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DIABLO CANYON POWER PLANT

ANNUAL ENVIRONMENTAL OPERATING REPORT

(Part B)

1984

PACIFIC GAS AND ELECTRIC COMPANY

PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT

1984 ANNUAL ENVIRONMENTAL (NON-RADIOLOGICAL) OPERATING REPORT

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1.0 INTRODUCTION

The Pacific Gas and Electric Company (PGandE) has committed to minimizing the impact of the Diablo Canyon Power Plant (DCPP) facility construction and operation on the environment. The 1984 Annual Environmental Operating Report (AEOR) is being submitted in accordance with the objectives of the Environmental Protection Plan (EPP) as required by Facility Operating License DPR-80, to demonstrate that the plant is operating in an environmentally acceptable manner.

2.0 ENVIRONMENTAL MONITORING

2.1 AQUATIC

2.1.1 National Pollution Discharge Elimination System (NPDES) Permit Annual Progress Reports

The reporting requirements section of the DCPP NPDES permit No. CA0003751 requires that the Regional Water Quality Control Board (RWQCB), Central Coast Region, receives annual progress reports covering NPDES Provisions D.6 (Demusseling), D.7.a (Thermal Effects Monitoring Program (TEMP)), and D.7.b (Impingement and Entrainment Studies). The 1984 progress reports were submitted to the RWQCB on March 27, 1985. Copies of the reports were forwarded to the Nuclear Regulatory Commission (NRC) at that time.

2.1.2 NPDES Permit Nonroutine Reports [EPP Section 3.2]

The following nonroutine reports were submitted to the RWQCB in 1984. In accordance with EPP Section 3.2, copies of these reports were forwarded to the NRC as the reports were issued.

May 18, 1984	April monthly waste discharge report indicated that the monthly nonfiltrable residue limit for discharge 001H was exceeded.
June 19, 1984	May monthly waste discharge report indicated that the monthly nonfiltrable residue limit for discharge 001H was exceeded.
August 14, 1984	Spill of sodium bisulfite solution into Diablo Creek.
September 11, 1984	Release of reverse osmosis blowdown into Diablo Creek.

2.1.3 Environmental Investigations

Environmental studies have been performed at DCPP since 1966, and results are published by PGandE's Department of Engineering Research (DER) in an annual volume entitled "Environmental Investigations at Diablo Canyon." Attachment 1 contains summaries of the studies performed in 1984. Copies of the entire report are available upon request.

2.2 TERRESTRIAL

2.2.1 Erosion Control [EPP Section 2.2]

The DCPP associated transmission line rights-of-way did not require erosion control measures in 1984.

Several erosion control measures, including drainage improvement, back-filling of eroded areas and road repaving, were undertaken in the plant site area located north of Diablo Creek. This work was designed to control erosion in the CA-SLO-2 archaeological site and to minimize siltation of Diablo Creek and Diablo Cove.

2.2.2 Herbicide Application [EPP Subsection 4.2.1]

No herbicide was applied within the DCPP associated transmission line corridors in 1984.

Herbicide was applied to the DCPP 230KV and 500KV switchyards on November 11, 1984. AAtrex-90, in a concentration of 10 pounds in 100 gallons of water per acre, was applied to the approximately 16.1 acres. The application was made using a mechanical boom with spray, by a contractor licensed by the California Department of Agriculture.

2.2.3 Preservation of Archaeological Resources [EPP Subsection 4.2.2]

2.2.3.1 CA-SLO-2 Site Management. There were no disturbances of CA-SLO-2 site during 1984 which required the submittal of a nonroutine report to the NRC.

On June 15, 1984, the NRC issued a "No Effect" determination regarding the impact of DCPP operation and maintenance on CA-SLO-2 site.

Storage of equipment and construction materials at CA-SLO-2 was discontinued and sandblasting activities were moved to a new location outside of the CA-SLO-2 area. Measures designed to control erosion were completed.

2.2.3.2 Chumash Indian Access Agreement. In 1982, a controlled site access agreement was enacted between PGandE and the Santa Ynez Band of the Chumash Indian Tribe. There were no requests for a site visit by the Santa Ynez Band in 1984.

