine.		Establish a notification/communication plan to ensure regulatory compliance now and in the future.
						Identify any rare or sensitive plant and animal populations within the watershed and develop specific plans for their protection.

Scenario 2

Scenario 2 is identical to Scenario 1 until the proposed blowdown recovery system is online. At that time, withdrawal rates are reduced to not more than one-half the natural flow rate from May 1 to October 31 of each year. Maximum withdrawal rates (≤ 400 gpm) would occur only during the rainy season (November-April). This ensures sufficient water to support aquatic organisms and riparian plants through the summer-fall low flow period, while still allowing six months of least-cost operation.

Table 2 presents information on seven factors associated with this scenario. Scenario 2 strikes a compromise between lower costs of operation and protection of the stream ecology. Scenario 2 also allows continuation of controlled livestock grazing, by continuing the availability of livestock water at three locations within the watershed.

Use of scenario 2 significantly reduces the risk that the permit process, required for facility improvements, will result in agency imposed mitigation requirements.

Scenario 3

Scenario 3 is identical to Scenarios 1 and 2 up to 1993 until the blowdown recovery system is operational. At that point, water from Diablo Creek is not needed to meet makeup water volume requirements. Therefore, all diversions from the stream are curtailed and only well water continues to be pumped from the watershed.

This scenario reserves stream water entirely for the support of aquatic organisms and riparian plants throughout the year. The greater reliance on SWRO water makes this the least cost effective scenario. It is however, the most environmentally sensitive alternative.

Table 3 presents information on seven factors associated with this scenario.

ECONOMIC CONSIDERATIONS

Until the blowdown recovery system is operational, the cost of supplying makeup water using any of the three alternatives remains the same ($150,655 per month). This is based on the combined costs of facility rental and water production only, with watershed sources contributing an average 200 gpm and the SWRO providing the remaining 400 gpm. When comparing the variable costs of running the two different raw water supply systems, the SWRO is more expensive to run than the PTS. Lower operating costs could be achieved if more water could be made available from watershed sources (Figure 3). However, based on historical flow records for Diablo Creek (see Appendix C, Hydrology), the maximum sustained rate at

which stream water may be reliably delivered is 200 gpm. Therefore, more than 60% of the total makeup water requirement will continue to come from site wells and sources outside the watershed.

Table 2

Moderate Stream Withdrawal, Scenario 2

Description of Water Use Scenario	Benefits to PG&E	Risks to PG&E	Identified Cost Categories	Regulatory Compliance	Benefits to Natural Resources	Opportunities for Protection and Enhancement of Watershed Natural Resources
Short-term withdrawal rate remains at 200 gpm until steam recovery system comes on-line. Thereafter, withdrawal rate drops to 140 gpm (50 from stream and 90 from site wells).	Essential short-term water needs are met.	Dependence on Diablo Creek water puts PG&E at risk from drought and the potential effect of future competing riparian users within the watershed.	Costs for temporary repairs at Diversion Point 2.	Must continue tri-annual reporting to SWRCB for riparian water diversion.	More water available for support of aquatic life and riparian vegetation.	Reduce erosion associated with transmission tower access roads and fuel management prescribed fires.
Interim measures and capital improvements at Diversion Point 2, same as Alternative 1.	Continued use of Diablo Creek water reduces total cost of makeup water requirement; amount of reduction unknown.	Current offstream water storage practices may not comply with riparian water right common law doctrine.	Costs for temporary repairs at Diversion Point 2.	Must acquire streambed Alteration Permit from CDFG for new dam and piping, and all future maintenance of diversion pools.	Increases effectiveness of resource enhancement activities associated with stream corridor.	Work with fuel management program to identify ways of maximizing wildlife benefits associated with chaparral burning.
	There is greater reliability associated with the lower withdrawal rate, based on historical flow data.		Costs associated with securing necessary permits.	Nationwide 404 Permit required from COE to construct new dam at Diversion Point 2.		Identify specific measures for the enhancement of stream and riparian habitat along Diablo Creek.
Discontinue diversion of water for livestock use.		Existing livestock grazing leases may be compromised by removal of watering sites.	Costs associated with adjustment to grazing lease agreements.	Building Permits required from San Luis Obispo County to construct new dam at Diversion Point 2.		Develop a plan for enhancement of oak woodland habitat that addresses long-term recruitment of young age class trees.
Retain a 200 gpm capability as emergency backup.		Agency review during permit process could result in required mitigation.	There are opportunity costs of not using cheaper water to the fullest extent.	Must investigate nature of off-stream water storage to determine compliance with riparian water right common law doctrine.		Establish a notification/communication plan to ensure regulatory compliance now and in the future.
						Identify any rare or sensitive plant and animal populations within the watershed and develop specific plans for their protection.

Table 3

Minimum Stream Withdrawal, Scenario 3

Description of Water Use Scenario	Benefits to PG&E	Risks to PG&E	Identified Cost Categories	Regulatory Compliance	Benefits to Natural Resources	Opportunities for Protection and Enhancement of Watershed Natural Resources
Short-term withdrawal rate remains at 200 gpm until steam recovery system comes on-line..	Essential short-term water needs are met (1991-1993)	Dependence on Diablo Creek water puts PG&E at risk from drought and the potential effect of future competing riparian users within the watershed.	Costs for temporary repairs at Diversion Point 2.	Must continue tri-annual reporting to SWRCB for riparian water diversion.	Significantly more water available for support of aquatic life and riparian vegetation.	Reduce erosion associated with transmission tower access roads and fuel management prescribed fires.
Interim measures and capital improvements at Diversion Point 2, same as Alternative 1.	Continued use of Diablo Creek water reduces total cost of makeup water requirement; amount of reduction unknown.	Current offstream water storage practices may not comply with riparian water right common law doctrine.	Costs for capital improvements at Diversion Point 2.	Must acquire streambed Alteration Permit from CDFG for new dam and piping, and all future maintenance of diversion pools.	Significantly increases effectiveness of resource enhancement activities.	Work with fuel management program to identify ways of maximizing wildlife benefits associated with chaparral burning.
With steam recovery system operating at full capacity, no water is taken from the stream.	There is greater reliability associated with the lower with-drawal rate, based on historical flow data.			Nationwide 404 Permit required from COE to construct new dam at Diversion Point 2.		Identify specific measures for the enhancement of stream and riparian habitat along Diablo Creek.
90 gpm are still pumped from site wells and blended with other sources of makeup water.		Agency review during permit process could result in required mitigation.	Costs associated with securing necessary permits.	Building Permits required from San Luis Obispo County to construct new dam at Diversion Point 2.		Develop a plan for enhancement of oak woodland habitat that addresses long-term recruitment of young age class trees.
			There are opportunity costs of not using cheaper water to the fullest extent.	Must investigate nature of off-stream water storage to determine compliance with riparian water right common law doctrine.		Establish a notification/communication plan to ensure regulatory compliance now and in the future.
Continue diversion of water for livestock use, but equip all troughs with shut-off values to conserve water.						Work with fuel management program and livestock tenant to increase the effective period of the burn cycle using cattle to help sustain a grass cover on treated chaparral areas.

ENVIRONMENTAL CONSIDERATIONS

A preliminary assessment of the ecology of the Diablo Creek watershed has been prepared (Appendix C). This assessment was undertaken so that the continued use of Diablo Creek water for power plant operations might be evaluated from a more holistic resource viewpoint.

Our studies have shown that surface water flow in Diablo Creek is intermittent seasonally over the lower three miles of stream channel. This includes areas below and above the points of diversion. We have also shown that rainbow trout are present in isolated pools throughout the stream. Riparian habitat below the diversions appears to be more extensive now than it was in the 1960s, before power plant construction. Of those candidate rare plant species that could occur in the watershed, none are associated with riparian habitats. No state or federally listed threatened or endangered wildlife species are likely to occur within the watershed; however, the stream corridor could provide habitat for two state-designated sensitive species, (the cooper's hawk and the western pond turtle) and two fully protected species (the golden eagle and the ringtail).

In evaluating potential water supply scenarios involving Diablo Creek, we have considered the effect of different withdrawal rates on the stream and near-stream ecology. On March 18, 1991, the project team met in a workshop where considerable attention was focused on this issue. It is our opinion that the aquatic resources of Diablo Creek are limited by low flow rates, particularly in the summer. Reducing or eliminating the diversion of water for power plant use would have some positive environmental effects, but is not expected to significantly increase the carrying capacity of the stream for trout, or enhance the growth and vigor of the riparian community except under conditions of prolonged drought. Still, Scenarios 2 and 3 offer some increased potential for stream and riparian resource values; Scenario 1 does not.

We have identified a number of generalized approaches to resource enhancement within the watershed (Tables 1-3). Further study and planning is needed to develop a specific resource management plan.

OTHER CONSIDERATIONS

Diablo Creek is subject to the effects of drought. During the present five-year drought, it has not been possible to maintain a withdrawal rate of 200 gpm from the combined watershed facilities (stream and wells). Further, there is some probability, though it may be slight, that other watershed landowners may elect to exercise riparian rights in the future. Any such diversion of water would further jeopardize the reliability of Diablo Creek as a source of makeup water.

We have identified the need for maintenance and improvements to the water diversion facilities on Diablo Creek. This work will require local, state and federal permits. There is some probability that during

agency review of these improvements, we will be asked to provide bypass flows through our diversion structures to protect downstream aquatic life. We feel that this probability is slight given the overall quality of the stream, but it cannot be entirely ruled out. Scenario 2 addresses this issue by providing bypass flows during the summer and fall period.

The tangible benefits of balancing the need for low-cost water with natural resource management goals in the Diablo Creek watershed are difficult to quantify. The intangible benefits are in the area of public and agency relations, community outreach, and corporate image. We conclude that those benefits would be greater with Scenarios 2 and 3.

Section 6

REFERENCES

Pacific Gas & Electric Company. 1985. Water rights at Diablo Canyon Nuclear Power Plant. Letter with attached report from N.H. Daines to J.D. Shiffer, January 24.

_____. 1988. Downstream effects of hydroelectric development on riparian vegetation: A joint PG&E - SCE research project. Research and Development Department report 009.4-89.10. Prepared by Jones and Stokes Associates, Sacramento.

_____. 1991. Diablo Creek Project: Regulatory review. Letter from J. McKinney, Building and Land Services Department, to M.E. Fry, Technical and Ecological Services Department, March 27.

Appendix A

1990 STREAMBED ALTERATION PERMIT

CONTENTS

The department has 30 days from date of receipt of a completed application in which to make its recommendations. This time period does not begin until the department receives the appropriate fee (see attached fee schedule).

