CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

CLEANUP AND ABATEMENT ORDER NO. R5-2002-0204
FOR
ANADARKO PETROLEUM CORPORATION; BOEING SATELLITE SYSTEMS, INC.; CALPINE; CYPRESS AMAX MINERALS COMPANY; FREEPORT MCMORAN, INC./AMINOIL, INC.; GEOTHERMAL INC.; GEOTHERMAL KINETICS, INC.; HUGHES AIRCRAFT COMPANY/THERMOGENICS, INC.; IMC GLOBAL; MAXUS ENERGY CORPORATION; MCR GEOTHERMAL; MSR PUBLIC POWER AGENCY; NATOMAS; NORTHERN CALIFORNIA POWER AGENCY; OCEAN ENERGY RESOURCES INC.; PACIFIC GAS AND ELECTRIC COMPANY; PHELPS DODGE; PHILLIPS PETROLEUM COMPANY; REPUBLIC GEOTHERMAL; SACRAMENTO MUNICIPAL UTILITY DISTRICT; SANTA FE GEOTHERMAL INC./OCCIDENTAL GEOTHERMAL INC.; SHELL OIL COMPANY; STATE OF CALIFORNIA DEPARTMENT OF WATER RESOURCES; SUNOCO; THERMAL POWER; AND UNION OIL COMPANY OF CALIFORNIA DBA UNOCAL
GEOTHERMAL INC. FACILITY
CLASS II SURFACE IMPOUNDMENTS AND DISPOSAL TRENCHES
CLOSURE, POST-CLOSURE MAINTENANCE AND GROUNDWATER CLEANUP
LAKE COUNTY

This Order is issued to Anadarko Petroleum Corporation, Boeing Satellite Systems, Inc., Calpine, Cypress Amax Minerals Company, Freeport McMoran, Inc./Aminoil, Inc., Geothermal Inc., Geothermal Kinetics, Inc., Hughes Aircraft Company/Thermogenics, Inc., IMC Global, Maxus Energy Corporation, MCR Geothermal, MSR Public Power Agency, Natomas, Northern California Power Agency, Ocean Energy Resources Inc., Pacific Gas and Electric Company, Phelps Dodge, Phillips Petroleum Company, Republic Geothermal, Sacramento Municipal Utility District, Santa Fe Geothermal Inc./Occidental Geothermal, Inc., Shell Oil Company, State of California Department of Water Resources, Sunoco, Thermal Power, and Union Oil Company of California dba Unocal (hereafter collectively refer to as Discharger) based on provisions of California Water Code Section 13304, which authorizes the California Regional Water Quality Control Board, Central Valley Region (hereafter Regional Board) to issue a Cleanup and Abatement Order (Order).

The Regional Board finds that:

1. Geothermal Inc. owns and formerly operated the Geothermal Inc. Facility (facility) in Lake County. The facility consists of seven surface impoundments and three solid waste disposal trenches (landfills) that formerly accepted liquid and solid wastes produced by geothermal exploration, steam power generation and other geothermal related activities. The facility began operating in 1976 and ceased operations in 1987.

2. The 40-acre former waste disposal site is approximately four miles southeast of Middletown at 19020 Butts Canyon Road, in Sections 5, 6, 7, and 8, T10N, R6W, MDB&M, as shown on Attachments A and B. The site boundaries are within assessor's parcel number 14-004-01-00.

3. The facility is regulated under Waste Discharge Requirements (WDRs) Order No. 86-087 that includes liner requirements for all new and retrofitted surface impoundments and landfills. The WDRs classified the facility as a Class II-1 waste disposal site that was subject to the regulations formerly contained in Subchapter 15 of Title 23, California Code of Regulations (CCR). Since that time, site investigations have shown that the waste at the facility is designated waste (Class II) and is non-hazardous. In 1997, the regulations for designated wastes were moved from Title 23, CCR into Chapters 1 through 7, Subdivision 1, Division 2, of Title 27, CCR (hereafter Title 27). The facility continues to be subject to these regulations.

4. On 22 June 1984, the Regional Board issued Cease and Desist (C&D) Order No. 84-076 requiring Geothermal Inc. to retrofit all surface impoundments with double liners and leachate collection systems, identify all areas of surface water and groundwater pollution, and to submit cleanup or containment plans. On 16 April 1985, the Regional Board issued C&D Order No. 85-092 that amended Order No. 84-076 requiring that all of the surface impoundments be retrofitted or closed by 1 November 1988. On 23 February 1987, the Regional Board issued Administrative Civil Liability (ACL) Complaint No. 87-500 for $15,000 because of C&D Order violations. On 24 August 1987, the Regional Board issued ACL Complaint No. 87-507 for $10,000 for failure to comply with Water Code Section 13267. On 23 August 1987 the Board referred the case to the California Office of the Attorney General (hereafter Attorney General). During November of 1987, Geothermal Inc. filed for reorganization under Chapter 11 of the U.S. Bankruptcy Code.

5. Due to the condition of the site and the bankruptcy proceedings of Geothermal Inc., the Regional Board adopted Resolution No. 91-200 on 6 September 1991, wherein the Regional Board resolved that the Executive Officer shall pursue enforcement action against all potentially responsible parties (PRPs), including generators of the waste received at the facility and Geothermal Inc.

6. Waste generators were identified as PRPs from Geothermal Inc. waste disposal records. These records identify each generator that brought waste to the facility for disposal. Geothermal Inc. and the PRPs (including companies or entities that later acquired the environmental liability for waste at the facility from a waste generator) are named as the Discharger in this Order.

7. On 8 May 1992, the Attorney General sent a letter to a list of eight PRPs that informed them about Resolution No. 91-200 and about their potential liability for cleanup costs at the facility. The letter informed the PRPs that the Attorney General was prepared to take enforcement action, but preferred to secure voluntary cooperation in cleanup and closure of the facility.

8. On 4 June 1992, a meeting was held with representatives from the Regional Board, the Attorney General, and each of the eight then-identified PRPs. Following the meeting, the PRPs, on a voluntary basis, formed a Technical Committee (TC) consisting of representatives from Pacific Gas and Electric Company, Northern California Power Agency, Unocal, and Santa Fe Geothermal/Occidental Petroleum Geothermal, Shell, SMUD, Freeport McMoran, and Thermal. The purpose of the TC was to develop a technical basis for PRP allocation of costs. Subsequent to the completion of that task on April 14, 1993, a five-member Management Committee (MC)

was formed by the PRPs to provide technical oversight for the site cleanup and closure. Pacific Gas and Electric Company has served as the main contact for the MC.

9. Between 1994 and 1996, the MC submitted the following major documents:

Remedial Investigation Work Plan and Waste Characterization and Treatability Work Plan, dated July 1994;

Waste Characterization and Treatability Study, dated February 1995;

Remedial Investigation, May 1995;

Remedial Action Alternatives Evaluation, dated December 1995; and

Conceptual Closure Plan Design, dated August 1996.

These documents brought the facility through investigation, waste characterization, remedial investigation and alternatives, and conceptual closure. Results of the waste characterization indicated that the wastes contain high levels of various salts and metals. The conceptual closure proposed in the 1996 report was to excavate the wastes (clean closure) and place them in a constructed on-site landfill with a composite liner and a composite final cover (closure cell).

10. During 1998, the MC submitted a document entitled *Technical Evaluation of Phytoremediation and Work Plan for Demonstration Study*, dated August 1998. This document proposed a demonstration study to evaluate the effectiveness of using a phyto-cover over the waste instead of the conceptual landfill closure cell. Regional Board staff approved the study with the stipulation that the phyto-cover provide equivalent protection to the closure cell method and that it comply with the requirements of Title 27.

11. Beginning in 1996, several seasons of above average rainfall greatly increased the amount of water in the ponds. All free water needs to be removed from each pond before closure work can begin on that pond. During 1999 and 2000 the MC performed pilot testing for enhanced spray evaporation to reduce the amount of water in the ponds. The results of this testing indicated that spray evaporation is effective in reducing the amount of water in the ponds; however, given the large volume of water still remaining in the ponds the MC has proposed to treat the remaining pond water and discharge it to surface water under a National Pollutant Discharge Elimination System (NPDES) permit. NPDES permit requirements are not contained in this Order.

12. Ponds 1 and 2 contain low pH hydrogen sulfide scrubber wastes generated from the Stretford process. Pond 2 and Pond 3 received interim closure during 1996 by transferring remaining water in those ponds to Ponds 1 and 7, stabilizing the wastes with clean soil and covering the wastes with a 20-mil high density polyethylene (HDPE) geomembrane. Ponds 5 and 6 were clean closed during 1985 prior to being retrofitted with double clay liners. Pond 5 was subsequently taken out

of use when the leachate collection and removal system (LCRS) filled with rainwater. Pond 5 did not receive any waste after being clean closed and lined.