3.0 UNUSUAL OR IMPORTANT ENVIRONMENTAL EVENTS [EPP Section 4.1]

3.1 DIABLO COVE ALGAL OBSERVATIONS

Underwater biological surveys and laboratory analyses of results from subtidal settling plate studies detected changes in the marine algal environment of south Diablo Cove during the Spring of 1984. These population changes included an unusual amount of bleaching in articulated coralline algae, early senescence in Botryoglossum farlowianum, premature stipe loss in Cystoseira osmundacea, and increased numbers of benthic diatoms and an Ulva species. There were no demonstrable changes in fish or invertebrate populations. The changes were verbally reported to the on-site NRC inspector and the RWQCB staff.

The observed conditions subsided during the Summer and Fall months, so that by the end of 1984 the algal environment appeared normal. No correlation could be found in comparing algal changes with temperature, light, or power plant discharge data. This area will be closely monitored by the Thermal Effects Monitoring Program (TEMP) team during 1985.

4.0 PLANT CONSISTENCY REQUIREMENTS [EPP Section 3.0]

4.1 DESIGN CHANGES

Proposed plant design changes, which have the potential to affect the environment, must receive an environmental evaluation prior to implementation. A summary of each Design Change Notice (DCN), which received an environmental evaluation prior to implementation in 1984, is presented.

DCO-EC-3186 - Discharge Structure Modifications.

The DCPP NPDES permit requires that the temperature at the point of discharge of both units does not exceed 86°F. In order to meet the 86°F limit the discharge structure was modified to increase mixing between the two unit discharges. The following modifications were made:

(1) Openings were cut in the central wall separating the two discharge tunnels;

(2) An end weir was constructed in the stilling basin;

(3) Weir plates on the lower weirs were removed;

(4) Side walls were extended to minimize water splash.

The environmental review states that enhanced mixing, especially during demusseling operations, would result in a reduced temperature in the thermal plume. It was, therefore, determined that the design change would not involve an adverse environmental effect, and that an unreviewed environmental question was not involved.

DC1-EJ-13855 - Modification to the Circulating Water Temperature Monitoring System

To conform with an NPDES permit requirement, a continuous temperature monitoring system has been installed which measures intake and discharge temperatures. The system is tied to an alarm, located in the control room, which is triggered when the ΔT between the two measurements approaches 20°F.

The environmental review determined that the modification did not involve an unreviewed environmental question.

DC1-EC-15744 - CA-SLO-2 Archaeological Site Erosion Control

In order to control erosion on the CA-SLO-2 archaeological site, this design change provided for increased drainage in the area, backfilling of eroded areas, and repaving of portions of the property access road.

These measures were determined not to involve an unreviewed environmental question, and will decrease adverse impact on the archaeological site as well as decreasing the siltation of Diablo Creek.

DC1-SC-15987 - Ground Water Monitoring Wells for Temporary Waste Holding Pond

This design change provided for the drilling of four (4) ground water monitoring wells around the temporary waste holding pond, as required by the RWQCB. The depth of the wells was determined by the bedrock level.

The environmental evaluation determined that well installation would have no adverse environmental effects. If archaeological material had been discovered during the drilling of any well, an alternate drilling site would have been selected.

DCO-EM-23155 - Biolab Saltwater Supply System Installation

The Biological Thermal Effects Laboratory at DCPP performs many of the environmental studies required by the NPDES permit. The heavy winter storms of 1982-1983 destroyed the laboratory saltwater supply system. This design change provided for a replacement system.

Because this system would replace the former system and the discharge would not exceed the existing NPDES permit limit, it was determined that the installation would not have any adverse environmental effect, and that no unreviewed environmental question was involved.

DCO-SM-23356 - Pressure Relief Discharge Controls for the Chlorination Facility

This design change proposed to install a pressure relief system on the chlorine evaporator for the salt water system, as recommended by the supplier. This change provides for an alarm system which is activated at 325 psig, which allows the attendant to act (i.e., turn down the heater) before the pressure reaches the 400 psig release valve pressure.

