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The Resources Agency

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Memorandum

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To : Jim Snow
Division of Operations & Maintenance

From : Gerald Boles
Northern District
Department of Water Resources

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Subject: Semi-Annual Compliance Monitoring Report for the Bottle Rock Powerplant

This report presents activities conducted from January 1 through June 30, 1986, that meet the compliance monitoring and mitigation requirements for the Bottle Rock Geothermal Powerplant.

Water Quality

Monthly samples from the five surface water monitoring stations and bimonthly samples from the five ground water monitoring stations were collected and submitted for analysis to the Bryte Chemical Laboratory. Analyses completed to date are presented in Tables 1 through 5 for the surface water stations and Tables 6 through 10 for the ground water stations. Only those portions of the tables that contain new data are presented, since all previous data have been distributed.

General water quality parameters, nutrients, minerals, and minor elements from the surface water monitoring stations continue to remain at the same levels in the most recent samples as found since monitoring began. Normal seasonal fluctuations are apparent in the general water quality parameters, nutrients, and minerals, while variations in concentrations unrelated to seasonal patterns occur for the minor elements. Significantly lower levels of electrical conductivity and alkalinity from the most recent samples were caused by the very high levels of rainfall experienced during that period of time. Turbidity levels were normal despite the heavy surface runoff.

Ground water samples from the Barrett Spring, Francisco Well, and Union Well have produced essentially unchanged results since monitoring began. Seasonal fluctuations in concentrations of the various parameters are only slight. Samples collected from the Wright Spring show slightly greater seasonal fluctuations, while those from the Coleman Well exhibit quite large seasonal fluctuations. The Coleman Well has a loose-fitting concrete lid which allows surface runoff and other materials to enter. Results from the water analyses from the Wright Spring and Coleman Well are similar to those found previously.

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Benthic Macroinvertebrates

Benthic macroinvertebrate samples are collected during April, July, and October from the five surface water monitoring stations. Data from samples for which analyses have been completed are presented in Tables 11 through 15.

Benthic macroinvertebrate communities from all the monitoring stations exhibit normal seasonal variations in numbers and types of organisms present. Communities are sometimes reduced during the spring or late summer, but such depression is related to washout of organisms from high spring flows or late summer high water temperatures that limit the community to tolerant organisms. Other than naturally occurring seasonal fluctuations in environmental conditions, no adverse impacts are apparent in the benthic communities.

Clear Lake

Water quality parameters in Clear Lake are being monitored to satisfy some of the environmental concerns of Lake County. Data are collected from a representative site in each of the three arms of Clear Lake. Water quality data not previously reported are presented in Tables 16 through 18.

Data from each arm show similar trends. Little changes in water quality parameters are apparent, other than seasonal fluctuations normal for Clear Lake. Phytoplankton productivity generally shows substantial increases during the spring and fall, with high plankton levels occurring throughout the summer. Blue-green algae dominate the phytoplankton community. Electrical conductivity and alkalinity show substantial reductions in levels due to the high amounts of precipitation and tributary runoff occurring during the spring of 1986. Other parameters show little difference from normal seasonal levels.

Revegetation

The fill slopes were replanted where necessary during December 1985. Deer guards were installed around all plants. All plants received an application of time-release fertilizer during February. The irrigation system was inspected, repaired where necessary, and activated in late April.

Preliminary survival assessment of plantings made in December indicates only fair survival (approximately 65 percent), but excellent growth. Hand-weeding and grubbing around plantings may be necessary in the future to reduce competition with grasses. Ideal growing conditions during the spring of 1986 allowed grasses to grow to nearly five feet in height. The grasses have since died and begun to fall over, which reduces competition with the woody vegetation planted on the fill slopes.

Cooling Tower/Vegetation Monitoring

During June 1985, several species of trees and shrubs within 100 meters of the Bottle Rock Powerplant in an east-northeast direction began showing signs of acute stress. Samples of leaves and duff were collected for chemical analyses to determine the presence of any toxic substances attributable to exposure to geothermal steam originating from the muffler. Results of the analyses (Table 19) were determined by Dr. Frank Bingham of the University of California at Riverside to indicate that toxic concentrations of boron and possibly sodium were present. He also felt that the plants might recover after the winter rains.