With the exception of Pond 5, the liquids in the ponds contain concentrations of inorganic constituents that are significantly higher than in background groundwater. Concentrations of total dissolved solids (TDS) in samples collected during May 2000 were: 9,100 mg/L (Pond 1), 4,100 mg/L (Pond 4), 590 mg/L (Pond 5), 3,900 mg/L (Pond 6), and 4,000 mg/L (Pond 7).

13. During April 2002, the MC submitted an addendum to the 1995 Remedial Action Alternatives Evaluation. The addendum presents results of the phytoremedation study and includes a recommendation for closure of the facility utilizing an evapotranspiration (ET) cover to be placed over the waste once the pond water is treated and removed. The proposed ET cover would consist of four feet of clean soil, eucalyptus trees and grass. Closure would also include removal of waste from the disposal trenches, as well as from Ponds 1 and 7 for consolidation into the remaining ponds. The proposed closure would utilize eucalyptus trees in areas surrounding the ponds to lower groundwater levels in order to maintain 5 feet of separation between groundwater and waste as required by Title 27. Title 27 also requires a demonstration that clean closure is infeasible for the facility to be closed using the proposed method.

14. Regional Board staff issued a 24 June 2002 letter to the MC expressing concerns about groundwater separation from waste, trees in the cover, and the possibility of percolate contacting the waste and leaching from the edge of the proposed cover. In response, the MC submitted a 16 July 2002 letter that addressed staffs concerns. The new proposed closure included more trees around the perimeter of the waste to maintain five feet of separation between the highest anticipated level of ground water and the waste; eliminated trees from the final cover above waste material that could damage the cover if blown over or could provide conduits to groundwater along the roots; and included an HDPE geomembrane layer and geocomposite drainage layer with two feet of cover soil.

15. The proposed closure method constitutes an engineered alternative to the Title 27 prescriptive standard design for waste containment systems. Title 27 allows the Regional Board to approve an engineered alternative provided certain demonstrations are made. Further details about the information contained in the addendum and the required demonstrations are given in later Findings of this Order.

WASTES AND THEIR CLASSIFICATION

16. The facility formerly accepted liquid and solid wastes produced by geothermal exploration, steam power generation and other geothermal related activities. These wastes consisted of:

    a. drilling mud and fluids consisting of bentonite mud, caustic, and rock/soil from the drill hole;
    b. geothermal brines and sump liquids;
    c. condensates from cooling towers;
    d. petroleum fractions;

e. hydrogen sulfide scrubber wastes (Stretford waste); and
f. solid waste from geothermal plant construction and maintenance.

17. The February 1995 *Waste Characterization and Treatability Study* submitted by the MC presented waste characterization data from extensive sampling and analysis of the waste. Following their review, the Department of Toxic Substances Control issued a letter dated 28 June 1995 stating that they concurred with the conclusions in the study that the waste does not meet the classification of a hazardous waste as defined in Title 22, CCR. Regional Board staff subsequently issued a letter dated 17 November 1995 concurring with the finding in the study that the waste at the facility is a designated waste as defined in Water Code Section 13173 and that Class II waste management is appropriate.

18. The regulations for containment of designated wastes have been promulgated in Title 27. This Order incorporates many of the requirements of Title 27.

SITE DESCRIPTION

19. The site is located 4 miles southeast of Middletown along Butts Canyon Road. The site is situated at the base of the foothills of Long Valley and is surrounded by oak trees and grasslands. The Guenoc Winery is located on property to the southeast of the facility.

20. The geology at the site consists of alluvial and lacustrine deposits overlying faulted bedrock. Bedrock includes serpentine, shale sandstone, and siltstone of the Franciscan and Knoxville formations.

21. Land within 1000 feet of the facility is used for cattle grazing.

22. The closest active faults are the Collayomi Fault located approximately 7.2 miles northwest of the site, the Hunting Creek – Berryessa Fault located 8.6 miles northeast of the site, and the Maacama Fault located 12.9 miles west of the site. The fault that would produce the maximum ground shaking at the site using the maximum credible earthquake is the Hunting Creek – Berryessa Fault at 0.327g from a magnitude 6.9 event.

23. Groundwater occurs primarily in the alluvial and lacustrine deposits overlying the bedrock. Recharge to groundwater is primarily infiltration from rainfall. There are nine water wells within a one-mile radius of the site. Seven of these wells are used for domestic purposes and two are used for irrigation. The nearest irrigation well is 0.5 miles from the site. The nearest domestic well is 0.75 miles from the site.

24. The designated beneficial uses of groundwater are municipal, domestic, agricultural, and industrial supply.

25. The facility receives an average of about 24 inches of precipitation per year as based on a 30-year average measured at the Clearlake station, corrected using on-site precipitation data. The mean

evaporation for this facility is approximately 47 inches per year as measured at the Lakeport station and as measured in the on-site ponds. Based on these data, average annual net evaporation at the facility is 23 inches.

26. The 1000-year, 24-hour precipitation event for the facility is 6.5 inches, and the 100-year, 24-hour precipitation event for the facility is 5.1 inches, as measured at the Clearlake station. The 100-year precipitation season is 51.7 inches as measured at the Clearlake station. The on-site 100-year precipitation season is approximately 46 inches, based on data from the Clearlake station that has been in turn corrected using on-site precipitation data.

27. The facility is not within a 100-year floodplain.

28. The site is located at a surface drainage divide. The western part of the site drains to an unnamed drainage that flows to Putah Creek and then to Lake Berryessa. The eastern part of the site drains to another unnamed drainage that flows to Detert Reservoir, then to McCreary Lake, then Putah Creek and Lake Berryessa.

29. The designated beneficial uses of these surface waters are municipal and domestic supply; agricultural supply; power generation; recreation; and preservation and enhancement of freshwater aquatic life and wildlife.

ENGINEERED ALTERNATIVE DEMONSTRATIONS

30. Following the removal of all free liquids, §21400(b)(1) of Title 27 requires a mandatory clean closure attempt for surface impoundments unless the discharger demonstrates, and the Regional Board finds, that it is infeasible to attempt clean closure. If this demonstration is successful, §21400(b)(2) allows closure of the surface impoundment as a landfill.

31. The MC has proposed an engineered alternative for the closure of the surface impoundments as described in Finding Nos. 13 and 14, above. Section 20080(b) of Title 27 allows the Regional Board to consider the approval of an engineered alternative to the prescriptive standard where the discharger demonstrates that: (1) the construction or prescriptive standard is not feasible as provided in §20080(c); and (2) the proposed engineered alternative is consistent with the performance goal addressed by the particular prescriptive standard, and provides protection against water quality impairment equivalent to the prescriptive standard. In order to demonstrate that a prescriptive standard is not feasible, the discharger is required under § 20080(c) to demonstrate that: (1) the prescriptive standard is unreasonably and unnecessarily burdensome and will cost substantially more than an alternative which will meet the criteria contained in §20080(b), or (2) would be impractical and would not promote attainment of applicable performance standards.

32. The performance standard for Class II waste management units is given in §20310(a) of Title 27 that states in part: “Class II waste management units shall be designed and constructed to prevent migration of wastes from the Units to adjacent geologic materials, ground water, or surface water,

during disposal operations, closure and the post-closure maintenance period."

33. The performance standard for final covers is given in Section 20950(a)(2)(A)1. of Title 27 which states in part: "Closure – for landfills and for waste piles and surface impoundments closed as landfills, the goal of closure, including but not limited to the installation of a final cover, is to minimize the infiltration of water into the waste, thereby minimizing the production of leachate and gas." Furthermore, §20240(c) of Title 27 requires 5 feet of separation between wastes and the highest anticipated elevation of underlying groundwater.

34. During March 2001, the MC submitted an evaluation of the feasibility of clean closure. The report evaluated the feasibility or infeasibility of clean closure in order to satisfy §21400(b)(1) and §20080(b)(1) of Title 27 as described in the above Findings. Following review of the evaluation, Regional Board staff issued a letter dated 2 May 2001 in which staff agreed that the evaluation demonstrated that clean closure would cost substantially more than the prescriptive standard (roughly twice as much at $16.8 million under the worst case scenario); however staff informed the MC that the study did not adequately address the remaining portions of the demonstration of infeasibility. The MC further addressed these and other required Title 27 demonstrations in later submittals that are discussed in Findings below.