Installation of this system will decrease the potential for an atmospheric release of chlorine gas. There was no unreviewed environmental question involved in this modification.

5.0 PLANT REPORTING REQUIREMENTS [EPP Section 5.0]

5.1 EPP NONCOMPLIANCES

There were no EPP noncompliances during 1984.

5.2 CHANGES IN STATION DESIGN

There were no changes in station design or operation, tests and experiments which involved a potentially significant unreviewed environmental question in 1984.

5.3 NONROUTINE REPORTS

There were no EPP nonroutine reports in 1984.

6.0 EPP AUDIT [EPP Section 5.1]

The PGandE Quality Assurance Department performed an audit of the implementation of the EPP in 1984. No items of noncompliance were found.

ATTACHMENT 1

SUMMARY OF

ENVIRONMENTAL INVESTIGATIONS AT DIABLO CANYON, 1984

Pacific Gas and Electric Company

Department of Engineering Research

San Ramon, California

1. INTERTIDAL FISH COMMUNITY STUDY

Intertidal fish studies have been conducted since 1978. The perimeter of Diablo Cove was extensively sampled in a distribution study to determine populations locations within the cove. During the study, 2,266 fish were identified, surveyed for location and elevation, and released. The most abundant species were Xiphister atropurpureus, X. mucosus and Gobiesox maendricus.

A community structure study was designed based on the data from the distribution study. A total of 171 permanent sampling locations along relatively uniform vertical gradients were sampled every two months from February 1979 to June 1983. During this study, 4,820 fishes of 15 species were identified, measured, and released. The most common species during the four years of study were Xiphister mucosus, X. atropurpureus, Anoplarchus/Cebidichthys, and Gobiesox maedricus. Abundances of all species were observed to increase during the early summer months due to recruitment of juveniles. Spawning of the dominant species seemed to occur during early spring each year.

2. NPDES MONITORING PROGRAM AND TOXICITY STUDIES

During 1984 the NPDES self-monitoring program as required by the Regional Water Quality Control Board was continued without modification. PGandE's Department of Engineering Research (DER) maintained responsibility for receiving water monitoring.

Major elements included in the monitoring program were the Thermal Effects Monitoring Program (TEMP) reported annually to the Regional Board, USNRC and California Department of Fish and Game each April, and physical oceanographic studies, and effluent toxicity studies reported to the Regional Board monthly.

3. HEAT TREATMENT OPTIMIZATION STUDIES

The Diablo Canyon Power Plant Heat Treatment Optimization Study was initiated in early 1983. The purpose of this study is to develop a site specific heat treatment procedure which will maximize marine biofouling control and minimize potential environmental impacts. The study has been designed to satisfy requirements of Provision D.6 of the Diablo Canyon NPDES permit. Phase I of the study consists of a laboratory determination of the thermal tolerance of major biofouling species. This work was completed in 1984. In Phase II, actual fouling communities are cultured in a sidestream of the power plant's cooling water flow to determine growth rates and periods of peak settlement. These fouling organisms are subjected to simulated heat treatment comprised of varying combinations of temperature, duration, and frequency. Physical model studies are being conducted in Phase III to determine the areal extent of the discharge plumes resulting from the heat treatment procedures simulated in Phase II. This information will be coupled with laboratory studies to predict the environmental consequences of heat treatment temperatures under

various physical and environmental conditions. In addition, an engineering assessment of alternatives to heat treatment for the control of biofouling was added to Phase III during 1984. Results of all three study phases will be integrated to develop a site specific heat treatment program which maximizes the effectiveness of macrofouling control and minimizes environmental effects. The effectiveness of heat treatment procedures will be monitored during Phase IV.

4. BREAKWATER REPAIR MARINE MONITORING PROGRAM

Environmental monitoring of the Diablo Canyon Power Plant breakwater repair continues. In 1984, effects of construction related turbidity on the marine biota were investigated. In 1984 the water quality monitoring program was discontinued since turbidity measurements were ambient. The monitoring of the flora and fauna stations was continued throughout 1984. Analysis indicated no measurable effects on the benthic community in the vicinity of construction activities.