Notification No _____ Received _____

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF REMOVAL OF MATERIALS AND/OR ALTERATION OF LAKE, RIVER, OR STREAMBED BOTTOM, OR MARGIN

A. APPLICANT Pursuant to Sections 1601–1607 of the California Fish and Game Code

I, J. D. Townsend (Name of Applicant) of P.O. Box 56, Avila Beach, CA 93424 (Mailing Address).

Representing Pacific Gas and Electric Company (Name and address of Individual, Agency, Company, etc. owning property or doing work)

Hereby notify the California Department of Fish and Game of operations to be carried out by or for me

from October 15, 1990 (Starting Date) to October 31, 1990 (Ending Date) on or affecting

Diablo Canyon (Name of Stream, River, or Lake) of San Luis Obispo County, tributary to N/A (Major Water Body)

Located _____ (Distance and Direction to Landmarks)

Section Canada De Los Osos Township Pecho Range Islay

USGS Map N/2 Port San Luis 15 deg. Co. Assessor's Parcel No. 76-011-18

Property owners name and address (if different from applicant) Pacific Gas and Electric Company

(Leasee) 77 Beale Street, San Francisco, CA

Kurt Brungs/Kelly Hall (805) 545-6748 (Name of Person to Be Contacted at Site During Operations) is responsible for operations at the site.

He/she can be reached at P.O. Box 117, Avila Beach, CA 93424 (805) 545-6748 (Mailing Address) (Telephone)

B. Description of operation 1. The nature of said operations will be as follows:
Check all squares which apply.

- [X] Soil, sand, gravel, and/or boulder removal or displacement
- [ ] Water diversion or impoundment
- [ ] Mining—other than aggregate removal
- [ ] Road or bridge construction
- [ ] Levee or channel construction
- [ ] Timber harvesting or any related activity required for harvesting timber
- [ ] Temporary, recreational or irrigation dam
- [ ] Fill or spoil in bed, bank, or channel
- [ ] Other—Describe below

2. Type of material removed, displaced or added [ ] Soil [ ] Sand [ ] Gravel [ ] Boulders
Volume 40 cu yds

3. Equipment to be used in the described site 2 dump trucks & 1 loader

4. Use of water (i.e., domestic, irrigation, gravel, washing, etc.) Domestic Quantity 200 GPM

5. Describe type and density of vegetation to be affected, and estimate area involved.
No vegetation will be affected.

6. What actions are proposed to protect fish and wildlife resources and/or mitigate for project impacts? No fish or wildlife will be affected while the sedimentation basin is being cleaned.

7a. Does project have a local or state lead agency or require other permits? [ ] Yes [X] No

7b. If 7a answer is yes, please attach or identify any available environmental document.

7c. For state-designated wild and scenic rivers, a determination of the project's consistency with the California Wild and Scenic Rivers Act must be made by the Secretary for Resources. Until the Secretary determines the project is consistent with the Act, the Department cannot issue a valid agreement. A tentative agreement will be issued, conditioned upon a finding of consistency by the Resources Secretary.

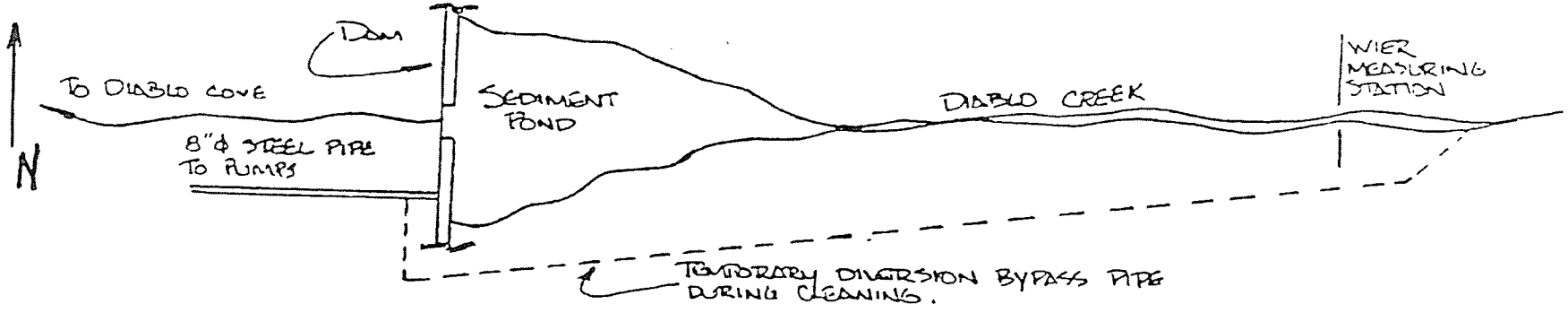
7d. THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

8. Briefly describe proposed construction methods. Attach diagram or sketch of the location of your operation to clearly indicate the stream or other water and access and distance from named public road. Indicate locked gates with an "X". Show existing features with a solid line (————) and proposed features with a broken line (– – – – – –). Show compass direction. Attach larger scale map if necessary.

David Mikkelsen 10/3/90
Signature of Applicant Date
for J. D. Townsend

NO CARBON NEEDED
FG2023 (Rev. 11/87)

87 63405



Sediment Pond Area Sketch

Notification No. 1212-90 THP No. _____

AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Departme and T. O. TOWNSEND (PACIFIC GAS & ELECTRIC CO.) of AVILA BEACH, State of CALIFORNIA, hereinafter called the operator, is as follows:

WHEREAS, pursuant to Division 2, Chapter 6 of California Fish and Game Code, the operator, on the 11TH day of OCT 19 90, notified the Department that he intends to substantially divert or obstruct the natural flow of, or substantially change the b channel, or bank of, or use material from the streambed of, the following water: DIABLO CANYON CK, in the County SAN LUIS OBISPO, State of California, S___ T___ R___.

WHEREAS, the Department (~~represented by _____ has~~ made an inspection of subject area on ~~_____ day of _____ 19____~~, and) has determined such operations may substantially adversely affect existing fish and wildlife resources including: NATIVE FISH AND OTHER WATER DEPENDENT ORGANISMS.

THEREFORE, the Department hereby proposes measures to protect fish and wildlife during the operator's work. The operator her agrees to accept the following recommendations as part of his work: Numbers 1, 13, 16, 19, 20, 21, & 22 from the list of recommendations on the back of this page and the following special recommendations:

1. All work in or near the stream or lake shall be confined to the period OCT 17, 90 - NOV 15, 90
2) ALL WORK SHALL BE CONFINED TO SEDIMENT BASIN CLEANING AT DIABLO CANYON.
3) SPECIAL ATTENTION SHALL BE GIVEN TO NUMBER 21 (ON BACK)

The operator, as designated by the signature on this agreement, shall be responsible for the execution of all elements of this agreen A copy of this agreement must be provided to contractors and subcontractors and must be in their possession at the work

If the operator's work changes from that stated in the notification specified above, this agreement is no longer valid and a notification shall be submitted to the Department of Fish and Game. Failure to comply with the provisions of this agreement and with c pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652 and 5948, may result in prosecution.

Nothing in this agreement authorizes the operator to trespass on any land or property, nor does it relieve the operator of responsil for compliance with applicable federal, state, or local laws or ordinances.

THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJ FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS W BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

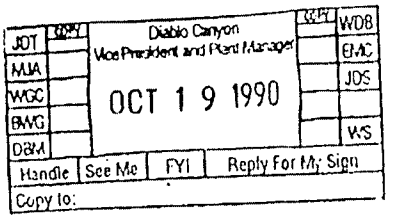
This agreement becomes effective on WHEN SIGNED AND RETURNED / EXPIRES 10-17-9

Operator _____	D. Sparks Department Representative
Title _____	Title WARDEN
Organization _____	Department of Fish and Game, State of Calif
Date _____	Date 10-17-90

*If inspection was not made, cross out words within parentheses

FG 1060 (5/87) 87

Date 10-17-90



Notification Number 1272-90

Enclosed are my recommendations for your proposed work as is required by Fish and Game Code, Sections 1601-1603.

If you agree to incorporate these recommended measures into your project, please sign as the operator in the lower left hand corner of the agreement and mail the white and pink copies to the address below. The yellow copy is yours.

If you do not agree to the measures, then you may not begin operations until the differences have been resolved as specified in the Fish and Game Code.

According to the Fish and Game Code, your written response must be returned to me within fourteen days, unless the period has been extended by mutual agreement.

Sincerely,

D. Sparks 438 3626

Fish & Game Warden
Region 3

Return response to :

Glenn Sparks
P.O. Box 1015
Santa Margarita, CA 93453

RECOMMENDATIONS

1. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. The disturbed portions of any stream channel or lake margin within the high water mark of the stream or lake shall be restored to as near their original condition as possible.

2. Restoration shall include the revegetation of stripped or exposed areas.

3. Rock, riprap, or other erosion protection shall be placed in areas where vegetation cannot reasonably be expected to become reestablished.

4. Installation of bridges, culverts, or other structures shall be such that water flow is not impaired and upstream or downstream passage of fish is assured at all times. Bottoms of temporary culverts shall be placed at or below stream channel grade. Bottoms of permanent culverts shall be placed [illegible] stream [illegible] grade.

5. Plans for design of concrete sills and other features that could potentially impede fish migrations must be approved by Department engineers.

6. When any dam (any artificial obstruction) is being constructed, maintained, or placed in operation, sufficient water shall at all times be allowed to pass downstream to [illegible]

7. An adequate fish passage facility must be incorporated [illegible]

8. [illegible] gravel which will cause little or no siltation.

9. No equipment will be operated in live stream channels.

10. Equipment shall not be operated in the stream channels of flowing live streams except as may be necessary to construct crossings or barriers and fills at channel changes.

11. When work in a flowing stream is unavoidable, the entire streamflow shall be diverted around the work area by a barrier, temporary culvert, and/or a new channel capable of permitting upstream and downstream fish movement. Construction of the barrier and/or the new channel shall normally begin in the downstream area and continue in an upstream direction, and the flow shall be diverted only when construction of the diversion is completed. Channel bank or barrier construction shall be adequate to prevent seepage into or from the work area. Channel banks or barriers shall not be made of earth or other substances subject to erosion unless first enclosed by sheet piling, rock riprap, or other protective material. The enclosure and the supportive material shall be removed when the work is completed and the removal shall normally proceed from downstream in an upstream direction.

12. Temporary fills shall be constructed of nonerodible materials and shall be removed immediately upon work completion.

13. Equipment shall not be operated in the lake or its margin except during excavation and as may be necessary to construct barriers or fills. If work in the lake is unavoidable, a curtain enclosure to prevent siltation of the lake beyond the immediate working area shall be installed. The enclosure and any supportive material shall be removed when the work is completed.