35. During March 2002, the MC submitted an addendum to the December 1995 *Remedial Action Alternatives Evaluation* mentioned in Finding No. 9, above. The 1995 evaluation had proposed clean closure of the ponds by excavating the waste and placing it in an on-site landfill with a composite liner equipped with an LCRS, and composite cover. The 2002 addendum presented modeling results that utilized data collected during the phytoremediation study and periodic site monitoring events to predict the performance of the engineered alternative closure of the ponds. Data from a sealed double-ring infiltrometer test performed on the waste material was also utilized (results indicated $k=1x10^{-7}$ cm/s). Other data utilized included groundwater level measurements following the lowering of Freeman Lake by approximately 5 feet; water uptake data for mature eucalyptus trees at a phytoremediation site near Courtland, California; and rainfall data from an on-site weather station compared with weather stations in Middletown, Clearlake, and Lakeport. The MC found that rainfall data from the Clearlake station correlated best with data from the on-site weather station and was utilized in the models. The correlation of the Clearlake data and the site data was presented in further detail in the 31 May 2002 *Response to Comments* that addressed the concerns about the addendum expressed in a Regional Board staff letter dated 3 May 2002.

Two models were utilized in the evaluation. The first model (the infiltration model) used the UNSAT-H modeling program to predict the performance of the engineered alternative cover in preventing infiltration of rainwater. The second model (the Modflow groundwater flow model) utilized a 10-year transient predictive simulation to predict groundwater elevations beneath the waste in order to show that 5-feet of separation could be maintained between groundwater and waste as required by Title 27. The groundwater flow model was calibrated against site groundwater elevations measured under pre-closure conditions and each model was tested for

sensitivity to various input parameters.

The infiltration model was initially run with annual rainfall totals of 28, 38 and 53.5 inches of rainfall that were based on average, high and very high precipitation years at the Clearlake station. In each case the model predicted that water infiltrating into the 4-feet of cover soil would not reach the waste. The model was re-run with two feet of cover soil in response to staff's concerns in the 24 June 2002 letter. This modeling also indicated that infiltrating water would not reach the bottom of the two-foot soil layer. The mechanisms that prevent infiltration into the waste include the low hydraulic conductivity of the cover material, storage of moisture in the cover soil, plant uptake of water during the rainy season and the subsequent evaporation and evapotranspiration of the moisture from the cover soil during the remainder of the year. Any infiltrating rainwater that does reach the bottom of the two-foot soil layer would be stopped by the HDPE geomembrane and travel to the edge of the closure unit through the geocomposite drainage layer. This indicates that the engineered alternative cover would comply with the Class II performance standard given in §20310(a) of Title 27, and the performance standard for final covers is given in §20950(a)(2)(A) of Title 27. This also indicates that the engineered alternative satisfies the necessary demonstrations required in §20080(b)(2) in that it is consistent with the performance goals and would provide equivalent protection to the prescriptive standard.

The groundwater flow model was run under eleven forecast simulations to evaluate various combinations of remedial options at the site. These simulations included a base case in which the site would remain unclosed. The MC reported that several simulations were able to meet the waste-groundwater separation criterion, but that one simulation resulted in the best combination of reducing the footprint of the closed landfill, meeting the waste-groundwater separation criterion, and minimizing the size of the phytoremediation plantation. This simulation was later modified and re-run based on staff's concerns about maintaining greater than five feet of separation between waste and the highest anticipated level of groundwater. The modified closure scenario includes moving wastes from the disposal trenches and Ponds 1 and 7 to Ponds 4 and 6; two feet of cover soil, shallow rooted vegetation, and geomembrane/drainage layer over Ponds 2, 3, 4 and 6 to control infiltration; addition of sufficient soil to achieve proper drainage and a plantation of eucalyptus trees over ponds 1 and 7; addition of sufficient soil to achieve proper drainage and a plantation of eucalyptus trees over Pond 5 and the unused ponds to the south of Ponds 2 and 3 to lower groundwater levels; a line of eucalyptus trees between the east side of the landfill and Freeman Lake to intercept groundwater with elevated concentrations of boron and sulfate; and the lowering of Freeman Lake to 1,096 feet above mean sea level. Under this closure scenario, the waste would reside only in Ponds 2, 3, 4 and 6. In order to predict the highest anticipated elevation of underlying groundwater, a ten year simulation was used with average annual rainfall during each year except year six during which a simulated 100-year rainfall season was used. The model predicted that greater than five feet of separation can be achieved when new groundwater equilibrium conditions are established after closure is complete. Once established, five feet of separation can be maintained between groundwater and waste, even during a 100-year rainfall season. The model results indicate that the proposed engineered alternative closure can comply with 5-foot separation requirement in §20240(c) of Title 27.

36. During May 2002, the MC submitted a response to comments on the March 2002 addendum. These comments were included in a Regional Board staff letter dated 3 May 2002. Among these comments was that the addendum did not provide a reason or reasons why the prescriptive standard is unreasonably or unnecessarily burdensome as required by §20080(c)(1) of Title 27. The MC response stated: *To demonstrate that the prescriptive standard is unreasonably and unnecessarily burdensome, we looked at whether the clean closure alternative provided significant benefits (i.e., additional protection of the environment) that would warrant the additional cost to implement this alternative. In the evaluation of economic feasibility, we relied on provisions of State Water Resources Control Board Resolution 92-49. Section III(H)(1)(b) of that resolution states that economic feasibility is an objective balancing of the incremental benefit of attaining further reductions in the concentrations of constituents of concern as compared with the incremental cost of achieving those reductions.* The MC response went on to say that the significantly higher cost of the prescriptive standard ($8 million to $10 million more) reflects the unreasonable and unnecessary burden of that option because:

    a. clean closure involves significantly more handling of the waste and therefore more exposure to human health and the environment;

    b. Ponds 2 and 3 were previously closed through an interim remedial measure in 1996 that included stabilizing the waste with clean soil and would need to be re-excavated under the clean closure option;

    c. the engineered alternative closure provides at least equivalent protection to the prescriptive standard by preventing the creation of leachate by using infiltration before it can reach the waste;

    d. under the clean closure option, the bottom of the liner would likely be in contact with underlying groundwater since that option as proposed in 1995 did not include mechanisms to maintain the required separation between groundwater and waste;

    e. under clean closure, the landfill would be less aesthetically appealing than under the engineered alternative closure; and

    f. with an equivalently protective and lower cost closure alternative available, it is unreasonably and unnecessarily burdensome to require a remedy that increases the costs by $8 million to $10 million.

    The reasons presented by the MC indicate that the prescriptive standard closure would be unreasonably and unnecessarily burdensome. This final demonstration completes the necessary demonstrations required under §20080(b) and (c) of Title 27 for the Regional Board to approve the engineered alternative closure.

LEGAL AUTHORITY

37. Monitoring data from groundwater monitoring wells indicate that the wastes in the ponds have discharged into the underlying groundwater.

38. The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fourth Edition*, (hereafter Basin Plan) designates beneficial uses of the waters of the State, establishes water quality objectives to protect these uses, establishes implementation plans and policies for attaining water quality objectives, and incorporates by reference plans and policies adopted by the State Water Resources Control Board. Storm water from the site drains to upper Putah Creek, then to Lake Berryessa, then to lower Putah Creek, and then to the Delta. The Basin Plan identifies the beneficial uses of these surface waters as domestic, municipal, agricultural and industrial supply, groundwater recharge, recreation, aesthetic enjoyment, fresh water replenishment and habitat, spawning, wildlife habitat and the preservation and enhancement of fish, wildlife and other aquatic resources.

39. The beneficial uses of the groundwater underlying Ponds 1-7 are domestic, municipal, agricultural and industrial supply. The water quality objectives for TDS, chloride, sulfate and boron to protect these beneficial uses are:

Standard Type	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Boron (mg/L)
Primary MCL	None	None	500	None
Secondary MCL	500	250	250	None
Agricultural Goal	450	106	None	0.7

40. Semi-annual groundwater monitoring is conducted at the facility. Water samples are collected from groundwater in the vicinity of Ponds 1-7 to characterize the background quality of groundwater underlying Ponds 1-7. The quality of these samples was:

Well ID	Date Sampled	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Boron (mg/L)
A-4	Apr. 2002	630	10	140	0.043
A-5	Apr. 2002	330	6.8	48	< 0.02
MW-102	Apr. 2002	140	2.3	3.1	0.015
MW-109	Apr. 2002	110	5.5	3.8	< 0.02
MW-110	Apr. 2002	130	5.6	0.77	< 0.02

MW-113	Apr. 2002	450	8.6	100	< 0.02

41. Water samples are also collected from groundwater downgradient from Ponds 1-7. The quality of those samples was:

Well ID	Date Sampled	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Boron (mg/L)
A-7	Apr. 2002	2,390	28	1,400	9
FMW-5	Apr. 2002	1,930	26	1,100	5.2
EX-10B	Apr. 2002	1,620	20	1,100	5.6
MW-105	Apr. 2002	670	130	250	4.9
MW-106	Apr. 2002	6,960	110	4,700	23
MW-107	Apr. 2002	3,230	91	2,000	6.3
MW-108	Apr. 2002	1,140	97	560	2.2

42. Thus, the levels of TDS, chloride, sulfate and boron in the groundwater in the vicinity of the ponds and the disposal trenches are significantly higher than the background levels of those constituents indicating that the ponds have impacted water quality.