Breakwater repair activities and limited grouting are scheduled to begin again in June 1985. Monitoring studies conducted during 1984 will be continued through 1985.

5. WHEELER J. NORTH ECOLOGICAL STUDIES: 1984

Intertidal and subtidal marine ecological studies conducted by the W. J. North study team continue. In addition to their regular periodic monitoring subtasks, abundances of major subtidal phaeophyta were estimated at all five sampling stations during May, August, and December. A special study of subtidal erect coralline algae (Calliarthron spp.) was undertaken in August with a followup in December.

These investigations complete field studies of preoperational conditions in Diablo Cove and nearby areas. The general status of plant and animal communities at this point in time was one of recovery from the recent El Nino. Two major categories of effects from El Nino were observed: the first was widespread physical damage from powerful storms during early 1983. The second was presence of elevated water temperatures and depletion of dissolved nutrients which was inferred from symptoms prevalent among the flora. A second localized disruption apparently occurred during late spring 1984 and, as far as could be ascertained, affected organisms only along one of the subtidal transects in central Diablo Cove. Results of El Nino and the localized disruption were seen primarily as changes in abundances, distributions, and in some cases, age compositions of various populations.

6. ANALYSIS OF THE PARTYBOAT SPORTFISHERY IN THE VICINITY OF DIABLO CANYON, SAN LUIS OBISPO COUNTY, CALIFORNIA

The partyboat sportfishery catch has been intensively monitored for five years as part of a baseline study conducted prior to commercial operation of the Diablo Canyon Power Plant. Emphasis is placed on the number of anglers, the amount of time spent fishing, and the catch per unit effort by fishing trip. Seasonal and annual trends in landings and fishing pressure are documented, as well as annual trends in the landings of individual bottomfish species.

7. OBSERVATIONS OF THE SEA OTTER ENHYDRA LUTRIS POPULATION BETWEEN POINT BUCHON AND RATTLESNAKE CREEK SAN LUIS OBISPO, CALIFORNIA

The monitoring of the southern sea otter continues. Sea otter numbers, rafting sites, and incidental feeding activities were recorded twice a month from January to April and three times a month from April through December 1984. Subtidal sea urchin and abalone density surveys, night activity monitoring and tagged sea otter observations were also conducted. The sea otter population within the study area remains stabilized and well established. Females and pups dominate the area accompanied by several territorial males. The most commonly occupied resting sites include Windy Point, Lion Rock, Intake Cove, and Pecho Rock. Feeding observations indicate that small shelled mollusks and other incidental food items represent 50 percent of the sea otters diet. This indicates a continued shift in prey species from more preferred food such as abalone, sea urchins, and crabs. Sea urchin densities remain below detectable levels and abalone densities, although still low have increased to approximately 2/100m . Only three tagged animals were observed in the study area, one of which was a pup. It appears that at least one of these animals were from the San Simeon area. Night observations continue to confirm activity patterns similar to those of daylight hours. Females, however, appear to forage more at night than males.

8. OBSERVATIONS OF THE GRAY WHALE MIGRATION IN THE VICINITY OF DIABLO CANYON

A census of the California gray whale, Eschrichtius robustus was conducted offshore of the Diablo Canyon Power Plant for the third consecutive season to determine the number of animals passing through the anticipated area of the thermal plume, their time of passage, and distance from shore while in migration. A total of 77.5 hours of 26 days were spent collecting data. A study corridor 1,830 meters (6,000 feet) wide was used based on discharge plume predictions. During the 1983 - 1984 migration, southbound whales passed the plant between January 3, 1984, and February 10, 1984. The northerly return could not be separated into the typical two phases, the first consisted of males and females without calves and the second was comprised of cows and calves. Numbers passing within the 1,830 meter corridor reached 5.0 whales per hour (WPH) during the southerly leg and 6.7 WPH during the northerly movement. The largest pod contained

six individuals. Mean pod size was 1.4 during both southerly and northerly movement. Based on 77.5 hours of observation, an estimated 2,193 whales passed through the 1,830 meter corridor on the southerly migration, while 4,444 whales passed through on the northerly migration. Yearly variation in the numbers of whales observed seems to be related to their distance offshore, thus influencing the percentage passing through our observation zone.