14. Silt settling basins shall be located away from the stream or lake to prevent discolored, silt-bearing water from reaching the stream or lake.

15. Preparation shall be made so that runoff from steep, erodible surfaces will be diverted into stable areas with little erosion potential. Frequent water checks shall be placed on dirt roads, cat tracks, or other work trails to *control erosion.*

16. Wash water containing mud or silt from aggregate washing or other operations shall not be allowed to enter a lake or flowing streams.

17. [illegible] the stream immediately below the project site. This catchment basin shall be constructed of gravel which is free from sand or silt.

b) Upon completion of the project and after all flowing water in the area is clear of turbidity, the gravel along with the trapped sediment shall be removed from the stream.

18. If operations require moving of equipment across a flowing stream, such operations shall be [illegible] below.

19. If a stream channel has been altered during the operations, its low flow channel shall be returned as nearly as possible to its natural state without creating a possible future bank erosion problem [illegible] sluice-like area. If a lake margin has been altered, it shall be returned as nearly as possible to its natural state without creating a future bank erosion problem. The gradient of the streambed or lake margin shall be as nearly as possible the same gradient as existed prior to disturbance.

20. Structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur.

21. No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any logging, construction, or associated activity of whatever nature shall be allowed to enter into or placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream or lake.

22. The operator will notify the Department of Fish and Game of the date of commencement of operations and the date of completion of operations at least five days prior to such completion.

Appendix B

DIABLO CANYON CREEK WATER DIVERSION DAM ASSESSMENT

Existing Channel Conditions: The banks of Diablo Creek in the area inspected are composed of multiple strata of alluvial materials of varying thickness and composition, deposited over geologic time. At least one of the layers is composed of very porous gravelly materials. A pit about ten feet deep below channel invert has been excavated in the upstream storage area at the lower dam site, allowing visual evaluation of subsurface materials. The undisturbed channel invert appears to consist of a three-foot deep structurally-compact layer of a porous mixture of sand and angular to subrounded gravel and cobbles derived from local shale and sandstone materials.

Channel banks in the work area are vertical due to past construction activity, and are from five to ten feet high. Outside of the work area, channel banks are generally at a slope of 1:1 or steeper, with depths from three to eight feet. Natural banks appear to be generally stable on a long-term basis, with mature oak trees and other vegetation growing well down the channel bank. Upstream of the weir dam, a 20-to-40 year-old tree is growing near the channel invert, indicating little channel erosion in a time period known to have experienced several major storm and runoff events. On-site erosion potential from existing near-vertical man-made banks appears to be low-to-moderate based on the observed composition of well-drained high-strength soils and structural integrity of the adjacent undisturbed banks.

Hydrologic Effects: Order-of-magnitude watershed hydrology estimates were made for Diablo Creek in October 1990 in a separate report. The drainage area is substantial, at about 3200 acres (5 square miles), with expected peak flows of up to 1600 CFS, consistent with routine winter peak flows observed by PG&E personnel of 500 - 1000 CFS.

Infrequent peak runoff flows may be expected to inudate existing structural improvements. Under such conditions, backwater effects of the small concrete dams would help to dissipate flow energy and minimize water velocity in the retention basin areas. This condition would help minimize erosion impacts on steep and near-vertical banks and would result in trapping of coarser bedload materials normally transported downstream under high flow conditions. Maximum erosion potential associated with high flows would be expected to occur immediately downstream of each concrete dam where energy dissipation would be maximum.

Evidence exists to show minor channel degradation has occurred in the time period since power plant construction. An alluvial deposit has developed above the entrance to the large-diameter culvert beneath switchyard fill. Deposition materials have been derived in part from the upstream channel invert between culvert and water diversion structure several hundred feet upstream. None of the materials would have come from further upstream, based on the assumption that existing dams form an effective bedload sediment trap. An unknown amount of the material would have been contributed from downstream tributary drainages as well.

Evaluation of Lower Water Diversion Dam: Based on existing site conditions, the following observations can be made: 1) Prior to cleanout, the lower dam probably suffered from a small-to-moderate, unquantifiable amount of subsurface seepage on one or more horizontal planes at or below water surface elevation. A similar situation is likely to have occurred at the upper dam as well. 2) The water impoundment structure is a simple concrete cutoff wall keyed into the native channel banks and invert to an unknown depth. Cutoff depth is probably significantly less than the 8 - 10 foot depth of the pit excavated upstream, allowing subsurface seepage under the existing structure. 3) Normal pond sedimentation with clay and silt materials provided a suitable blanket material to maintain seepage at an

acceptably low level. 4) Removal of the sediment deposit and over-excavation has allowed seepage and water loss to occur at an unacceptably high level through permeable subsurface layers. 5) Unacceptable levels of subsurface seepage will continue to occur until the permeability of the retention basin ground surface is reduced to a satisfactory level.

Retention Basin Sealing: Options normally considered for sealing a leaking retention basin would include: 1) natural deposition of clay and silt materials over time, 2) incorporation of hydrophilic bentonite clay by mixing into basin materials, 3) use native materials, clay soils, or a bentonite clay as a blanket or liner material over pervious materials, 4) use of a man-made impermeable membrane, and 5) use of gunnite or concrete grout on exposed surfaces.

Option 1 is not practical based on existing time constraints. Options 2 and 3 would be difficult to implement on porous vertical walls of native materials. The gravelly layers may not provide sufficient fines or small enough pore spaces for the bentonite approach to be fully successful. This approach would be most practical and cost-effective in a more open, low-slope repair situation. Option 5 is technically feasible but has potential problems. Gunnite may be difficult to effectively place on loosely-cemented vertical walls. Since the application is non-structural, the lining would tend to crack due to aging or applied hydrostatic stresses, allowing seepage paths to redevelop. A cracked or damaged lining would present a significant maintenance/ rehabilitation/ disposal problem at some later date. Concrete lining would also eliminate potential vegetation regrowth on channel banks.

Use of Option 4 as a short-term repair measure seems most feasible at this time, and could be implemented in a number of ways. Use of medium duty, single or multiple layer poly sheeting would be appropriate for this application. The alternative, industrial quality neoprene/fabric materials cost several dollars per square yard and would not be needed for temporary repairs.

Membrane Installation: This will require hand preparation of smooth bank surfaces to prevent puncture failures. The basin should be dewatered and could be partially filled with firm soil materials to cover projections and to expedite sheet placement. The plastic should be extended over the weir wall, down through the pit, and up the sidewalls to above expected high water level. It would be desirable to overlap sheets or fold seams if multiple sheets are needed for complete coverage. Fold and shape materials to site contours to minimize stretching and extend upstream beyond the pit area where porous aggregates are exposed. The sheeting will need to be immobilized with a layer of soil and/or water during placement to preserve orientation and prevent flotation.

Installation will no doubt be difficult on vertical banks. The upper edges should be held in place with some suitable method, including but not limited to: pins spiked into the bank through multiple plastic layers, keyed into a hand-dug and backfilled trench in sidewalls, rolled and stapled to 2x4 lumber that is suitably restrained, or attached using multiple grommets and light-duty ropes.

The sheet liner could be supplemented with a clay or silt blanket lining a foot or more thick in the channel invert in untreated areas above the existing pit. Natural siltation would be expected to fill the hole over time. The installation will probably not be 100% effective in preventing migration of water through existing horizontal strata, but should maintain seepage losses at an acceptably low level on a short-term basis.

Recommended repair measures are unlikely to change existing fisheries habitat values in any significant manner. Installation procedures should be in accordance with procedures outlined in the F&G Streambed Alteration Agreement.

On-site Erosion Potential: One repair goal is to maximize useful life of the upstream storage pool by minimizing sediment deposition. As previously noted, hazard of vertical bank failure is judged to be low to moderate. Mechanical alteration of existing banks to reduce erosion potential is not recommended. Efforts to reduce bank slopes would damage existing trees and vegetation and generate significant amounts of excess materials for disposal elsewhere.

Site access road surfaces should be ditched and revegetated to minimize surface runoff transport of sediment into the water storage area. Sheet erosion potential can be minimized by immediate reseeding, straw mulching, and occasional irrigation of disturbed road areas and other cut bank areas until a vegetative cover is established. Native or introduced grass species tolerant of shade and the local climate could be recommended by a seed or farm supply store.

Long-term System Performance Improvement: Existing water diversion system components have been developed piecemeal over time, and are now recognized as a distinct powerplant subsystem. The fresh water supply system is a critical component of successful plant operation, and is expected to maximize surface water recovery in a reliable, efficient, and low-maintenance manner.

Redevelopment of the existing system could be considered in order to best meet operational objectives. A new dam with suitable cutoff wall and engineered impermeable upstream storage area could maximize water recovery potential. The upstream area could be lined with reinforced concrete to allow for vehicular access and simplified cleanout procedures. Continued use of the existing dam impoundment as an upstream bedload and sediment trap would partially separate water intake and clarification functions and would help to maximize downstream water quality and pump station life. Allowing the existing dam to partially refill with sediment would also raise the local channel invert and help to stabilize existing vertical cut banks.

A bottom discharge gate in a new dam may help in periodic sediment removal, but is not expected to provide complete cleanout. The storage basin bottom would need to be vee-shaped with sideslopes exceeding underwater angle of repose of sediment materials in order to ensure sediment mobility. The vee trough would need to contain a perforated pipe or similar structure attached to the outlet gate to ensure flushing of the entire basin.

Maintenance efforts regarding trash accumulation on the water intake screen may be reduced by moving the inlet to a subsurface location away from the edge of the storage pool. Floating trash can be kept away from a screen projecting above water line by operating an inverted irrigation sprinkler inside the screen with the spray jet impacting at the water line.

Appendix C

ECOLOGICAL PROFILE OF THE DIABLO CREEK WATERSHED

CONTENTS

FIGURES

TABLES

GEOMORPHOLOGY AND EROSION POTENTIAL

GEOLOGY AND SOILS

The Diablo Creek watershed is similar to adjacent canyons, consisting of a coastal terrace and uplands within the western San Luis Mountains. Underlying the watershed is the Miocene Monterey formation, consisting of resistant hard siliceous shale and interbedded chert (Montano de Oro State Park 1988). The color is variable, generally white and brown to gray and reddish-brown on fresh surfaces, weathering to chalky white. The formation shows evidence of many sedimentary layers with great total depth. Individual beds are brittle and fracture easily, with thickness varying between 0.5 and 6 inches. Evidence of bedding is common from channel invert to ridge tops.