43. Measurements conducted in monitoring wells and piezometers indicate that groundwater resides at elevations that vary from a few feet from the pond bottoms to levels that are above the pond bottoms and the solid waste disposal trenches. Thus, groundwater levels are high enough for groundwater to contact the waste in the ponds and disposal trenches.

44. The wastes in the ponds contain high levels of various salts and metals. Accordingly, the ponds are a continuing threat to water quality as long as liquids remain in the ponds, and the ponds remain unclosed.

45. The State Water Resources Control Board (State Board) has adopted Resolution No. 92-49, the *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section* 13304. This Policy, as amended, sets forth the policies and procedures to be used during an investigation or cleanup and abatement of discharges of waste and the effects of discharges of waste subject to Section 13304 of the Water Code. This Policy requires that cleanup standards be consistent with State Board Resolution No. 68-16 (the antidegradation policy).

46. Section III.F.2.c. of Resolution No. 92-49 provides that the Regional Board shall require actions for cleanup and abatement to implement the provisions of Chapter 15 that are applicable to

cleanup and abatement, if technologically and economically feasible, where "cleanup and abatement involves actions other than removal of the waste, such as containment of waste in soil or ground water by physical or hydrological barriers to migration (natural or engineered), or in-situ treatment (e.g., chemical or thermal fixation, or bioremediation) . . . ."

47. Resolution No. 92-49, Section III.G., requires that the Regional Board:

"Ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible; in approving any alternative cleanup levels less stringent than background, apply Section 2550.4 of Chapter 15 . . .; any such alternative cleanup level shall:

1. Be consistent with the maximum benefit to the people of the state;
2. Not unreasonably affect present and anticipated beneficial use of such water; and
3. Not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards."

48. Section 13304(a) of the California Water Code (Water Code) provides in part:

"Any person who has discharged or discharges waste into the waters of this state in violation of any waste discharge requirement or other order or prohibition issued by a regional board or the state board, or who has caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance, shall upon order of the regional board, clean up the waste or abate the effects of the waste, or, in the case of threatened pollution or nuisance, take other necessary remedial action, including, but not limited to, overseeing cleanup and abatement efforts."

49. Section 13304(c)(1) of the Water Code states in part:

"[T]he person or persons who discharged the waste, discharges the waste, or threatened to cause or permit the discharge of the waste within the meaning of subdivision (a), are liable to that government agency to the extent of the reasonable costs actually incurred in cleaning up the waste, abating the effects of the waste, supervising cleanup or abatement activities, or taking other remedial action. The amount of the costs is recoverable in a civil action by, and paid to, the governmental agency . . . ."

50. Water Code §13350(a) provides, in part:
"Any person who (1) intentionally or negligently violates any . . . cleanup and abatement order hereafter issued, reissued, or amended by a regional board . . .shall be liable civilly in accordance with subdivision (d) or (e)." Water Code §13350(e) provides a maximum civil liability amount

for each day a violation of a cleanup and abatement order occurs and provides for different minimum civil liability amounts for each day a violation of a cleanup and abatement order occurs depending on whether a discharge does or does not occur. In accordance with Water Code § 13350(f), the Regional Board may not impose a civil liability amount less than the specified minimum amount unless it makes certain express findings.

Water Code § 13350(d) states: "The court may impose civil liability either on a daily basis or on a per gallon basis, but not both. (1) The civil liability on a daily basis may not exceed fifteen thousand dollars ($15,000) for each day the violation occurs. (2) The civil liability on a per gallon basis may not exceed twenty dollars ($20) for each gallon of waste discharged."

Water Code § 13350(e) states: "The state board or a regional board may impose civil liability administratively pursuant to Article 2.5 (commencing with Section 13323) of Chapter 5 either on a daily basis or on a per gallon basis, but not both. (1) The civil liability on a daily basis may not exceed five thousand ($5,000) for each day the violation occurs. (A) When there is a discharge, and a cleanup and abatement order is issued, except as provided in subdivision (f), the civil liability shall be not less than five hundred dollars ($500) for each day in which the discharge occurs and for each day the cleanup and abatement order is violated. (B) When there is no discharge, but an order issued by the regional board is violated, except as provided in subdivision (f), the civil liability shall not be less than one hundred dollars ($100) for each day in which the violation occurs. (2) The civil liability on a per gallon basis may not exceed ten dollars ($10) for each gallon of waste discharged."

Water Code § 13350(f) states: "A regional board may not administratively impose civil liability in accordance with paragraph (1) of subdivision (e) in an amount less than the minimum amount specified, unless the regional board makes express findings setting forth the reasons for its action based upon the specific factors required to be considered pursuant to Section 13327."

51. The waste generators, by disposing of wastes at the facility, have caused or permitted or threatened to cause or permit waste to be discharged to waters of the state where it has created and/or threatens to create a condition of pollution or nuisance.

52. Excavation of the wastes from Ponds 1 and 7 and the disposal trenches, closure of the ponds and planting of the eucalyptus trees in areas of impacted groundwater is anticipated to improve groundwater quality at the site. The planting of eucalyptus trees around the disposal area and the lowering of Freeman Lake are expected to lower groundwater levels to at least five feet below the level of the waste in accordance with the regulations contained in Title 27.

53. This Order requires the Discharger to develop concentration limits for the constituents of concern that are based on background groundwater quality as required by §20415(e) of Title 27. This Order requires that the concentration limits be updated after each monitoring event when new background data becomes available. The concentration limits will be the clean-up goals for impacted groundwater unless the Discharger can demonstrate that concentration limits greater than background are warranted pursuant to §20400 of Title 27.

54. Section 13267 of the Porter-Cologne Water Quality Control Act also states:

"(a) A regional board, in establishing or reviewing any water quality control plan or waste discharge requirements, or in connection with any action relating to any plan or requirement or authorized by this division, may investigate the quality of any waters of the state within its region."
(b) (1) In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports."

55. This Order requires the Discharger to develop and submit an Engineering Feasibility Study that evaluates methods for cleaning up groundwater that has already been impacted by the discharges of waste. This Order also requires the Discharger to develop and submit a Corrective Action Plan that proposes implementation of the best remedy from the Engineering Feasibility Study. The technical reports required by this Order are necessary to assure compliance with this Order.

FINANCIAL ASSURANCES

56. Following Board staff approval of the final construction report, this Order requires the Discharger to submit financial assurance cost estimates and a proposed Title 27 financial assurances mechanism that is adequate for at least 30 years of post-closure maintenance and for implementing the Corrective Action Plan.

CEQA CONSIDERATIONS

57. A draft Initial Study and proposed Mitigated Negative Declaration for the closure project were circulated to the Discharger, interested parties, interested agencies and made available to the public for public comment on 15 August 2002. The public comment period closed on 16 September 2002. A Resolution adopting the Mitigated Negative Declaration was adopted by this Board concurrently with this Order, in accordance with the California Environmental Quality Act (Public Resources Code Section 21000, et seq. and the Guidelines, Title 14 California Code of Regulations, Section 15000, et seq.).

58. On 6 December 2002, the Regional Board, acting as lead agency, adopted a Mitigated Negative Declaration for the Dischargers' proposed facility closure in accordance with the California Environmental Quality Act (Public Resources Code Section 21000, et seq.). The Regional Board determined that the project, as revised to incorporate mitigation measures, would not have a significant effect on the environment.

59. A Resolution adopting a Mitigation and Monitoring Plan to enable the Board to ensure that the mitigation measures agreed to by Discharger are implemented is adopted by this Board concurrently with adoption of this Order.

OTHER LEGAL REFERENCES

60. This Regional Board's Order does not protect the Discharger from any criminal enforcement action brought against them for any illegal or unlawful disposal/transportation/storage of designated waste or the unlawful discharge of said waste into waters of the State.