9. A NUMERICAL ANALYSIS OF ALGAL COMMUNITY STRUCTURE IN DIABLO COVE, CALIFORNIA

A study was conducted to examine the intertidal plant community structure in the vicinity of Diablo Cove. Bimonthly surveys were conducted at several stations in the area of Diablo Cove. Each station consisted of three 30m transects running perpendicular to the shoreline. Qualitative data of species presence or absence were collected in 12-1m square quadrats along each transect. The ordination technique of Detrended Reciprocal Averaging was used to examine within survey-station community structure. Results indicated that differences in structure between surveys and stations are a result of differences in species composition and dominance. Physical environmental data collected in the study area were used with the biological data as input to the multivariate technique of Canonical Correlation. Results from Canonical Correlation indicated that changes in biological community structure correlate well with measured physical data. These physical data are a rough measure of seasonal change in local oceanic conditions.

10. OCEANOGRAPHIC STUDIES

Physical and chemical oceanographic studies were conducted in the vicinity of the Diablo Canyon Power Plant. During February, June, and September of 1984, the temperature, salinity, and dissolved oxygen concentrations were monitored at 27 stations. Additionally, pH was sampled at 12 of the locations in and near Diablo Cove. Surface to bottom temperature profiles were taken at each station. Water samples used for salinity, dissolved oxygen, and pH determinations were collected just below the surface, at mid-water column, and 0.5m above the bottom at each station.

These samples were analyzed for heavy metals and other designated pollutants. Sediment samples were collected at four stations in and near Diablo Cove.

The tracking of multiple surface drifters (drogues) was conducted 11 times during the year to provide additional information on current patterns offshore of Diablo Canyon.

11. FIXED LOCATION CONTINUOUS CURRENT MEASUREMENTS

Current measurements were conducted as in previous years. Predominant flow directions were coast-wise, parallel to the coast line and bathymetric contours. The frequency of occurrence of upcoast and downcoast flows was generally the same. The years seasonality of current directions was similar to previous years data. Upcoast flows predominated in the late summer through the winter months followed by a persistent downcoast trend in the spring and early summer months. During transitions between these predominant flow regimes, currents showed reversing flows with periods ranging from days to weeks.

During 1984 the average current speed was nearly 0.30 knots. During past years, average speeds have been approximately 0.20 knots. Peak speed recorded was 1.5 knots while the previous year's maximum was 1.3 knots. The percent occurrence of speeds greater than 0.5 knots was 15 percent during this period and 9 percent during the previous year's sampling.

12. OFFSHORE CURRENTS OBSERVATIONS

A field program to measure current patterns offshore of Diablo Canyon was conducted. Results of the analysis of data collected to date suggest that offshore currents will be the dominant factor controlling the extent and configuration of the far field plume from the Diablo Canyon Power Plant. Tracking of individual surface drifters (drogues) has occurred since 1966. In 1984, monthly studies were conducted utilizing multiple drouges.

A statistical comparison of the pathlines and velocities of two different drogue types, and a comparison of data from the moored current meter taken simultaneously with drogue data have been undertaken.

13. MONITORING OF NEARSHORE WAVE CLIMATE

Nearshore wave climate was monitored in an on-going study offshore of Pacific Gas and Electric Company's Diablo Canyon Power Plant. The wave monitoring program consists of measuring deep water direction, wave height, and period. Directional data are collected using a clinometer, which is installed at an elevated position approximately 900 feet above sea level on-shore on the slope of Green Peak, and an accelerometer bouy, located at the 75 foot contour near the Intake Cove. Significant wave heights are calculated by Scripps Institution of Oceanography, as part of the Coastal Data Information Program.

14. SUBTIDAL SEAWATER TEMPERATURES

Subtidal seawater temperatures were monitored at five stations in and near Diablo Cove from January 1978 to May 1984. Hourly temperature data were collected to evaluate the daily, monthly, and annual trends in nearshore waters adjacent to the Diablo Canyon Power Plant.

