

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION**

ORDER NO. R7-2006-0062

WASTE DISCHARGE REQUIREMENTS
FOR
HEBER FIELD COMPANY, OWNER
ORMAT NEVADA INC., OPERATOR
ORCAL GEOTHERMAL INC., LANDOWNER
WELLFIELD MUD SUMPS
Heber Known Geothermal Resource Area (KGRA) - Imperial County

The California Regional Water Quality Control Board, Colorado River Basin Region, finds that:

1. Heber Field Company owns the wellfield associated with the Heber Known Geothermal Resource area (KGRA). The wellfield is located south of the town of Heber in Imperial County. The address for Heber Field Company is 947 Dogwood Road, Heber, CA 92249.
2. The operator of the facility is Ormat Nevada Inc., 6225 Neil Road, Suite 300, Reno, NV 89511-1136.
3. The landowner of the wellfield is Orcal Geothermal Inc., 6225 Neil Road, Suite 300, Reno, NV 89511-1136.
4. This Board Order regulates the handling and disposal of drilling wastes generated by geothermal exploration well drilling, operation and maintenance throughout the Heber KGRA. The location and outline of the Heber KGRA is shown on Figure 1. Proposed locations for future exploration wells are also shown on Figure 1.
5. The wellfield is currently regulated under Board Order No. R7-2005-0063 adopted on May 4, 2005. The waste discharge requirements (WDRs) are being updated to include a section of the wellfield omitted from Order No. R7-2005-0063, the South Heber Exploration portion of the wellfield, and to clarify water quality issues associated with the facility. Heber Field Company submitted an updated Report of Waste Discharge dated April 26, 2006 to revise the WDRs to include the South Heber Exploration portion of the wellfield.
6. The wellfield is comprised of geothermal production and injection wells, and future exploration sites, all located on private land. The production wells provide hot geothermal brine and steam to geothermal power plants to create energy. Injection wells return the brine to the geothermal resource. Exploration wells are drilled to expand the power potential, or to gather information about the resource.
7. Definition of terms used in this Board Order:
 - a. **Facility** – The entire parcel of property where Heber Field Company or related geothermal industrial and drilling activities are conducted.

- b. **Waste Management Unit (WMUs)** – Mud sumps are WMUs.
- c. **Discharger** – The term “discharger” means any person who discharges waste that could affect the quality of the waters of the State, and includes any person who owns the land, waste management unit, or who is responsible for the operation of a waste management unit. Specifically, the terms “discharger” or “dischargers” in this Order includes Heber Field Company, Ormat Nevada Inc., and Orcal Geothermal Inc.

Geothermal Drilling Wastes

- 8. The following wastes are generated during construction, operation and maintenance of exploration, production, and injection wells:
 - a. **Geothermal brine** – The Discharger reports the geothermal brines in the area of the Heber KGRA are defined as hot saline solutions within the resource located approximately 6,000 feet below ground surface with Total Dissolved Solids (TDS) of approximately 14,000 to 16,000 mg/L. Concentrations of major brine constituents are provided below:

1. Sodium (Na)	4,040 mg/L
2. Chloride (Cl)	7,653 mg/L
3. Calcium (Ca)	1,048 mg/L
4. Potassium (K)	292 mg/L
5. Sulfate (SO ₄)	99 mg/L
6. Lithium (Li)	4.72 mg/L
7. Lead (Pb)	0.59 mg/L
8. Arsenic (As)	0.13 mg/L
 - b. **Drilling muds with additives** – Drilling mud is inert mineral clay such as bentonite clay. Drilling mud additives may include sodium bicarbonate, soda ash, drilling soap, organic polymers, wood fibers, graphite, cottonseed hulls, walnut shells and cement. Drilling mud additives do not render the drilling mud hazardous when used according to manufacturer's specifications.
 - c. **Drill cuttings (rock)** – small rock fragments that have been pulverized during drilling and forced to the surface by drilling mud, aerated mud and/or air.

Drilling Waste Containment (WMUs)

- 9. The Discharger proposes to contain geothermal brine generated during drilling, by discharging into large portable tanks. Geothermal brine will then be re-injected into the geothermal resource, or discharged into permanent Class II surface impoundments constructed pursuant to Title 27 of the California Code of Regulations (Title 27).
- 10. Drilling muds and rock cuttings generated during well drilling, will be discharged to mud sumps designed to temporarily (less than one (1) year) contain the material while drying. Mud sumps will be built with a minimum of twelve (12) inches of compacted clay with permeability of approximately 1×10^{-6} cm/sec, or with synthetic liners of equivalent permeability. Discharges of drilling mud and cuttings from well drilling operations to mud

sumps are exempt from the permit requirements of Title 27 of the California Code of Regulations (CCR), as set forth in Section 21565(b)(2) of Title 27.

11. Drilling fluid will not contact geothermal brine.
12. Clay liner compaction must be certified by a Civil Engineer or Certified Engineering Geologist registered by the State of California. Synthetic liner placement and welding must be certified by the installer to show that proper factory requirements were met and no damage occurred during placement. Both types of certification must be submitted, in writing, to the Regional Board prior to use of the temporary mud sump. After cleanout of geothermal solids, the integrity of the liner must be re-certified before reuse.