Figure C–1 shows the length of the watershed to be about four times its average width. Hillside slopes of 30-75% are common throughout the watershed. The type and distribution of soils within the watershed is illustrated in Figure C–2, and is based on the San Luis Obispo County soil survey (USDA Soil Conservation Service 1979). Upland soils on the steeper slopes are thin, with a shallow depth to parent material. They are typical of the loose, rocky, coarse-textured, acidic Santa Lucia soils; and are characterized by low fertility and low water retention capabilities.

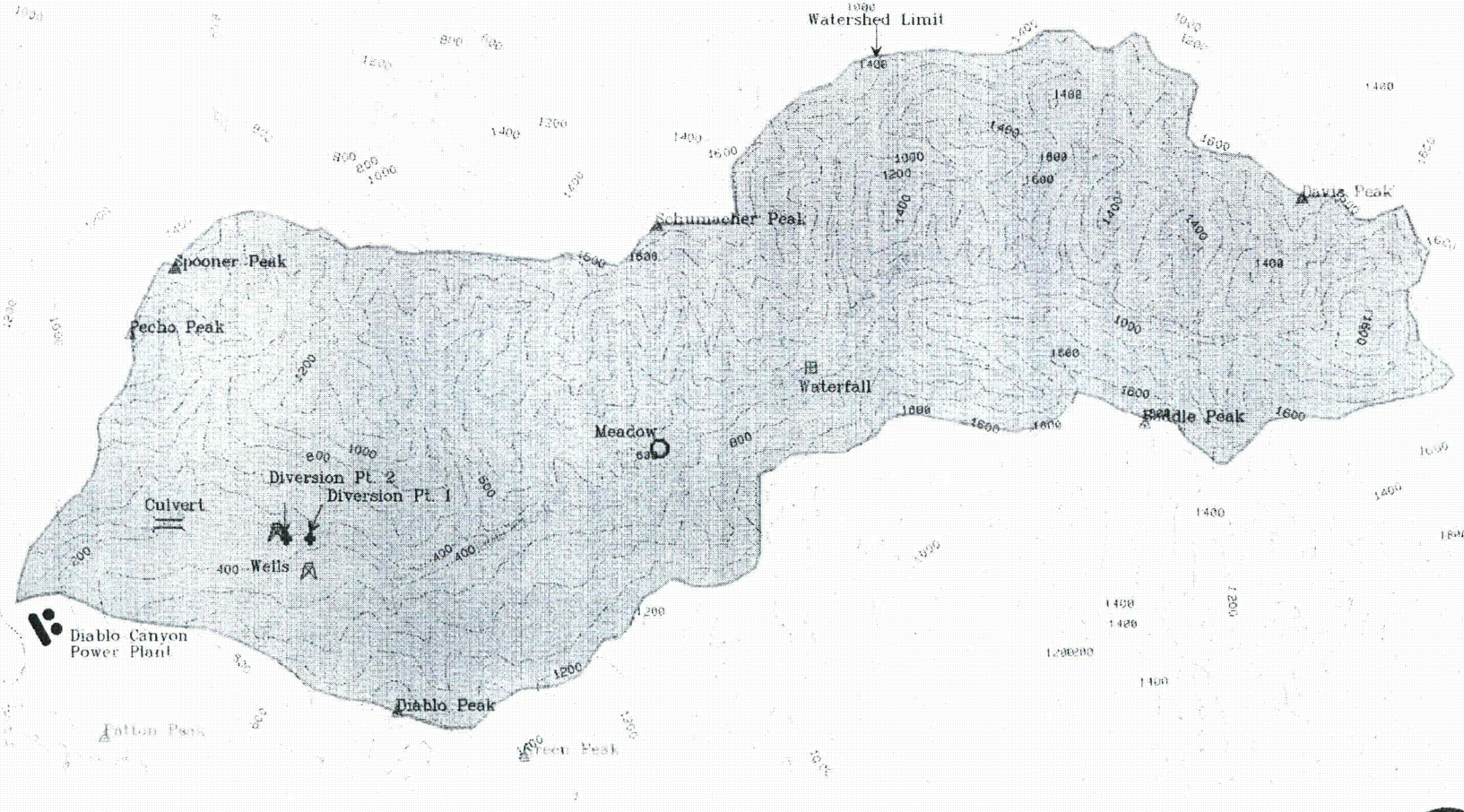
CHANNEL MORPHOLOGY

The banks of Diablo Creek in the areas inspected are composed of multiple strata of alluvial materials of varying thickness and composition, deposited over geologic time. At least one of the layers is composed of very porous cobble and gravel materials. In the lower watershed, channel banks are generally at a slope of 1:1 or steeper, with depths of 3-8 feet. Natural banks appear to be generally stable on a long-term basis, with mature oak trees and other vegetation growing down the channel bank. The channel slope, averaging about 5% throughout much of the watershed, is generally steep enough to prevent significant sediment or bed load deposition.

A pit about 10 feet deep below channel invert was recently excavated in the upstream storage area at Diversion Point 2, allowing visual inspection of subsurface materials. The undisturbed channel invert appears to consist of a 3-foot-deep structurally compact layer or stratum. This layer consists of a porous mixture of sand and angular to subrounded gravel and cobbles derived from local shale and sandstone materials. Extensive local geologic investigations (Harding Miller Lawson Associates, 1968) have been made in conjunction with switchyard fill design. Results reported from test borings indicate that subsurface alluvial materials exposed in the channel invert may be as deep as 30', extending up to 200' laterally from

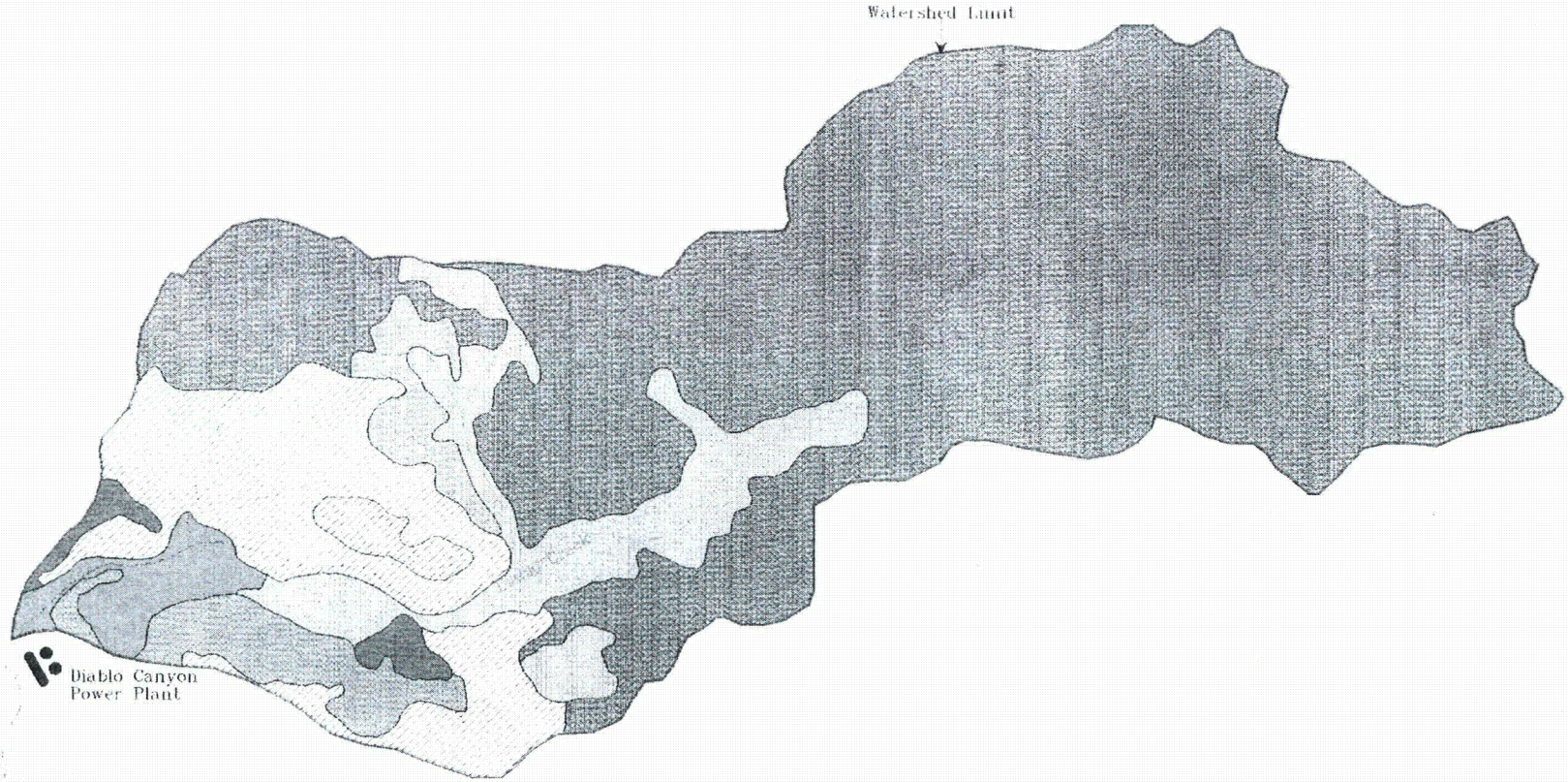
Figure C-1

DIABLO CREEK WATERSHED BASEMAP



SOIL TYPES IN THE DIABLO CREEK WATERSHED

Figure C-2



LEGEND

0 2000 4000 Feet

July 30, 1992

Total Watershed Acres = 3382

N

the channel. This finding is consistent with observed surface watering of significant segments of the Diablo Creek channel, except in periods of high flow. Subsurface water available in the extensive alluvial beds may be partially recovered in the wells at the lower end of the watershed.

A natural waterfall (hereafter referred to as Diablo Falls) exists in the channel about 2 miles upstream of Diversion Point 1, or 3 miles above the ocean outfall (Figure C–1). Bedrock conditions at Diversion Point 1 are believed to force migrating groundwater to the surface, where total flow may be measured. Flow over the waterfall was estimated at 300 gpm in early March, about two to three times that observed on the same date at Diversion Point 1.

The lower 3 miles of creek channel is composed of deep and extremely porous cobbles and gravel of native materials. Such bed conditions result in subsurface flow of all or part of the total flow. This condition is influenced by the magnitude of flow and location in the watershed channel. Late season flow downstream of the waterfall is entirely subsurface for more than 1 mile. About one-third to one-half of the late season subsurface flow was observed to return to the surface at Diversion Point 1, where it is captured and used for power plant purposes. Some of the subsurface flow may also be captured by the three freshwater wells immediately upstream of the 500-kV switchyard (Figure C–1).