Seasonal trends are similar for the entire 65 month period. Minimum subtidal seawater temperatures occurred in late winter or early spring, and annual maximum temperatures were recorded in the late summer or early fall.

The seasonal flucuations in subtidal temperatures corresponded to the generalized temperature characteristics of the oceanographic seasons off the central California coast (i.e. the Upwelling, Oceanic, and Davidson periods).

The presence of the 1982 - 1983 El Nino warming event off the central California coast is evident in the data. A warming trend in mean monthly temperature occurred early in 1982. By late 1982 and early 1983, the mean monthly temperatures were, in general, substantially higher than those recorded in other years.

15. FOAM MONITORING

Intensive monitoring of the Diablo Cove area has shown that foam exists in varying amounts when the cooling water system at Diablo Canyon Power Plant is operated. Natural sea foam is also created during many different meteorological and oceanographic conditions. The amount of natural foam appeared to be greater during certain periods of the year.

In January of 1977 an automated camera system was installed at the Diablo Canyon Power Plant site to continually monitor both naturally occurring and plant created foam within Diablo Cove.

Meteorological and oceanographic conditions that contributed to foam accumulation patterns, migration and dissipation are also reported.

Power ascension testing for Unit 1 began in November of 1984. During the months of November and December, Unit 1 was operated at 30 percent to 50 percent capacity, resulting in an increased discharge temperature. Early observations indicate that the thermally elevated discharge does not significantly contribute to the foam levels within Diablo Cove.

16. EVALUATION OF CROSS-FLOW MIXING WITHIN THE DISCHARGE STRUCTURE OF DIABLO CANYON POWER PLANT

A dye tracer study was conducted at Diablo Canyon Power Plant to determine the extent of cross-flow mixing provided by the addition of ports in the discharge structure center divider. The study was

designed to determine the extent of mixing and dilution of the plant cooling water during heat treatment of the cooling water conduits. Rhodamine WT tracer dye was used to simulate heat during a heat treatment/demusseling test. Dye was injected into the cooling water system through the de-chlorination diffusers located in the discharge structure approach chamber. Heat treatment was simulated by releasing dye in a stepwise manner to correspond to the gradual increase of temperature of the recirculated water to a constant maximum demusseling temperature, and then decreasing back to normal operating temperature.

Dye concentrations were determined within the discharge structure after the point of injection. Additionally, the discharge jet configuration and dye dilution and dispersion within the receiving water was monitored at several locations within Diablo Cove.

17. HYDRAULIC MODEL CROSSFLOW STUDIES

In 1982 crossflow tests were performed on a hydraulic model for the case of heat treatment flows (500 cfs) in one unit, and normal operating flows (2,000 cfs) in the second unit. In these tests, crossflows through the crossover ports were measured using the energy balance technique.

In late 1984, tests were performed to determine crossflow for other flow combinations, e.g. zero flow in one unit and either heat treatment flow (500 cfs), 1 pump opeation (1,000 cfs) or normal operation (2,000 cfs) in the second unit. A second series of tests were performed for normal operation in one unit, and either heat treatment (500 cfs) or one pump operation (1,000 cfs) in the second unit. In 1984, crossflows were measured by collecting water at the downstream weir, and included crossflows both through the cutout and between the end of the center wall and the end weir. It was found that the crossover ratio, defined as the ratio of the crossover flow to the difference in flows entering the structure from each unit, was relatively constant, in the range 0.38 - 0.46, over a wide range of flows.

18. ANALYSIS OF DISCHARGE JET ORIENTATION WITHIN DIABLO COVE

An analysis of the orientation of the discharge jet from the Diablo Canyon Power Plant was performed. An automated camera atop the 67 meter (250 foot) meteorological tower provides a single photograph of Diablo Cove every 60 minutes during daylight hours. The jet orientation within the cove was determined from these photographs by examining the angle of the turbulence from the discharge. For exploratory analysis, a stepwise regression was performed to determine which, if any, of the independent parameters significantly influence jet orientation. The regression model included tide level, wind speed and direction, wave height, period, and direction, offshore current speed and direction, and discharge conditions (buoyancy and momentum).