61. Any person affected by this action of the Regional Board may petition the State Water Resources Control Board (State Board) to review the action in accordance with Title 23 California Code of Regulations Sections 2050-2068. The State Board must receive the petition within 30 days of the date of this Order. Copies of the law and regulations applicable to filing petitions may be found on the Internet at www.swrcb.ca.gov or will be provided upon request.

IT IS HEREBY ORDERED pursuant to Sections 13304 and 13267 of the California Water Code that Anadarko Petroleum Corporation; Boeing Satellite Systems, Inc.; Calpine; Cypress Amax Minerals Company; Freeport McMoran, Inc./Aminoil, Inc.; Geothermal Inc.; Geothermal Kinetics, Inc.; Hughes Aircraft Company/Thermogenics, Inc.; IMC Global; Maxus Energy Corporation; MCR Geothermal; MSR Public Power Agency; Natomas; Northern California Power Agency; Ocean Energy Resources Inc.; Pacific Gas and Electric Company; Phelps Dodge; Phillips Petroleum Company; Republic Geothermal; Sacramento Municipal Utility District; Santa Fe Geothermal Inc./Occidental Geothermal Inc.; Shell Oil Company; State of California Department of Water Resources; Sunoco; Thermal Power; and Union Oil Company of California dba Unocal and their agents, assigns and successors, in order to meet the provisions of Division 7 of the California Water Code and the regulations adopted thereunder, shall cleanup and abate the effects of the discharges of waste as follows:

A. DISCHARGE PROHIBITIONS:

1. The discharge of any waste at the facility that originates from outside of the facility boundaries is prohibited.

2. The discharge of any waste at the facility after completion of facility closure activities is prohibited.

3. The discharge of any waste or leachate to surface waters, surface water drainage courses, or groundwater, except as specifically allowed under a NPDES permit, is prohibited.

B. FACILITY SPECIFICATIONS:

1. The treatment or disposal of waste shall not cause pollution or a nuisance as defined in the California Water Code, Section 13050.

2. A minimum separation of 5 feet shall be maintained between wastes and underlying groundwater, as determined in the Monitoring and Reporting Program, and as specified in Provision No. 9 of Section C below.

3. Prior to closure, a minimum two-foot freeboard, as measured at the lowest point of the overflow, shall be maintained in surface impoundments at all times. If freeboard levels in any surface impoundment are less than three feet, Board staff shall be notified.

4. Water used on the final cover shall be limited to the minimum amount necessary for dust control, moisture conditioning of cover soil, and to establish and maintain vegetation.

GENERAL WASTE MANAGEMENT UNIT CONSTRUCTION

5. This Order waives the requirement for unsaturated zone monitoring system under §20415(d) of Title 27 because of existing groundwater impacts, and the proximity of the wastes to groundwater.

6. All units shall be closed in accordance with the requirements of Title 27 and this Order. A final closure and post-closure maintenance plan shall be submitted for approval by Board staff prior to closure construction. The design plans submitted to the Board for review and approval prior to construction shall include, but not be limited to, the final engineered design plans, a slope stability analysis, a construction quality assurance (CQA) plan, and a revised water quality monitoring plan. The final construction report shall include, but not be limited to, construction record drawings for the closed units, a CQA report with a written summary of the CQA program and all test results and analyses, and a certification by a registered California civil engineer or certified engineering geologist. The final construction report shall be submitted within **120 days** of completion of construction.

7. Construction methods and quality assurance procedures shall be sufficient to ensure that all parts of the final cover meet the hydraulic conductivity, moisture content, and compaction requirements.

8. Waste management units shall be designed, constructed, and operated to prevent inundation or washout due to floods with a 100-year return period.

9. All containment structures shall be designed and constructed under the direct supervision of a California registered civil engineer or a certified engineering geologist and shall be

certified by that individual as meeting the requirements of this Order, the performance goals of Title 27 and the approved design plans and specifications.

10. The Discharger may propose changes to the closure design prior to construction, provided that approved components are not eliminated, and the engineering properties of the components are not substantially reduced. The proposed changes may be made following approval by the Executive Officer. Substantive changes to the design require reevaluation and approval by the Board.

SURFACE IMPOUNDMENT SPECIFICATIONS

11. Prior to closure, surface impoundments shall be maintained to accommodate the anticipated volume of precipitation under 1000-year, 24-hour precipitation conditions as well as under 100-year seasonal precipitation, and must maintain the required minimum of two feet of freeboard.

12. Annually, prior to the anticipated rainy season but no later than **1 November**, any necessary erosion control measures shall be implemented, and any necessary construction, maintenance, or repairs of precipitation and drainage control facilities shall be completed to prevent erosion or flooding of the facility and to prevent surface drainage from contacting or percolating through wastes.

CLOSURE SPECIFICATIONS

13. Prior to closure construction, the Discharger shall obtain permit coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002 for Discharges of Storm Water Associated With Construction Activity. The Discharger shall submit a Notice of Intent to comply with the permit to the State Water Resources Control Board and a Storm Water Pollution Prevention Plan shall be prepared.

14. The closure of each unit shall be under the direct supervision of a California registered civil engineer or certified engineering geologist.

15. Closed units shall be provided with at least two permanent monuments, installed by a licensed land surveyor, from which the location and elevation of all wastes, containment structures, and monitoring facilities can be determined throughout the post-closure maintenance period.

16. All liquids shall be removed from each surface impoundment prior to closure. Treated liquids from the surface impoundments shall not be discharged to surface waters except as provided in an NPDES permit allowing such discharge.

17. At closure, all waste and at least 12-inches of soil beneath the waste shall be completely removed from Pond 1 and Pond 7 and consolidated into Pond 4 and/or Pond 6.

18. At closure, all waste and at least the first 12-inches of soil beneath the waste shall be completely removed from the disposal trenches located beneath and south of Pond 4 and consolidated into Pond 4 and/or Pond 6.

19. During the closure of Ponds 4 and 6, contaminated surface soils in the western ponding area shall be removed and placed into Pond 4 and/or Pond 6.

20. At closure, Ponds 2, 3, 4, and 6 shall be provided with a final cover consisting of, from bottom to top, the following:

    a) a layer of 60-mil HDPE geomembrane that is placed above the waste material that has been compacted and flat rolled to be smooth and free from any protrusions that could damage the geomembrane;

    b) a geocomposite drainage layer;

    c) two feet of cover soil; and

    d) shallow rooted (less than 2-feet) vegetation that requires minimum maintenance.

    The material at the surface (in contact with the geomembrane) shall consist of stabilized wastes or suitable general fill. This material shall be placed as specified in the closure plan and construction quality assurance plan, and compacted to provide a stable surface for the cover liner, drainage layer and cover soil. Soil classified as primarily sand or gravel (GW, GP, SW or SP according to the Unified Soil Classification System) shall not be used as general fill in contact with the geomembrane.

21. At closure, Ponds 1 and 7 shall be provided with sufficient clean cover soil to achieve proper drainage and sufficient vegetation (including eucalyptus trees) to prevent infiltration of rainwater into any remaining impacted native soils and to maintain the required five feet of separation between groundwater and wastes in Ponds 2, 3, 4, and 6. The cover over Ponds 1 and 7 shall also be graded to drain.

22. The final cover over Ponds 2, 3, 4 and 6 shall be graded to drain with a slope that is adequate to prevent infiltration of rainwater through the cover soil and into the waste, but shall be no less than 3-percent. Pond 5 shall also be graded to drain with a minimum slope of 3-percent, and cover soils over Pond 5 shall be planted with vegetation including eucalyptus trees for groundwater elevation control.

23. The two unused ponds located southwest of Ponds 2 and 3 shall be filled and graded to drain and planted with eucalyptus trees for groundwater elevation control.

24. Sufficient numbers of eucalyptus trees shall be planted and maintained south of Ponds 1 through 3, between the east side of the landfill and Freeman Lake and around the perimeter area immediately surrounding Ponds 1 through 7 for hydraulic control and to maintain the required 5 feet of separation between groundwater and waste.

25. The Discharger shall install piezometers immediately adjacent to the closure area, including adjacent to Pond 2, in order to monitor groundwater levels and the separation between groundwater and waste.

26. Areas with slopes greater than ten percent, surface water drainage courses, and areas subject to erosion by wind or water shall be designed and constructed to prevent such erosion.

27. Precipitation and drainage control systems shall be designed and constructed to accommodate the anticipated volume of precipitation and peak flows from surface runoff under 1000-year, 24-hour precipitation conditions.