The total channel length is about 5.1 miles from watershed ridge crest to ocean outfall. Surface water flow is intermittent seasonally over the lower 2 miles of stream channel. This may be true, as well, for the upper 3 miles of Diablo Creek. Detailed field surveys in this part of the watershed have not been undertaken.

EROSION POTENTIAL

A uniform and healthy ground cover is desirable for maximizing water retention while minimizing erosion and sediment transport from steep hillside areas. A healthy plant community provides mechanical protection from rainfall and sheet and rill erosion. The plant canopy provides surface protection from the thermal and convective effects of the air mass, helping to conserve and retain moisture. Organic matter also helps to improve soil infiltration and moisture retention.

Ground cover in the watershed consists of a mosaic of plant communities in generally good hydrologic condition. Vegetative cover is poorest where rocky outcrops or road cuts prevent satisfactory soil depth for plant establishment.

Sediment loading and erosion potential are maximum in areas where runoff flow is concentrated by road cuts, culverts, and equipment trails. Fuel load management areas where prescribed burns have recently occurred are at higher risk for runoff and erosion than similar untreated areas. A catastrophic event such as a large-scale range fire would be expected to change hydrologic conditions by increasing peak runoff flows and associated sedimentation, while reducing the magnitude of late season return flows. Sediment loading from upstream sources creates negative impacts on the makeup water system. Major effects include increased bedload, greater sediment transport, and higher water turbidity. These conditions increase maintenance costs for detention basins, and pumping and filtration systems. Tower access roads in the lower watershed appear to be a significant source of such sediment, with one large slip area, exposed cut and fill slopes lacking vegetation, and unprotected drainage features that concentrate runoff flows.

HYDROLOGY

CLIMATE DATA

The Mediterranean climate of the Diablo Creek watershed is typical of the Central Coast, with mild temperatures, little diurnal fluctuation, and warm, dry summers (Montano de Oro State Park 1988). Fog is common along the coastal terrace during the summer, averaging 200-250 hours per month. Annual temperatures may be summarized as follows: average, 56°-60°F; summer maximum, 65°-70°F; and winter maximum, 50°-60°F. There can be significant localized orographic variations, particularly in the more protected interior canyons. Wind direction in the vicinity of the power plant is predominantly WNW and NW.

Table C-1 provides monthly and annual precipitation data. The peak runoff season occurs between December and February, with a long-term average rainfall of 14.5 inches (Stechman 1978, 1989). Mean and standard deviation for various increments of the rainfall record are shown in Table C-1, and are seen to be quite variable. Winter 1982/1983 was an extreme year with about three times normal rainfall. The last six years of record have been relatively dry, with three years at about 2/3 of average precipitation.

Table C-1

Mean Monthly, and Total Annual Precipitation (in Inches)

Month	Monthly	Cumulative
July	Trace	Trace
August	0.02	0.02
September	0.23	0.25
October	0.68	0.93
November	1.95	2.88
December	1.68	4.56
January	1.94	6.50
February	3.45	9.95
March	1.74	11.69
April	1.37	13.06
May	0.24	13.30
June	0.05	13.35

Table C-1 (continued)

Mean Monthly, and Total Annual Precipitation (in Inches)

Precipitation Year (July 1 to June 30)	Total Precipitation		Summary Statistics Mean	Std. Dev.
1978/79	18.08			
1979/80	21.26			
1980/81	13.11			
1981/82	20.81			
1982/83	35.02	21.60	8.15	5 years
1983/84	10.08			
1984/85	10.02			
1985/86	17.17			
1986/87	12.29			
1987/88	15.01			
1988/89	10.88	12.57	2.92	6 years
11-year cumulative statistics			16.70	7.70

Source: USWB, Morro Bay Fire Station, as reported by Stechman (1989).

PEAK FLOW RUNOFF MODELING

Peak runoff flows for different return periods were estimated using a Soil Conservation Service hydrologic model (USDA 1989). Precipitation frequency data (NOAA 1972) watershed area measurements taken from the Port San Luis, 7.5 minute USGS Topographic Quad were used to obtain the model outputs. These modeled values are statistical estimates of short-term peak runoff flows, which differ from the average residual flows normally monitored by PG&E staff. Estimates of this kind are order-of-magnitude rather than precise in nature. The 3,200-acre watershed is drained by a 5.1-mile main channel with numerous ephemeral tributaries (Figure C-1). Runoff is expected to be rapid because of steep slopes and the presence of shallow soils with low water-holding capacity in upland areas. Modeled short-duration peak flows at the watershed outlet for a 100-year storm (1% annual probability of occurrence) are estimated at between 500 and 2,500 cfs (.22 to 1.12 million gpm; 1 cfs = 450 gpm), depending on assumptions made about upland soil and vegetation conditions. These extreme values are consistent with the 10' diameter culvert and emergency overflow channel designs used at the switchyard complex. Peak

watershed runoff measured by PG&E staff to date is a flow of about 2,600 gpm after a day with five inches of rainfall in March 1980. Observed peak flows are much lower than would be expected for a watershed of this size and steepness. The multiplier of 90-430 between predicted and runoff observed to date values suggests that the unusual and highly porous nature of the watershed is not adequately characterized by the model. Even though infrequent peak runoff flows observed are far smaller than predicted, they have periodically inundated existing structural improvements, causing need for repairs and maintenance.

MEASURED INSTREAM FLOW CHARACTERISTICS

Figure C–3 shows natural variation in flows measured at Diversion Point 1 from 1967 to 1987. In 1973, an automatic strip chart and float recording system were installed to record continuous flows over the weir at Diversion Point 1 . The data presented in Figure C–3 are derived in part from this source. Data from May 1967 to April 1968 represent month-long average flows measured using a staff gauge.

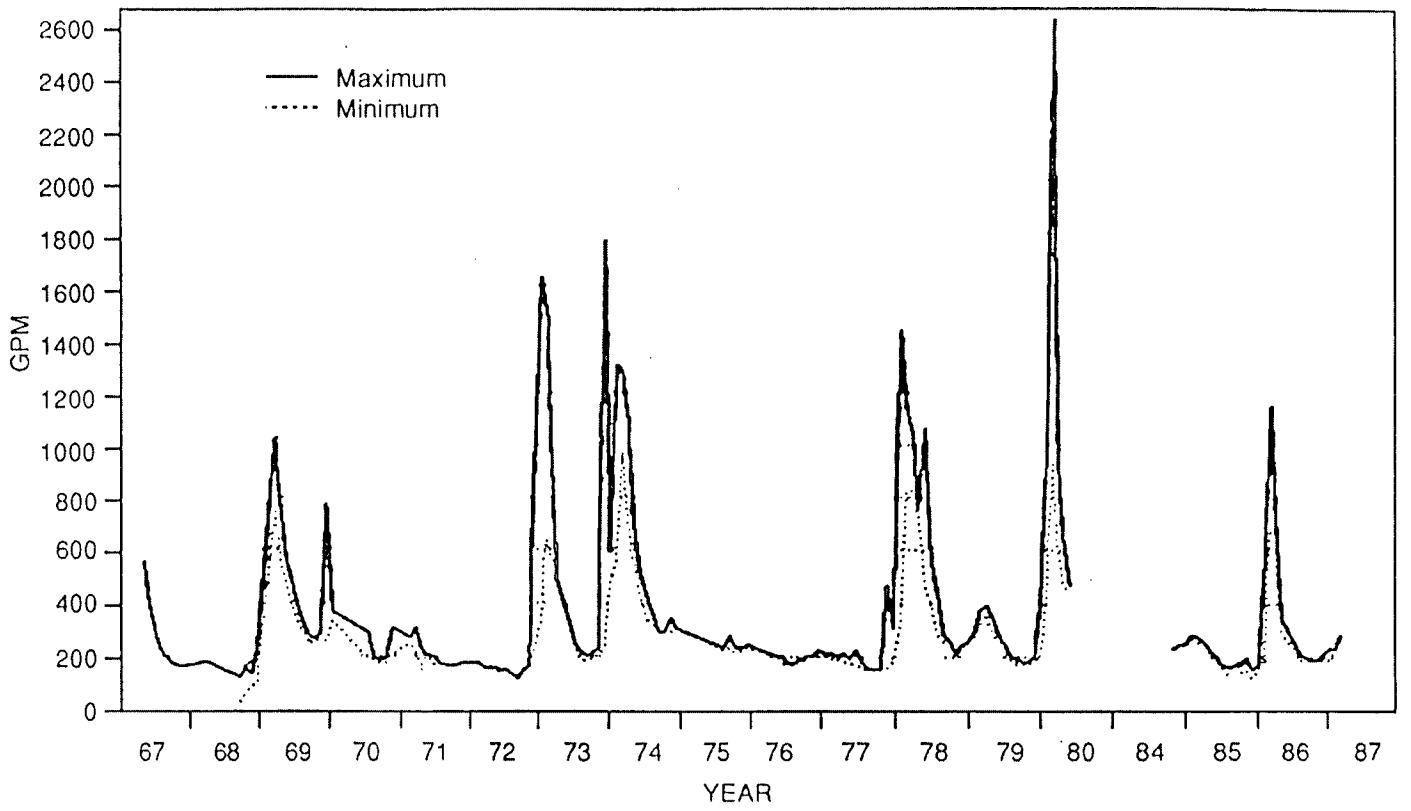
Flood flows in 1969 destroyed the weir system (Diversion Points 1 and 2), and consequently flow data are not available for early 1969. The severe storm rains in early 1983 (El Nino effects) caused flood flows again in Diablo Creek, damaging the strip chart recording device. Since then, the device has not been in operation, and subsequent flow measurements are staff gauge readings from Diversion Point 1.

Within-year Flow Variation

Figure C–3 shows that the maximum and minimum flows in Diablo Creek are highly variable. Average flows tend to be nearer the minimum flow values. Maximum flows reflect short-term conditions associated with storm events. Usually within one or two days following a storm, flows return to normal. Flows during the wet season (October-April) vary daily and monthly. Dry season flows are sustained by groundwater seepage and are more consistent from day to day, tapering off over time. The drought of the mid-1970s, when lower than normal wet season flows were recorded, is shown in Figure C–3.

Between-year Flow Variations

To date, the highest recorded flow (2,596 gpm) occurred in March 1980, when in one day, 5 inches of rainfall were recorded. Average maximum flows during the wet season range between 500 and 1,000 gpm. The lowest recorded flow to date (32 gpm) occurred in October 1968. During the mid-1970s drought, minimum flows (average of mean monthly data) were about 200 gpm. Applying this statistic to flow data for the current five-year drought shows minimum flows averaging about 65 gpm, or 32% of the minimum flows recorded during the last significant statewide drought (Mike Peterson, PG&E, pers. comm.).