Results indicate that tide level and discharge conditions are the most important factors influencing jet orientation.

19. MONITORING OF RECEIVING WATER TEMPERATURES FROM DIABLO CANYON POWER PLANT DURING POWER ASCENSION TESTING OF UNIT 1

Power Ascension Testing of Unit 1 at Diablo Canyon Power Plant began in 1984. A field data collection effort was instituted to describe the three dimensional receiving water temperature field and jet pathlines. Multiple tests were conducted at several power ascension levels, including 30 percent, 50 percent, 75 percent, 90 percent. Temperatures in the upper water column were measured along transects and temperature profiles were taken at fixed stations. Drogues were released and tracked to determine lagrangian velocities and temperature decay.

Results include graphical depiction of surface water isotherms, as the temperature decay along the plume centerline, and as a plot of fractional excess temperature versus the ratio of surface area and discharge flow rate.

20. HYDRAULIC MODEL STUDY OF THE THERMAL PLUME DISCHARGE GEOMETRY AND ZONE OF BOTTOM CONTACT, TEMPERATURES, AND WATER MOTIONS WITHIN DIABLO COVE

The geometry and behavior of the plume generated by the cooling water discharge of the Diablo Canyon Power Plant was studied. A flow visualization technique, utilizing dye crystals, was used to analyze bottom currents and determine the extent of the plume attachment region and location of lift-off. A temperature data acquisition system was used to record temperature build-up in selected locations within Diablo Cove.

Water elevation, current conditions, heat treatment mode and discharge flow rates are the independent factors which influence plume behavior considered in this study.

21. SURFACE HEAT TRANSFER EXPERIMENT

The areal extent of a heated plume from a large generating station is determined by a number of factors, one of which is the surface heat transfer rate. For a once-through system, such as the ocean discharge at Diablo Canyon, this factor affects primarily the extent of the low excess temperature isotherms, e.g. 0.5 degrees to 1.0 degrees C. A considerable amount of work has been done to establish surface heat transfer rates for cases in which the atmosphere above the water surface is neutrally stable or unstable. Limited data indicate that standard heat and mass transfer coefficients may be significantly high (up to a factor of two) when applied to the case of a stable atmosphere, i.e. cold water overlain by a warmer air mass. Since stable conditions are often experienced

off the central California coast, two instrumented test tanks were constructed at the Diablo Canyon Power Plant site. Heat transfer experiments were conducted for both heated and cooled tanks, with the objective of developing modified surface heat transfer coefficients for stable conditions. These site specific coefficients will then be used in computer models of the discharge plume from the Diablo Canyon Power Plant.

In order to apply the relationship developed from the test tanks to the ocean, measurements will be taken for both stable and neutral/unstable conditions. The data for the neutral/unstable cases will be used to develop a relationship between the tank and the ocean surface heat transfer rates. This relationship will then be used to apply the information developed for stable conditions above the tank to the ocean.

This report discusses the test procedures, presents the results, and compares the surface heat transfer coefficients obtained in the tests at the Diablo Canyon site with those available from the literature for neutral/unstable conditions.

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RELATED CORRESPONDENCE

PACIFIC GAS AND ELECTRIC COMPANY

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77 BEALE STREET, SAN FRANCISCO, CALIFORNIA 94106 TELEPHONE (415)

April 29, 1985

PGandE Letter No.: DCL-85-173

Mr. John B. Martin, Regional Administrator
U. S. Nuclear Regulatory Commission, Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Re: Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Annual Environmental Operating Report, Part B

Dear Mr. Martin:

Enclosed is the 1984 Annual Environmental Operating Report (Part B) for Diablo Canyon Unit 1, submitted in accordance with Subsection 5.4.1 of the Environmental Protection Plan, Appendix B to Operating License No. DPR-80.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,
ORIGINAL SIGNED BY
J. D. Shiffer

Enclosure

cc: R. W. Carr
R. B. Samworth
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ENCLOSURE