POST-CLOSURE MAINTENANCE SPECIFICATIONS

28. The Discharger shall monitor groundwater elevations to ensure that at least five feet of separation in maintained between groundwater and waste within the timeframe specified in Provision No. 9 of Section C below.

29. During the closure and post-closure maintenance period, the Discharger shall conduct routine maintenance of the final cover, areas with interim cover, the precipitation and drainage control facilities, the groundwater monitoring facilities, and any facilities associated with corrective action.

30. The Discharger shall, in a timely manner, repair any areas of the final cover that have been damaged by erosion, cracking, differential settlement, subsidence or any other causes that could allow ponding of surface water or percolation of surface water into the wastes.

31. Prior to and during the rainy season, the Discharger shall perform any and all necessary reseeding of the final cover to maintain adequate vegetation.

32. The Discharger shall maintain all plantations of eucalyptus trees at the facility to ensure that the trees are healthy and are not an undue fire hazard. Fallen eucalyptus trees in the plantation areas shall be removed and replaced as needed to maintain the required groundwater separation.

33. The Discharger shall perform all post-closure maintenance activities specified in the facility's Final Closure and Post-Closure Maintenance Plan that are not specifically referred to in this Order.

C. PROVISIONS:

1. The Discharger shall submit reports required by this Order pursuant to Section 13267 of the California Water Code. Failure to submit the reports by the due dates shown may lead to enforcement action pursuant to Section 13268.

2. By **27 December 2002**, the Discharger shall submit a final closure plan for closure of the facility. The plan shall include the elements required by Title 27, and this Order including a CQA plan. This plan shall be prepared by or under the supervision of a California registered civil engineer or certified engineering geologist.

3. By **1 June 2003**, the Discharger shall submit a post-closure maintenance plan for the facility. The plan shall include the elements required by Title 27 and this Order. The post-closure maintenance plan shall include a financial assurance cost estimate for post-closure maintenance preliminary to the 30-year cost estimate required by Provision No. 7 of this Order, below.

4. By **1 November 2003**, the Discharger shall submit an Engineering Feasibility Study that assesses the feasibility of various options for groundwater remediation at the facility. The study must assess the feasibility of remedies that will return groundwater to conditions that existed prior to wastes being discharged at the facility (background groundwater quality). The study must include an estimate of the time required for the remedy to achieve that goal and select a recommended remedy to be expounded in a Corrective Action Plan.

5. Within **6 Months** of Board staff's written approval of the Engineering Feasibility Study, the Discharger shall submit a Corrective Action Plan for groundwater remediation at the facility. The plan shall give details about how corrective action will be achieved, and include proposed time schedules for installation of any necessary equipment or other features, and an estimate of how long the corrective action will take to achieve the required cleanup goals.

6. By **1 February 2006**, the Discharger shall submit the final construction report (as required by Specification No. 6 of this Order) for Board staff approval showing that the units have been closed in accordance with the approved final closure plan and CQA plan.

7. Within **60 days** of Board staff's written approval of the final construction report, the discharger shall submit a detailed cost estimate for 30 years of post-closure maintenance of the facility, a cost estimate for implementation of the Corrective Action Plan and a proposed Title 27 financial assurances mechanism for the total of both sums for approval by the Executive Officer.

8. Within **90 days** of the Executive Officer's written approval of the cost estimates and proposed financial assurances mechanism, the Discharger shall establish a financial assurances mechanism naming the Regional Board as beneficiary, that is adequate for carrying out maintenance for the closed facility for 30 years and implementing the Corrective Action Plan per the approved cost estimates.

9. If after an initial monitoring period of at least five-years following the submittal of the final construction report that certifies the completion of closure either the Discharger or Board staff find that the pond closure is unable to comply with the requirements of this Order, the Discharger shall reassess the closure and perform any necessary modifications to ensure compliance with this Order.

10. The Discharger shall notify the Board in writing of any proposed change in ownership or responsibility for construction or operation of the units.

11. The Discharger shall comply with Monitoring and Reporting Program No. R5-2002-0204, which is attached to and made part of this Order.

12. Discharger shall implement the mitigation measures identified in the Mitigated Negative Declaration.

13. Discharger shall comply with the terms of the Mitigation and Monitoring Plan referred to in Finding 59.

14. The Discharger or persons employed by the Discharger shall comply with all notice and reporting requirements of the State Department of Water Resources with regard to the construction, alteration, destruction, or abandonment of all monitoring wells used for compliance with this Order or with Monitoring and Reporting Program No. R5-2002-0204, as required by Sections 13750 through 13755 of the California Water Code.

15. The Discharger shall immediately notify the Board of any flooding, equipment failure, slope failure, or other change in site conditions which could impair the integrity of waste containment facilities or of precipitation and drainage control structures.

16. The Discharger shall maintain waste containment facilities and precipitation and drainage controls, and shall continue to monitor groundwater and surface water per Monitoring and Reporting Program No. R5-2002-0204 throughout the post-closure maintenance period.

17. The post-closure maintenance period shall continue until the Board determines that remaining wastes in all units will not threaten water quality.

18. The Discharger shall have the continuing responsibility to assure protection of usable waters from discharged wastes and from leachate generated by discharged waste during

the active life, closure, and post-closure maintenance period of the units and during subsequent use of the property for other purposes.

19. In the event of any change in ownership of this waste management facility, the Discharger shall notify the succeeding owner or operator in writing of the existence of this Order. A copy of that notification shall be sent to the Board.

20. The Discharger may be required to submit other technical reports as directed by the Executive Officer.

It is further ordered that the investigative and cleanup tasks required in the above items shall be conducted by or under the direction of a California Registered Professional Civil Engineer, a Certified Engineering Geologist or a Registered Geologist experienced in the area of groundwater and soil cleanup.

If the named potentially responsible parties fail to comply with the provisions of this Order, the Executive Officer may refer this matter to the Attorney General for judicial enforcement or may issue a complaint for Administrative Civil Liability.

Ordered by:_____
THOMAS R. PINKOS, Executive Officer

6 December 2002
(Date)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2002-0204
FOR
ANADARKO PETROLEUM CORPORATION; BOEING SATELLITE SYSTEMS, INC.; CALPINE; CYPRESS AMAX MINERALS COMPANY; FREEPORT MCMORAN, INC./AMINOIL, INC.; GEOTHERMAL INC.; GEOTHERMAL KINETICS, INC.; HUGHES AIRCRAFT COMPANY/THERMOGENICS, INC.; IMC GLOBAL; MAXUS ENERGY CORPORATION; MCR GEOTHERMAL; MSR PUBLIC POWER AGENCY; NATOMAS; NORTHERN CALIFORNIA POWER AGENCY; OCEAN ENERGY RESOURCES INC.; PACIFIC GAS AND ELECTRIC COMPANY; PHELPS DODGE; PHILLIPS PETROLEUM COMPANY; REPUBLIC GEOTHERMAL; SACRAMENTO MUNICIPAL UTILITY DISTRICT; SANTA FE GEOTHERMAL INC./OCCIDENTAL GEOTHERMAL INC.; SHELL OIL COMPANY; STATE OF CALIFORNIA DEPARTMENT OF WATER RESOURCES; SUNOCO; THERMAL POWER; AND UNION OIL COMPANY OF CALIFORNIA DBA UNOCAL
GEOTHERMAL INC. FACILITY
CLASS II SURFACE IMPOUNDMENTS AND DISPOSAL TRENCHES
CLOSURE, POST-CLOSURE MAINTENANCE AND GROUNDWATER CLEANUP
LAKE COUNTY

The Geothermal Inc. Facility is an inactive disposal facility located approximately four miles southeast of Middletown consisting of seven surface impoundments and three solid waste disposal trenches that formerly accepted liquid and solid wastes produced by geothermal exploration, steam power generation and other geothermal related activities. Groundwater monitoring at the facility indicates that wastes have impacted underlying groundwater primarily with sulfate and boron as well as elevated concentrations of total dissolved solids. This Monitoring and Reporting Program (MRP) is being issued to the companies and agencies listed above pursuant to Sections 13304 and 13267 of the California Water Code. Monitoring of groundwater and surface water is necessary to ensure that closure and cleanup activities at the facility are improving water quality.

The Discharger shall maintain water quality monitoring systems that comply with the provisions of Title 27, California Code of Regulations (CCR), Division 2, Subdivision 1, Chapter 3, Subchapter 3, and are appropriate for detection monitoring, evaluation monitoring, and corrective action monitoring.

Failure to comply with this MRP constitutes non-compliance that can result in the imposition of civil monetary liability under authority granted in the California Water Code.