Notes:
1. Wet season maximum values are short-term increases from rain storms.
2. Maximum flows during early 1969 are higher than indicated. Flood flows destroyed the weir.
3. Minimum flows during the present drought (late 1980's-early 1990's) were about 50-80 gpm.
4. The average flows per month are nearer the indicated minimum flow values than maximum flow values.
5. No data for 1981-1983 and 1987 to date.

Figure C-3. Natural variation in flows measured at Diversion Point 1, 1967-1987.

Effect of Pumping on Instream Flows

PG&E began diverting water from Diversion Points 1, 2, and 3 in 1968 (PG&E file reports submitted to the State Water Resources Control Board. The records show that Diversion Point 2 served as a supplemental and backup source to Diversion Point 1 from 1968 to the early 1980s. During this time, Diversion Point 2 contributed about 5-15% of the total water extracted from Diablo Creek. A well casing embedded in the creek bed is still present, which can be used to extract subsurface water if needed. Diversion Point 3 was a water source for dust control during early DCPP construction (1968-1973), and is no longer in use. At present, daily pumping rates are often lower than 200 gpm, and vary according to DCPP freshwater needs. Balancing and adjusting water conveyance from the three sources is a function of equipment operability, efficiency, and cost-effectiveness.

Flow Characteristics Below Diversion Point 1

The distance from Diversion Point 1 to the mouth of Diablo Creek is about 1.1 miles. Portions of the channel along this reach were greatly modified during construction of the 500- and 230-kV switchyards. Non-point-source discharges from adjacent areas of the watershed and runoff from paved surfaces associated with these facilities are channeled to the creek by a yard and stormwater drain system (Figure C–1). The magnitude and seasonal pattern of this accretion is not known, and no instream flow data is available below Diversion Point 1. Furthermore, no quantitative data on withdrawal rates from Diversion Points 2 and 3 were found.

Approximately 900 feet below Diversion Point 1, Diablo Creek enters the culvert beneath the switchyard complex. Under normal flow conditions, surface water percolates into upstream alluvial channel materials and does not enter the culvert. A portion of the subsurface flow seeps from the ground supporting the culvert outfall where it daylights some 2,700 feet downstream. The seepage flow helps to maintain seasonal or annual pools in channel depressions in the reach below the switchyards. Surface flows in the areas above, within, and below the culvert occur only during larger storm and runoff events.

In the short reach of stream (500 feet) between the access road culvert and the mouth of Diablo Creek, yearlong surface flows are reported (quarterly observations by PG&E biologists, 1976-1991). No quantitative measure of these flows has been made. Qualitative estimates place the normal average dry season flow at no less than 3 gpm.

WATER QUALITY

The quality of water in Diablo Creek is affected by various factors. Some of these include storm drain runoff, accidental spills, soil erosion within the watershed, and activity of livestock. Drinking water quality is determined monthly as required by Title 22, Domestic Water Quality Standards (California Administrative Code 1977). Samples are collected from the pumping station downstream of Diversion Point 1 and are sent to an analytical laboratory for processing. Results are submitted monthly to the San Luis Obispo County Office of Health Services.

Diablo Creek water is relatively low in scaling agents (compared to well supplies), which in high concentrations result in a reduction of heat transfer efficiency in boilers and heaters. The 2-mile reach of stream below Diversion Point 1 contains eight permitted discharge locations. These are numbered 8 to 15, with 15 being the uppermost point of discharge (Figure C–1). Of these, three are classified as stormwater runoff and five as yard storm drain systems. Stormwater drains handle runoff from earthen surfaces, while yard storm drains handle pavement runoff. Discharge Points 9 and 15 drain areas where the potential for spills and other contamination is highest. These drainage systems are linked to an oily water separator to treat the water before release into Diablo Creek.

Water quality is further monitored according to conditions specified in NPDES Permit CA 0003751 (PG&E document files, DCPP). Water from four yard storm discharge points are sampled once annually for grease and oil contaminants. Results of this monitoring are reported to central coast region of the Regional Water Quality Control Board (RWQCB).

The report titled *Potential Effects of Storm Water Discharges on Diablo Creek* (PG&E 1986) provides analysis of 14 water quality parameters and pollutants associated with yard and storm drain runoff samples. Other pollutants are also identified that could potentially enter the stream as a result of accidental spills. These data are then compared with published toxicity levels for aquatic organisms. Table C–2 summarizes the results of this study. The report concluded that pollutant levels in the sampled discharges were below concentrations known to affect rainbow trout. Furthermore, the potential of storm and yard water runoff to cause adverse effects in Diablo Creek were found to be mitigated by a short residence time and rapid dilution under storm flow conditions. The study was conducted during a relatively high runoff year (Figure C–3), placing greater emphasis on wet season than dry season flows.

TABLE C-2

Comparison of DCPP Storm Water Runoff Constituents and Toxicity Tolerance Levels of *Salmo gairdneri* (source: PG&E 1986)

a) Chemical analyses of storm water runoff (ppm)

Drainage Point	pH	BOD	COD	TOC	NH_3	G&O	B	Fe	Cr	Cu	Ni	SO_3	SO_4	Cl
008	a\8.7	10	23	12	<0.1	<3	0.1	.039	<.001	.007	.002	-	-	-
	b\9.0	15	28	29	<0.1	<3	0.1	.234	<.001	.021	.006	-	-	-
009	8.1	7	9	35	<0.1	<3	0.4	.025	.005	.009	.006	-	-	-
	7.8	3	36	28	<0.1	<3	0.6	.057	<.001	.017	.006	-	-	-
010	8.1	4	9	26	0.4	-	-	-	-	-	-	-	-	-
	8.1	<3	22	40	0.4	-	-	-	-	-	-	-	-	-
011	9.0	<3	34	37	0.5	-	-	-	-	-	-	-	-	-
	9.0	3	21	18	<0.1	-	-	-	-	-	-	-	-	-
012	8.6	<3	54	17	<0.1	-	-	-	-	-	-	-	-	-
	8.3	<3	46	23	<0.1	-	-	-	-	-	-	-	-	-
013	9.2	<3	31	11	<0.1	<3	-	-	-	-	-	<.001	<5	<0.01
	8.8	<3	37	14	<0.1	3.9	-	-	-	-	-	<.001	10	<0.01

a\Sample 30 minutes after rain began
b\Composite of samples at 30 minute intervals for four hours
G&O = Grease and oil
\- = No analysis

b) Predicted toxicity data of storm runoff constituents to *Salmo gairdneri*

Constituent	Concentration (ppm)	Effect	Reference
Copper (Cu)	0.04-0.06	Little or no mortality of fry, 21 days; 15 C	Grande (1967)
Copper	0.4-0.5	48hr-TLm, Acute; depends on total hardness and D.O.	Brown (1968)
Copper	0.75	48hr-TLm, at 15.3-18.4 C	Brown and Dalton (1970)
Copper	0.8	48hr-TLm	Herber et al. (1965)
Iron (Fe)	Insoluble	Non-toxic	-
Chromium (Cr)	5.0 10.0-12.5	40% kill, 15 days 80% kill, 15 days	Fromm and Stokes (1962)
Chromium	20.0	No toxic effect	Herbert et al. (1965)
Chromium	31.0	No kill in 96hrs	Garton (1972)
Ammonia (NH_3)	0.41	48hr-TLm	Ball (1967)
Ammonia	0.7	Lethal in 390 min	Wuhrmannt Woker (1948)
Ammonia	5.0	Lethal	Meinck et al. (1956)
Ammonia	100-200	Threshold at pH 7	Lloyd (1961)
Sulphate (SO_4)	10,000 6820	25% mortality after 24hr Survive 3 weeks	Herbert and Wakeford (1962)
Chlorine (Cl)	0.001	Avoidance	Sprague and Drusy (1969)
	0.014	96hr-TLm	Anonymous (1971)
	0.029 0.23	96hr-TLm 96hr-TLm	Bash (1971)

TLm = Median Tolerance Limit (concentration that induces specific effect to 50% of the test population)

Although the probability of spills into Diablo Creek is relatively small, a number of accidental spills occurred from the mid-1970s to the early 1980s. These spills were associated with a pipeline used to convey liquids across Diablo Creek from the turbine building sump to the wastewater holding pond. The spills (largely chromated water and seawater) entered Diablo Creek near the ocean outfall, in the vicinity of the access road. Estimated spill volumes ranged from 1,000 to 5,000 gallons. Each event was promptly reported to the RWQCB, and no obvious environmental effects were revealed during followup biological surveys (PG&E document files, DCPP).

Rainbow trout occur in upstream areas where surface water flow is maintained throughout the year. They also occur in pools that remain watered when adjacent stream reaches are reduced to subsurface flows. This, in itself, is an indication of good overall water quality, as rainbow trout are known to be sensitive to changes in a variety of water quality parameters. For this reason, rainbow trout are commonly used in bioassay studies conducted by water laboratories throughout California.

AQUATIC BIOLOGY

Diablo Creek can be separated into four distinct sections based on habitat type and streambed characteristics. Figure C-4 shows the location of each stream reach. Sections 1-3 are directly affected by water diversions, groundwater pumping, storm water runoff, and other discharges. Section 4 is a largely unaltered and natural reach.

In February 1991, field surveys conducted in the upper watershed area (Section 4) revealed a small diversion located at Diablo Falls, 2 miles upstream from Diversion Point 1. This diversion provides water for livestock and has probably been in use for many years. A 2-inch pipe carries water approximately 0.5 mile downstream to a trough located in Ramiro Meadow. No quantitative measure of the flow entering the trough was made, but it was visually estimated at roughly 8 gpm. At the time of the most recent surveys, the stock trough was not equipped with a shutoff valve. Therefore, the flow into the trough was continuous, causing the trough to spill. Apart from this diversion, Section 4 is subject only to natural fluctuations in flow. A fifth stream section, which flows through the culvert beneath the 230- and 500-kV switchyards, has not been sampled.

An aquatic survey of Diablo Creek was performed by PG&E biologists in 1986. Sampling occurred in all four stream reaches, but was limited to the lower 1 mile of the channel (PG&E 1986). Thirty-three invertebrate taxa were identified. Some vertebrate species, including rainbow trout, were also found.

Rainbow trout are the only fishes known to occur in Diablo Creek, and they are present in all four stream sections (PG&E 1986). Thirty five adult trout (>4 inches) were collected during sampling in April 1986, and 27 adults and 5 juveniles were collected in May. This ratio of juveniles to adults is considered low, and suggests either low reproductive success or high juvenile mortality.

