Regulatory Docket File

PACIFIC GAS AND ELECTRIC COMPANY

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November 11, 1975

Mr. Gordon K. Dicker, Chief
Environmental Projects Branch 2
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Dockets 50-275-OL
50-323-OL

Dear Mr. Dicker:

As discussed with members of your staff, I am enclosing one copy of an internal memorandum covering a telephone conversation between the Company and members of the NRC Staff on October 28, 1975.

Very truly yours,

Philip A. Crane, Jr.

cc w/enc.: ASLB Members
All Parties

13006

1-4-62-6215 (REV. 9-70)

PG and E

FOR INTRA—COMPANY USES

DIVISION OR DEPARTMENT

FILE NO.

RE LETTER OF SUBJECT Diablo Canyon Nuclear Power Plant
Physical Model of Thermal Discharge
Telcon with NRC, October 28, 1975

October 30, 1975

MEMORANDUM:

This memorandum summarizes a telephone conversation on October 28, 1975, between PGandE representatives (RFCayot, Chief, Dept. of Engineering Research; JTWells, Supv. Engineer; MJDoyle,Jr., Field Engineering Supv.) and NRC staff members (LCHulman, Hydrologist; MLFliegel, Hydrologist; Roy Overstreet, Oceanographer). NRC staff asked if PGandE would make an assessment of the Diablo Canyon physical model test results, submitted to NRC as Environmental Report Supplement No. 7, with respect to the model's representativeness of the prototype and its quantification of likely prototype isotherms and the possibility of recirculation.

The response given by PGandE representatives was: yes; although analysis of all the model information is not complete and additional time is needed for preparation of a complete technical discussion and integration of all the work, PGandE can assess the model data submitted in ER Supplement No. 7 and make a quantification of likely isotherms and recirculation. Some of the elements of such an assessment were discussed, which led to NRC staff's identification of several areas of interest to them:

1. To what extent do the model and prototype dye test results agree?

2. What modifications were made to the model to improve this agreement?

3. What is the basis for concluding that the potential for thermal recirculation in the prtotype is negligible?

4. What is the basis for a tentative conclusion that model thermal results are representative of future prototype isotherms?

5. What are the likely prototype isotherms?

These questions were answered briefly; then NRC staff requested PGandE to develop complete answers to assist its preparation of a Supplement to the Final Environmental Statement.

(What follows are the answers to the five questions above, discussed in general on the telephone and with some detail added subsequently.)

1. The results of prototype dye tests were submitted to NRC with ER Supplement No. 6 (ER-6); those of model dye tests with ER Supplement No. 7 (ER-7). ER-6; Figure 14, shows prototype test dye distribution about three hours after the dye was injected into the discharge. ER-7, Figures 16 and 26, show model dye distributions about three prototype-equivalent hours after the model dye injection (prototype elapsed time is equal to the square root of 75 times model elapsed time). The moderate downcoast ocean current condition prevailing on September 18, 1974, was simulated during the model dye tests. The location and surface distribution of the dye was essentially the same for model and prototype - at the end of three hours, as well as during the dye dispersion process. The prototype and model dye test results are considered to agree.

2. During preliminary check-out of the model apparatus, some of which was observed by NRC staff during its visit to the model basin (described in ER-6), it was decided that precise model reproduction of prototype topography near the discharge structure was important to ensure that the model hydraulic plume would be directed appropriately in azimuth, and that it would accurately simulate the hydraulic plume interaction near the discharge at various tide stages. Additional oceanic current information was also needed to verify model currents through the entrances to Diablo Cove. Accordingly, an intensive swimmer topographic survey and multidrogue study was conducted at Diablo Canyon in early August, 1975. The information from these field investigations was used to specify the model topography near the discharge and to adjust the model downcoast ocean current patterns. After these adjustments, the remote-sensing consultant was called to the model basin and model dye tests begun. No data were analyzed until a week after completion of all 1975 dye and thermal tests. The model was not "tuned" or modified in order to duplicate the prototype dye test results. Rather, it was constructed and operated as precisely as possible to scale prototype physical characteristics.

3. None of the surface thermal plumes elucidated by the model operating with a downcoast current under various conditions of tide, wave turbulence, and heat load were observed to project into Intake Cove. Confidence in an

expectation of no recirculation is increased by the physical fact that prototype intake conduits are below the surface and will draw on subsurface water.