A. MONITORING AND OBSERVATIONS

1. Groundwater Monitoring

The Discharger shall sample groundwater from monitoring wells A-2 through A-5, A-7, A-8, EX-4, EX-10, FMW-5 through FMW-8, MW-6B, MW-102 through MW-110, and MW-113 through MW-119, as well as any other wells installed at the facility after adoption of these WDRs. The Discharger shall collect samples from the groundwater monitoring wells as

specified in Table 1. Sample collection shall follow standard EPA protocol. For each monitored groundwater body, the Discharger shall measure the water level in each well (in feet and hundredths, MSL) and determine groundwater gradient and direction at least quarterly, including the times of expected highest and lowest water level elevations for the respective groundwater body. Groundwater elevations shall be measured for a given groundwater body within a period of time short enough to avoid temporal groundwater flow variations which could preclude accurate determination of groundwater gradient and direction.

2. Surface Water Monitoring

The Discharger shall monitor surface water in accordance with Table 1 at locations SW01, SW02, SW03 and LAKE as shown on Attachment B.

TABLE 1 – GROUNDWATER AND SURFACE WATER MONITORING PROGRAM

Parameter	Units	Test Method	Frequency
Field Parameters			
Temperature	°F	Field Measure	Semiannually[1]
Groundwater Elevation	Feet (100ths), MSL	Field Measure	Quarterly
Specific Conductance	µmhos/cm	Field Measure	Semiannually[1]
pH	Number	Field Measure	Semiannually[1]
Turbidity	Turbidity units	Field Measure	Semiannually[1]
Monitoring Parameters			
Boron	mg/l	EPA 200.7	Semiannually[1]
Chloride	mg/l	EPA 300.0	Semiannually[1]
Sulfate	mg/l	EPA 300.0	Semiannually[1]
Total Dissolved Solids	mg/l	EPA 160.1	Semiannually[1]
Metals[2]	mg/l	See Footnote 2	Every 2 Years[1,2]
Volatile Organics	µg/l	EPA 8260B	5-Years[3]
Semi-Volatile Organics	µg/l	EPA 8270C	5-Years[3]

[1] For surface water, beginning with the first storm of the rainy season and during at least one other storm event during the wet season.
[2] Metals by EPA 200.7 except where noted: Arsenic (200.9), Barium, Chromium, Nickel, Selenium, Vanadium, and Zinc (every two years during the wet season).
[3] VOCs and SVOCs for detection and evaluation monitoring wells only (every five years during the wet season beginning during the first half of 2003). Excludes background wells.

B. REPORTING

The Discharger shall report monitoring data and information as required in this MRP. Reports that do not comply with the required format will be **REJECTED** and the Discharger shall be deemed to be in non-compliance with the WDRs.

1. Semiannual Reports

The Discharger shall report field and laboratory test results in semi-annual monitoring reports. The Discharger shall submit the semi-annual monitoring reports to the Board by **15 July** for the

January through June reporting period and by **15 January** for the July through December reporting period. The Discharger shall arrange the data in tabular form so that the date, the constituents, the concentrations, and the units are readily discernible. The Discharger shall summarize the data to clearly illustrate compliance with waste discharge requirements or the lack thereof. A short discussion of the monitoring results, including notations of any water quality violations, shall precede the tabular summaries. As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional or their subordinate and signed by the registered professional.

Each semiannual report is to include:

(a) tabulated cumulative monitoring data (groundwater and surface water) including depth to groundwater measurements in monitoring wells and piezometers, groundwater elevations above mean sea level, and Concentration Limits from the most recent annual report;

(b) a groundwater contour map for the current quarter's groundwater elevation data showing hydraulic gradient and flow direction;

(c) a copy of the laboratory analytical reports;

(d) a discussion about the effectiveness of the closure in maintaining 5-feet of separation between groundwater and waste; and

(e) the status of any groundwater remediation, including all applicable data such as pumping rates and cumulative volume for each well, and a discussion about the effectiveness of groundwater remedial action, with any proposed changes or modifications

2. Annual Report

The second semiannual report shall also constitute the annual report for the previous calendar year. The annual report shall contain graphical summaries of the monitoring data so as to show historical trends, and shall include Concentration Limits for each Constituent of Concern in groundwater. The Discharger shall report to the Board the results of any monitoring done more frequently than specified herein.

Each annual report shall include the information listed for semiannual reports (above) as well as:

(a) graphical presentations of all groundwater and surface water monitoring data so as to show historical trends;

(b) groundwater contour maps for the previous year's groundwater elevation data showing hydraulic gradients and flow directions;

(c) a discussion of the long-term trends in the concentrations of any pollutants in groundwater and/or surface water;

(d) an updated Water Quality Protection Standard including proposed Concentration Limits for all Constituents of Concern for groundwater and surface water.

C. WATER QUALITY PROTECTION STANDARD

The Water Quality Protection Standard (Standard) shall consist of the following elements:

1. Constituents of Concern;
2. Concentration Limits;
3. Monitoring Points (groundwater and surface water);
4. Point of Compliance; and
5. Compliance Period.

Each of these is described as follows:

1. Constituents of Concern

The list of Constituents of Concern shall include all parameters listed in Table 1 of this MRP.

2. Concentration Limits

The Discharger shall determine the Concentration Limit for each Constituent of Concern or Monitoring Parameter in groundwater based on background Monitoring Point data as required by §20415(e) of Title 27. The Discharger shall use the Concentration Limits as the basis of comparison with data from the Monitoring Points.

The Discharger shall update the concentration limits each time new background data becomes available (i.e. – semi-annually or annually depending on the frequency of monitoring for that constituent).

3. Monitoring Points

Groundwater:

The background Monitoring Point for groundwater shall be monitoring wells A-4, A-5, MW-102, MW-109, MW-110, MW-113, and any other background wells installed after the adoption of this Order.

The evaluation Monitoring Points for groundwater shall be monitoring wells A-7, EX-4, EX-10B, FMW-5 through FMW-8, MW-6B, MW-103, MW-105 through MW-108, MW-119 and any other monitoring wells installed in impacted groundwater after the adoption of this Order.

The detection Monitoring Points for groundwater shall be MW-104, MW-114, MW-116, MW-117 and MW-118, and any other detection monitoring wells installed in unimpacted groundwater after the adoption of this Order.

Surface Water:

The background surface water Monitoring Point shall be SW01. The detection Monitoring Points for surface water shall be SW02, SW03 and LAKE as shown on Attachment B.

4. Point of Compliance

The Point of Compliance for groundwater shall be the vertical surface located at the hydraulically downgradient limit of the waste management units that extends through the uppermost aquifer underlying the units. The Point of Compliance for surface water shall be surface water Monitoring Points SW02, SW03 and LAKE.

5. Compliance Period

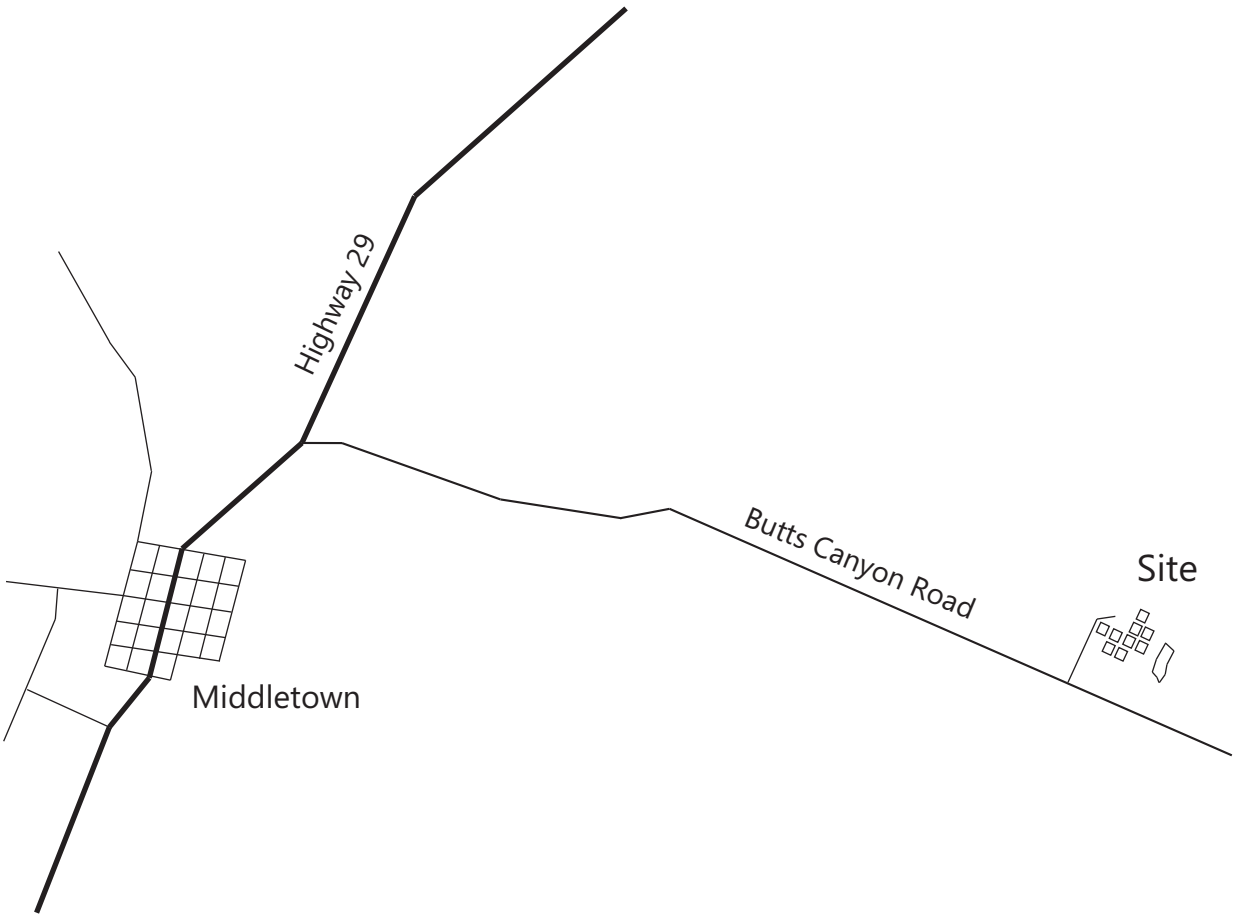
The Compliance Period is the number of years equal to the active life of the waste management unit(s) plus at least three consecutive years of compliance with the Water Quality Protection Standard (as described in Title 27, Section 20410).