In the 1986 survey, only the lower 300 feet of Section 4 was sampled. Yet, results showed trout four times more abundant here than in Sections 1-3. This is attributed to better overall habitat conditions in Section 4. A second field survey of this same reach of stream was conducted by PG&E biologists in November 1990. At that time, surface water flow was continuous over the sampled reach. A total of 11 rainbow trout were identified, ranging in size from 3 to 5.6 inches (Moock 1990).

Because of the intermittent nature of surface flows in Diablo Creek, trout tend to concentrate in still pools or where flowing water is present year-round. An example is the plunge pool formed by the outflow of

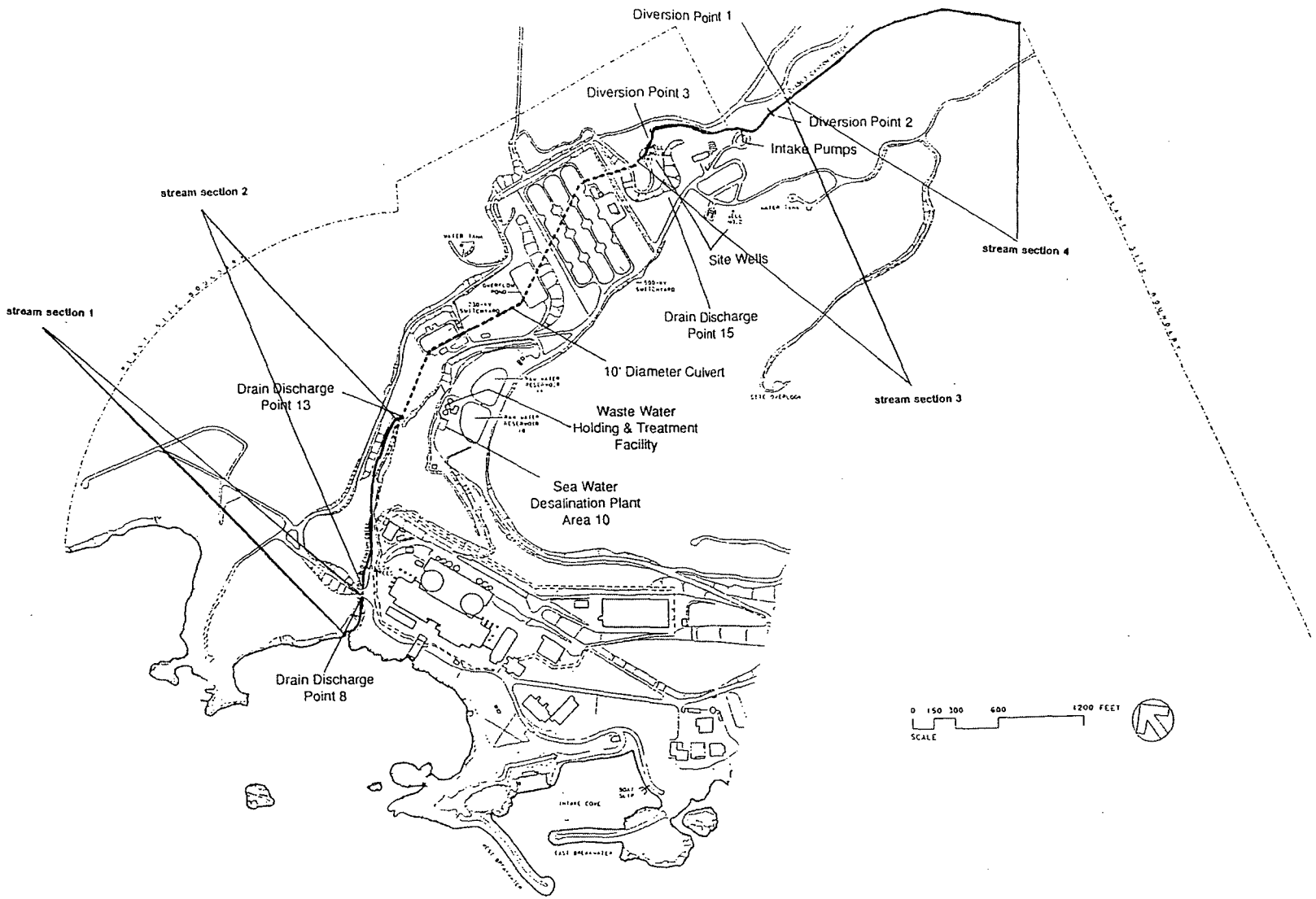


Figure C-4. Location of stream sections associated with Diablo Creek.

water through the switchyard culvert (Section 2). During the 1986 field survey, five adult trout (one measuring 11 inches) were identified here. Several dozen trout were also observed in the pool located at Diversion Point 2.

The primary factor limiting trout abundance in Sections 1-3 appears to be a lack of habitat - specifically, habitat capable of providing all life requisite needs through the dry season when surface flows are reduced and pools become isolated by dewatered reaches of stream channel.

BOTANICAL RESOURCES

Five vegetation community types occur in the Diablo Creek watershed. The following discussion characterizes each type with respect to species composition and general occurrence. Figure C-5 illustrates the pattern of distribution and relative abundance of each type within the watershed.

COASTAL SCRUB (INCLUDES COASTAL BLUFFS AND BEACHES)

This vegetation community is often referred to as a component of the "soft chaparral." Within the watershed, this habitat occurs near the mouth of Diablo Creek and may also occur as a narrow intergrade with riparian vegetation along the lower stream reaches. It is dominated by coyote bush (*Baccharis pilularis*), sagewort (Artemisia californica), coffeeberry (*Rhamnus californica*), sticky monkeyflower (*Mimulus aurantiacus*), redberry (*Rhamnus crocea*), and fuchsia-flowered gooseberry (*Ribes speciosum*). Numerous native and non-native forbs and grasses are also present within this shrub assemblage.

CHAPARRAL

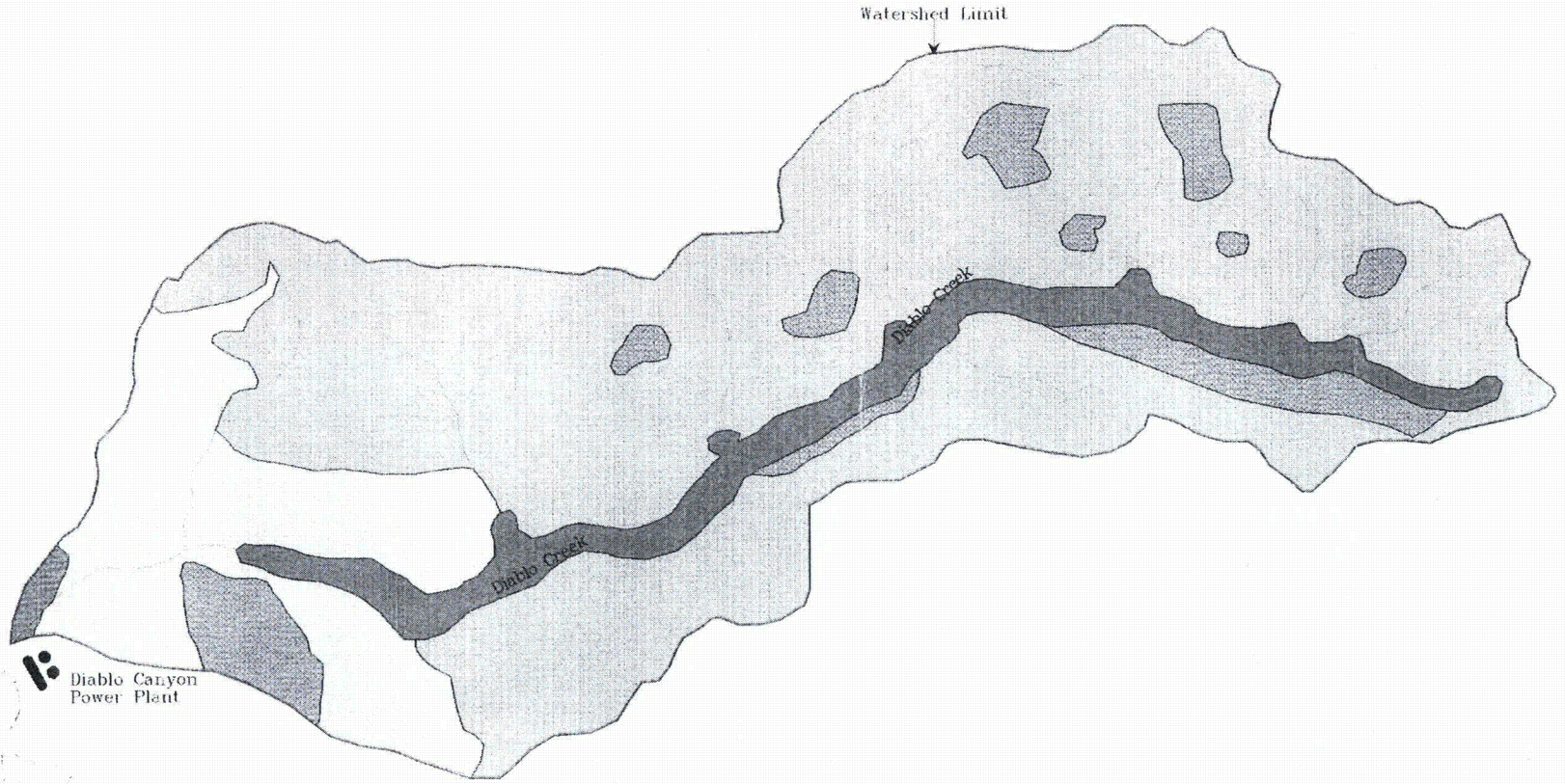
This community is commonly found on the rockier soils, ridgetops, and high ravines further inland to the coastal scrub. It is a very dense habitat often referred to in the literature as "hard chaparral." It is dominated by a dense assemblage of woody shrubs. Examples of the most commonly encountered species include toyon (Heteromoles arbutifolia), poison oak (*Toxicodendron diversiloba*), manzanita (*Arctostaphylos* spp.), blue ceanothus (Ceanothus thyrsiflorus), black sage (*Salvia mellifera*), and honeysuckle *(Lonicera hispidula)*. Very little herbaceous understory is present in this habitat type except in those areas that have been opened through prescribed burning.