The model and prototype dye study results, Figures 16 and 26 of ER-7 and Figure 14 of ER-6, show dye in the entrance to Intake Cove. To understand these results as they relate to model thermal results, it is necessary to examine concentrations of dye and relate them to concentrations of heat (temperature). For example, Figure 22, ER-7, shows concentrations of 1000-2000 ppb near the entrance to Diablo Cove which dispersed to concentrations of 20-40 ppb (Figure 26, ER-7) at the entrance to Intake Cove. A dilution of .01-.04 occurred. A severe case to consider for heat dispersion would be a similar .04 dilution of 6°C (incremental) surface water near the entrance to Diablo Cove (ER-7, Figure 9, two-unit test) which indicates an expectation of a .24°C rise in surface water temperature near the entrance to Intake Cove. Since this is less than the 0.5°C sensitivity of the model infrared scanner, it should not register as a thermal increment; and indeed it did not (ER-7, Figure 11). For one unit operation model results analyzed in the same way lead to expected rises of about 0.1°C in the surface water temperature near Intake Cove entrance.

Because: the intake conduits are below the surface; the model thermal results predict less than 0.5°C surface temperature rise at the entrance to Intake Cove; and considerations of model and prototype dye test results indicate that the potential for significant recirculation is negligible. When a downcoast ocean current does not prevail, the potential for recirculation is nil.

4. The model thermal results are considered to be representative of future prototype isotherms because:

   a. The model and prototype dye test results agree in broad, general, and basic ways. PGandE and the model consultant share this opinion. Nothing has been found which indicates a significant aspect of disagreement. The more detailed analysis which is presently in progress is expected only to quantify the fairly precise agreement already observed. PGandE believes the dye results indicate a satisfactory hydraulic model of the prototype has been achieved.

Extension of this conclusion to further definite conclusions concerning validity of model thermal results should properly wait until Unit 1 prototype thermal discharge can be compared to model thermal results. However, on the basis of the hydraulic agreement, it is also tentatively concluded that the model thermal results will turn out to be representative of prototype operations.

b. Model thermal plumes shown in ER-7 correlate with other work done before the physical model was constructed. In particular, the analytic model results from NRC staff studies displayed in the Final Environmental Statement are in general accord with the observed physical model isotherms with regard to surface isotherm areas outside the cove and benthic impact areas, for example.

c. Field studies done at Morro Bay Power Plant under a 1050 MW(e) load and a 19°F condenser temperature rise correlate with the model isotherm predictions. One result of these field studies, which were reported in An Evaluation of the Effect of Warm Water Discharges on the Beneficial Uses of Receiving Water, Morro Bay Power Plant, PGandE, 1973, was the enclosed figure showing the isotherm intensity versus areas enclosed by the isotherms. The range of several model predictions for a 2°C isotherm increment is shown there to fall within the range of Morro Bay field data. Although the Morro Bay discharge structure and flow velocity distribution near the structure are different than those of Diablo Canyon Power Plant, surface water temperature distributions well away from the structures should theoretically be similar so long as the waste heat load and condenser temperature rise are comparable. For that reason, the model agreement with Morro Bay field data at the 2°C isotherm locations is considered significant.

5. The predicted surface isotherms for one- and two-unit operation are those shown in the model remote sensing figures contained in ER-7. The predicted subsurface isotherms can be obtained from the corresponding model basin numerical figures in ER-7. The predicted thermal plumes detach from the bottom within Diablo Cove. The

part of Diablo Cove southeast of the hydraulic plume is predicted to experience higher temperatures than the northwest part. Outside the cove, heat is predicted to be confined to a layer within 10 feet below the water surface. Prototype plumes of the same approximate area extent will have surface trajectories determined by the oceanic current season. The plumes will be oriented up coast, out coast, and down coast, depending on oceanographic season. It is expected that the 2°C isotherm will not touch the shoreline, except within Diablo Cove and along the seaward side of the west breakwater.

The most important consideration, in concluding these assessments, is that the thermal representativeness of the physical model can never be anything but conservative. Although some periodic waves were generated on the model, these cannot completely simulate the ever-present random fine-grained prototype ocean turbulence which can be expected to distribute heat in the vertical water column and reduce surface isotherm extent more than the model could predict.