The Discharger shall implement the above monitoring program on the effective date of this Order.

Ordered by: _____
THOMAS R. PINKOS, Executive Officer

6 December 2002
Date

WLB



ATTACHMENT A

SITE LOCATION MAP

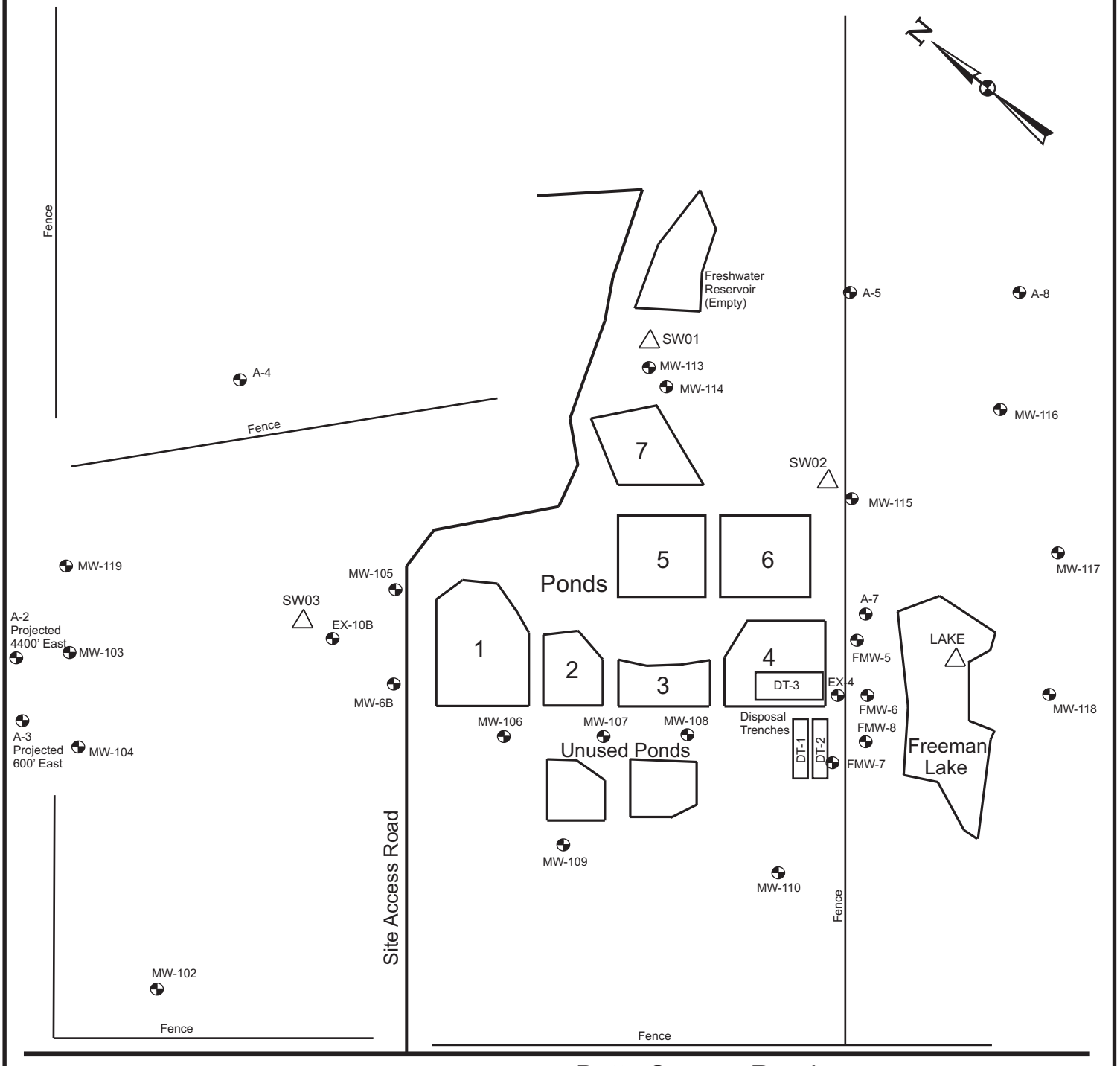
GEOTHERMAL INC. FACILITY

Lake County

Monitoring and Reporting Program No. R5-2002-0204

N

Not to Scale



ATTACHMENT B

SITE MAP

GEOTHERMAL INC. FACILITY

Lake County

Monitoring and Reporting Program No. R5-2002-0204

Legend

- Monitoring Well Location
- Surface Water Monitoring Location

Note: Map shows only those monitoring wells that are required to be sampled. Depth to groundwater measurements shall be taken from other wells and piezometers as indicated in the Monitoring and Reporting Program.

Not to Scale

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO. R5-2002-0204

APPROVING AN INITIAL STUDY
AND
ADOPTING A MITIGATED NEGATIVE DECLARATION
FOR
GEOTHERMAL INC. FACILITY
CLOSURE OF SURFACE IMPOUNDMENTS AND DISPOSAL TRENCHES
LAKE COUNTY

WHEREAS, the Regional Board proposes to adopt a Cleanup & Abatement Order for the closure of surface impoundments and disposal trenches at the Geothermal Inc. Facility in Lake County; and

WHEREAS, the Regional Board is the lead agency for this project under the California Environmental Quality Act and has conducted an Initial Study in accordance with Title 14, California Code of Regulations, Section 15063, entitled *Guidelines for the Implementation of the California Environmental Quality Act*; and

WHEREAS, mitigation measures identified in the Mitigated Negative Declaration will avoid the project's potential significant effects or will reduce such effects to a less than significant impact; and

WHEREAS, copies of the Initial Study and proposed Mitigated Negative Declaration were transmitted to or made available to all agencies and persons known to be interested in these matters; and

WHEREAS, the Regional Board received comments from various agencies and persons regarding the proposed project, Initial Study, or proposed Mitigated Negative Declaration. These comments have been considered and addressed in the response to comments and in the proposed mitigation measures that are part of the Mitigated Negative Declaration; and

WHEREAS, the Regional Board considered all testimony and evidence at a public hearing held on 6 December 2002 in Sacramento, California and good cause was found to approve the Initial Study and adopt a Negative Declaration;

NOW, before the California Regional Water Quality Control Board, Central Valley Region, BE IT RESOLVED as follows:

1. The Regional Board approves the Initial Study and adopts the Mitigated Negative Declaration including the Mitigation and Monitoring Plan for closure of the *Geothermal Inc. Facility.*

2. The record before the Regional Board contains no substantial evidence that a fair argument had been made that the project may have a significant effect on the environment.

I, THOMAS R. PINKOS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Central Valley Region, on 6 December 2002.

THOMAS R. PINKOS, Executive Officer

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