Cooling tower circulating water and steam emissions condensate samples were collected for chemical analyses (Tables 20 and 21, respectively) beginning in August of 1985 and continuing until March 1986, when the powerplant was shut down for maintenance. Of the potentially phytotoxic elements, both boron and sulfate regularly appeared at very high concentrations. The condensate of steam being emitted from the cooling tower generally had lower concentrations of elements than the circulating water.

Additional samples of leaves and duff were collected during April 1986, following foliation, and again on June 12, prior to steam stacking. Steam stacking occurred for approximately 36 hours on June 18 and 19. The powerplant became operational on June 20. As agreed upon with Dick Anderson of the California Energy Commission, additional leaf and duff samples were not collected because the duration of stacking was considered too brief to have any measurable effects on surrounding vegetation. Samples collected during April have been submitted for laboratory analyses. Transects established for determination of damage from possible emissions of boron from the cooling tower were surveyed in April for comparison to data collected the previous fall to attempt to determine any long-term impacts from the steam stacking occurring during the spring of 1985. Data are currently undergoing analyses.

The area exhibiting signs of vegetative damage from steam stacking during the spring of 1985 was surveyed in early June 1986 to determine if visible stress was still occurring. Of the plants exhibiting stress in 1985, which included Douglas fir, madrone, black oak, manzanita, and grasses, all had shown complete recovery by June 1986 except for Douglas fir. Growth on the other plants was excellent with no recurrent signs of vegetative damage. Nine Douglas fir trees exhibited extreme signs of damage. Two of the trees, both present within the boundaries of the Francisco Leasehold, appear to be dead. The other seven trees, two of which occur on the leasehold, are severely damaged primarily on the side facing the muffler, but exhibit new growth in the damaged areas. Plant recovery will continue to be monitored through the summer and fall.

Sedimentation and Erosion

During April, an inspection was conducted for signs of sedimentation and erosion in the vicinity of the powerplant pad, access road, sediment basins, and controlled burn areas. No active erosion was observed. Two sediment basins contained little or no materials, while the third contained approximately one cubic yard of materials. The basins had not been cleaned of sediments since originally constructed, but in the future will be cleaned each year prior to the first fall rains.

Wildlife

Necessary repairs were made to nest boxes during March. Bird nest boxes and dove cones were examined for use during April, May, and June. Squirrel boxes were examined for use only during April.

Twenty-seven of the fifty available bird nest boxes were used. Four boxes were used at different periods by two different species. The number of boxes used by the different species were 5 by western bluebirds, 4 by white-breasted nuthatches, 1 by plain titmice, 6 by house wrens, 2 by ash-throated flycatchers, and 13 by violet-green swallows. A screech owl was found in one box and pinyon mice in two others.

Mourning dove nest cones were not used for nesting or attempted nesting by any species in 1986.

Gray squirrel nest box use was restricted to one box in 1986. Two young were produced in the nest box, which was located in an isolated ponderosa pine at a height of approximately 17 feet. Eleven squirrels have been reared in the nest boxes since their installation in 1982. Three gray squirrel nest boxes in 1986 contained young or eggs of Brewer's blackbirds. Additionally, an incubating screech owl was found in one nest box. Screech owls have frequently utilized nest boxes for cover in the past, but had not used the boxes for reproduction.

Quail guzzlers were inspected during February and again in April. Both guzzlers were full of water and required only minor repairs of the water-collection devices.

Deer pellet group counts have continued to be obtained on a quarterly basis (Table 22). Deer use during the first two quarters of 1986, as compared to the same periods in 1985, had increased slightly in the black oak study area, but was substantially lower in the chaparral study areas. Both areas continue to exhibit deer use significantly less than that found during the baseline survey conducted during 1981 and 1982.

Attachments