R. F. CAYOT

RFC/JTW:lms

Enclosure

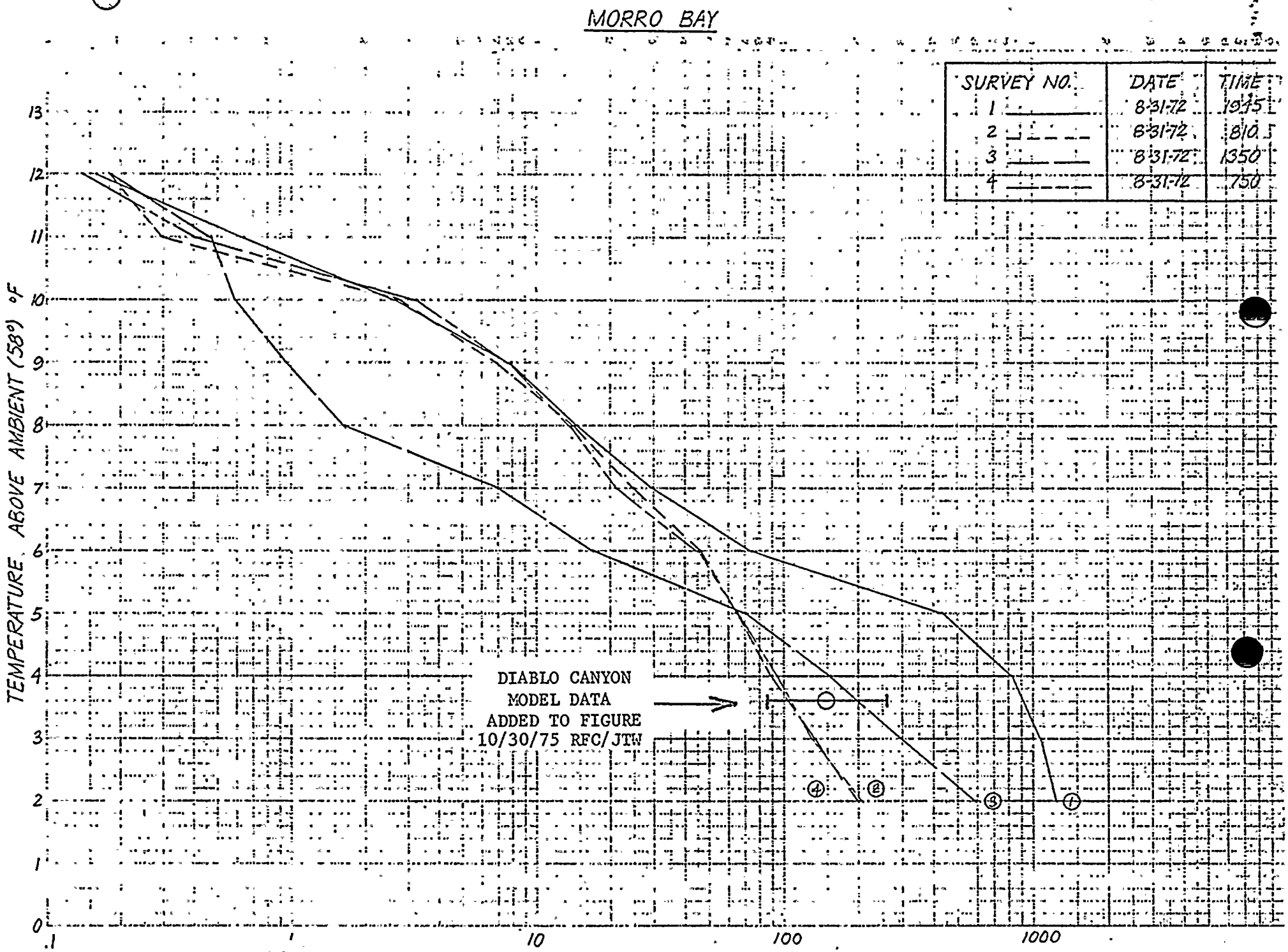

Figure III-17. AREA IN ACRES INFLUENCED BY ISOTHERM