GRASSLAND

This vegetation community is found on the more moderate slopes and flats and in the natural and manmade clearings in the chaparral. This habitat type is composed almost entirely of herbaceous flora. The dominant species are soft chess (*Bromus mollis*), ripgut brome (*B. diandrus*), filaree (*Erodium* spp.), wild barley (*Hordeum* spp.), cheeseweed (*Malva parviflora*), needlegrass *(Stipa pulchra)*, bur clover (*Medicago hispida*), and wild oats (*Avena barbata*). This vegetation type currently supports livestock grazing within and adjacent to the watershed. Many of the most highly disturbed areas within this habitat type are colonized by weedy or ruderal flora that have little or no forage value and outcompete many of the above described species. Examples of such aggressive taxa include milk thistle (*Silybum marianum)*, tansy mustard (*Sisymbrium officinale*), field mustard (*Brassica geniculata*), and Italian thistle (*Carduus pynocephalus*).

Figure C-5

VEGETATION TYPES IN THE DIABLO CREEK WATERSHED



OAK WOODLAND

This vegetation community is widely distributed in the Diablo Creek watershed. It is found mostly on north-and east-facing slopes and in shaded ravines. Where the slopes are moderate to steep, this habitat type is dominated by a rather dense shrubby form of coast live oak (*Quercus agrifolia)*, California bay (*Umbellularia californica*), poison oak, coffeeberry, and honeysuckle. On the gentler slopes and ravines, medium to large trees of coast live oak dominate the landscape. In this latter habitat, a sparse to moderate understory dominated by non-native forbs and grasses, gives a park-like quality to these ancient hardwood groves.

RIPARIAN CLOSED–CONE PINE–CYPRESS FOREST

Riparian

The riparian vegetation community is found along Diablo Creek and its tributaries. This habitat forms a narrow band along both sides of a natural drainage channel. It is most pronounced along Diablo Creek upstream from Diversion Point 3, reaching its best expression in the vicinity of Diablo Falls.

This habitat type is dominated by extensive stands of red willow (*Salix laevigata*), big-leaf maple (*Acer macrophyllum*), elderberry (*Sambucus mexicana*), wild cucumber (*Marah fabaceus*), poison hemlock (*Conium maculatum)*, nettle (*Urtica holosericea)*, and rush (*Juncus balticus*).

Although this habitat type represents the smallest acreage, it is one of the most significant natural resources of the watershed. It has a high index of floristic diversity and provides suitable habitat relationships for fish and wildlife.

FRESHWATER MARSH

Rare And Sensitive Plant Species

To determine the possible presence of rare and sensitive plants within the Diablo Creek watershed, a search was made of the California Natural Diversity Data Base, California Native Plant Society Inventory of Rare and Endangered Vascular Plants of California, and other available records. Other relevant literature was also reviewed, and local experts were consulted. Based on the results of this work, it is concluded that the Diablo Creek watershed may contain some species classified as rare or sensitive. Most of these species would be expected to occur in either the coastal scrub or chaparral vegetation communities. Some would only be expected to occur in association with unique soil types or rock outcrops. Table C–3 summarizes information pertaining to these candidate rare or sensitive plant species. We emphasize that these are

Table C-3

Candidate, Rare, Threatened or Endangered Plant Species that may potentially occur in the Diablo Creek Watershed

Species/Taxa	Common Name	Status CNPS	State	Federal	Habitat
Arctostaphylos pechoensis	Pecho Manzanita	4	-	3C	Coastal Scrub Chaparral
Calochortus obispoensis	San Luis Mariposa Lily	1B	-	C2	Chaparral, grassland (serpentine)
Carex obispoensis	San Luis sedge	1B	-	3C	Coastal Scrub, Chaparral (serpentine)
Chorizanthe breweri	Brewers spineflower	1B	-	C2	Coastal Scrub, (serpentine)
Cirsium fontinale var. obispoense	Chorro Creek Bog thistle	1B	-	C2	Chaparral (serpentine seeps)
Dudleya abramsii	San Luis dudleya	4	-	C2	Chaparral
Dudleya bettinae	San Luis serpentine dudleya	1B	-	C2	Coastal Scrub (serpentine)
Eriodictyon altissimum	Indian Knob balsam	1B	CE	C1	Chaparral
Fritillaria viridea	San Benito fritillary	1B	-	C2	Chaparral (serpentine)
Layia jonesii	Jone's layia	1B	-	C2	Chaparral
Lupinus ludovicianus	San Luis Obispo lupine	1B	-	C2	Chaparral
Malcothamnus niveus	San Luis bush malcothamnus	4	-	-	Chaparral

CNPS Status Codes:
- 4 = plants of limited distribution
- 1B = plants rare and endangered in California and elsewhere

State Status Code:
- CE = California endangered species

Federal Status Codes:
- 3C = no longer under review
- C2 = under review, information insufficient to support listing as endangered species.
- C1 = under review, information sufficient to support listing as endangered species.

candidate species only. No rare or sensitive plant species are known from documented sites within the watershed. Table C–3 shows no candidate-sensitive species associated with riparian habitat. Furthermore, species that may occur elsewhere in the watershed are not likely to be negatively impacted by current management practices, including the fuel management program.

A definitive conclusion regarding the presence of rare or sensitive plants requires that comprehensive sequential field surveys be performed throughout the watershed during the appropriate seasons of the year.

WILDLIFE HABITAT RELATIONSHIPS

The 3200 acre watershed of Diablo Creek is characterized by a mosaic of vegetation types that individually or in combination, satisfy the habitat requirements of a wide variety of wildlife species. Each of these vegetation types has been described earlier (see Botanical Resources).

During field surveys in early March 1991, PG&E and contract biologists inventoried each habitat type to determine structural characteristics of the vegetation that serve to further define wildlife relationships. This information enabled our use of the Wildlife Habitat Relationships (WHR) Program computer models (Mayer and Laudenslayer 1988). The WHR models can be used to develop a list of wildlife species predicted to occur within a designated geographical area based on vegetation habitat types and other special habitat elements.

A computer search was made of the five specific habitat types found in the watershed. The search further specified that these habitats occur in San Luis Obispo County. Beyond this, the search criteria were left as broad as possible. The output was reviewed by a PG&E wildlife biologist for obvious errors of commission and omission. The unedited output indicated a total of 296 species. After editing, a total of 151 species remain as probable candidates. Table C–4 shows the number of species associated with each habitat type in the watershed. Also shown are the number of species that may reproduce in each habitat. If totaled, these figures would greatly exceed 151. This is because many species are associated with more than one habitat. The WHR model is not precise in its ability to predict wildlife occurrences. It is best used to determine patterns of wildlife diversity between and among habitat types, and provide guidance for the planning of more detailed studies.

A second computerized database, the California Natural Diversity Database, was also used. This database maintains information on known locations of threatened, endangered and sensitive wildlife and plant species. Areas that have received little attention by professional biologists in the past, may show no record listings in the database. This does not mean that sensitive species are not found there. Using both databases has given us a better sense of the probability of occurrence of these species within the watershed.

Based on information from these sources and our own limited field studies, we can identify no candidate state or federally listed threatened or endangered wildlife species for the Diablo Creek watershed.

Two species, the coopers hawk and the western pond turtle, are currently listed by the CDFG as Species of Special Concern. Although we are aware of no records of these species from the Diablo Creek watershed, suitable habitat is present. Golden eagles are frequently seen to the north of the watershed where open grasslands offer good foraging opportunities. Suitable nesting habitat for this fully protected species is found within the watershed. No nest sites are known at this time. Another fully protected species, the ringtail, could also occur within the watershed based on suitability of habitat.

Table C-4

Summary of Wildlife Habitat Relationships for Diablo Creek Watershed.

Habitat Type	No. Birds	No. Mammals	No. Reptiles	No. Amphibians
Oak Woodland	86(44)	24(16)	16(16)	7(4)
Coastal Scrub	39(20)	31(22)	15(15)	6(5)
Chaparral	40(4)	26(10)	11(11)	3(1)
Annual Grass	40(4)	26(10)	11(11)	3(1)
Riparian	85(65)	28(24)	19(19)	6(3)

Note: Values in parentheses indicate the number of species potentially breeding within each habitat type.

EXISTING LAND USE

Livestock Grazing

The Pecho Ranch and Marre Ranch grazing leases converge within the Diablo Creek watershed. At present, livestock use within the watershed is considered to be light to moderate. Total grazable acres are small, but cattle do find their way into grassy openings in the dominant oak woodland and chaparral vegetation types. Stock water has been developed within Ramiro Meadow on the north side of Diablo Creek, about one-half mile below Diablo Falls. The source of this water is a 2 inch pipe located in the pool above Diablo Falls. A second trough is found below the summit of Green Peak, on the north slope. The source for this water is a 30,000-gallon redwood storage tank, located on the slope above the dog kennels. A third trough is located adjacent to the Dry Canyon Road, about one-half mile north of the turnoff to Ramiro Meadow. The source of this water is the old Field Ranch diversion and pump on Diablo Creek, downstream from Diversion Point 1. Effects of livestock grazing within the riparian zone of Diablo Creek appear at this time to be minimal.

Total grazing capacity within the watershed, and significance of the watershed to tenant grazing programs are unknown at this time. Potential exists for incorporation of livestock grazing into an existing fuel management program. Livestock could be used to manage vegetation following controlled burns in chaparral habitat. This would lengthen the period over which reduced fuel load benefits are realized. It is recognized however, that diverting water from Diablo Creek to satisfy the needs of livestock may be in conflict with the use of this water for power plant operations.

Fuel Management

The location of Diablo Canyon Power Plant and related facilities adjacent to the wildland vegetation of Diablo Creek watershed has necessitated development of a fuel management program on watershed lands. The program goals are protection of the plant site, transmission lines, and workforce population from wildfire. The approach is the management of fuels within the watershed using controlled burning, brush clearing and selective application of herbicides.

Diablo Canyon has experienced two wildfires in the past 6 years. These fires have caused phase to ground arcing of the overhead transmission lines resulting in loss of on-site power. The fuel management program is essential to ensuring reliability of operation and overall safety at Diablo Canyon.

Security Buffer

Diablo Creek watershed also serves the need for security at Diablo Canyon by providing a controlled access wildland buffer to the east of the power plant. The watershed represents approximately 32 percent of all lands owned or controlled by PG&E in the vicinity of the power plant and associated facilities.

Water Diversion

A key aspect of Diablo Creek watershed is the presence of water diversion facilities supplying raw fresh water to the power plant makeup water system. Currently these facilities are designed to deliver approximately 30 percent of the required makeup water supply on a daily basis.

Facility Siting

The lower watershed area contains the 500- and 230-kV switch yards and certain other nonrelated operations centers. Makeup water treatment facilities and storage reservoirs are also located here. The middle third of the watershed contains water diversion, pumping, and temporary storage facilities for the makeup water system. The upper watershed area contains numerous steel lattice transmission towers, tower access roads, and overhead conductors.