Drilling Waste Disposal

13. Liquid wastes generated from drilling, testing and maintaining geothermal wells will be returned to the geothermal resource by injection, or discharged to a Class II surface impoundment constructed pursuant to Title 27.
14. Solids discharged to the mud sump will be removed offsite or closed in place provided that representative sampling of the solids are shown not to be hazardous or designated waste. Such materials are exempt from regulation as solid waste under Title 27. Section 20090 of Title 27 states, "The following activities shall be exempt from the SWRCB-promulgated provisions of this subdivision, so long as the activity meets, and continues to meet, all preconditions listed: (g) Drilling Waste--Discharges of drilling mud and cuttings from well-drilling operations, provided that such discharges are to on-site sumps and do not contain halogenated solvents, and further provided that, at the end of drilling operation, the discharger either: (1) removes all wastes from the sump; or removes all free liquid from the sump and covers residual solid and semi-solid wastes, provided that representative sampling of the sump contents after liquid removal shows residual solid wastes to be nonhazardous. If the sump has appropriate containment features, it may be reused."

Surface Water

15. Surface water in the area of the Heber KGRA consists of canals and agricultural drains operated and maintained by the Imperial Irrigation District. The largest surface water in the area is the Central Main Canal, which bisects the Heber KGRA area.
16. The Facility is not located in a 100-year flood plain.

Regional Groundwater

17. The regional groundwater flow direction within the Imperial Valley is toward the Salton Sea, a closed basin with a surface elevation of approximately 225 feet below sea level. The Ormat-Heber facilities are located approximately 50 feet below sea level; groundwater flows in a general northwest direction.

Local Groundwater

18. The Discharger reports that shallow groundwater in the area of the Heber wellfield occurs approximately five (5) to ten (10) feet below ground surface with a general northwest flow direction, and a TDS ranging from 5,000 to 10,000 mg/L.
19. Groundwater depth, gradient, and quality in the area of the Heber KGRA may be influenced by irrigation of adjacent agricultural fields, and by recharge from nearby canals.

Regional Geology

20. The Heber wellfield is located within the Salton Trough area of southeast California. The Salton Trough is a tectonically active zone containing numerous faults associated with the San Andreas. The wellfield is located on the south central portion of the trough, and is underlain by deltaic and lacustrine formations associated with the Colorado River delta. Bedrock in this part of the Salton Trough is approximately three (3) miles below the ground surface.

Climate

21. Climate in the region is arid. Climatological data obtained from 1951 to 1980 indicate an average seasonal precipitation of 2.5 inches, and an average annual pan evaporation rate greater than 100 inches.
22. The wind direction follows two general patterns:
 - a. Seasonally from fall through spring, prevailing winds are from the west and northwest. Most of these winds originate in the Los Angeles basin. Humidity is lowest under these conditions.
 - b. Summer weather patterns are dominated by intense, heat-induced low pressure areas that form over the interior desert, drawing air south of the Facility. Humidity is highest under these conditions.

Basin Plan

23. The Water Quality Control Plan for the Colorado River Basin Region of California (Basin Plan) as amended to date, designates the beneficial uses of ground and surface waters in this region.
24. The beneficial uses of ground water in the Imperial Hydrological Unit are:
 - a. Municipal Supply (MUN)
 - b. Industrial Supply (IND)
25. With respect to the MUN designation, the Basin Plan states: "At such time as the need arises to know whether a particular aquifer which has no known existing MUN use should be considered as a source of drinking water, the Regional Board will make such a determination based on the criteria listed in the 'Sources of Drinking Water Policy' in Chapter 2 of the Basin Plan. An indication of MUN for a particular hydrologic unit

indicates only that at least one of the aquifers in that unit currently supports a MUN beneficial use. For example, the actual MUN usage of the Imperial Hydrologic Unit is limited only to a small portion of that ground water unit.”

26. The beneficial uses of surface waters in the area of the Heber wellfield are as follows:

a. Imperial Valley Drains

- i. Freshwater Replenishment (FRSH)
- ii. Water Contact Recreation (RECI)
- iii. Non-contact Water Recreation (RECII)
- iv. Warm Freshwater Habitat (WARM)
- v. Wildlife Habitat (WILD)
- vi. Preservation of Rare, Threatened, or Endangered Species (RARE)

b. All American Canal System

- i. Municipal (MUN)
- ii. Agricultural (AGR)
- iii. Aquaculture Supply (AQUA)
- iv. Freshwater Replenishment (FRSH)
- v. Industrial (IND)
- vi. Ground Water Recharge (GWR)
- vii. Water Contact Recreation (RECI)
- viii. Non-Contact Water Recreation (RECII)
- ix. Warm Freshwater Habitat (WARM)
- x. Wildlife Habitat (WILD)
- xi. Hydropower Generation (POW)
- xii. Preservation of Rare, Threatened, or Endangered Species (RARE)

Storm Water

27. Federal regulations for storm water discharges were promulgated by the U.S. Environmental Protection Agency (40 CFR Parts 122, 123, and 124). The regulations require specific categories of facilities which discharge storm water associated with industrial activity to obtain a National Pollutant Discharge Elimination System (NPDES) permit and to implement Best Conventional Pollutant Technology (BCPT) to reduce or eliminate industrial storm water pollution.

Anti-Degradation Policy

28. State Water Resources Control Board (State Board) Resolution No. 68-16 (“Policy with Respect to Maintaining High Quality Waters of the State”; hereafter Resolution No. 68-16) requires a Regional Board in regulating the discharge of waste to maintain high quality waters of the state (i.e., background water quality) until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in plans and policies (e.g. violation of any water quality objective). The discharge is required to meet waste discharge requirements that result in the best practicable treatment or control of the discharge necessary to assure pollution or

nuisance will not occur, and the highest water quality consistent with maximum benefit to the people will be maintained.

CEQA

29. The Imperial County Planning Department prepared a Negative Declaration for the South Heber exploration project. The Negative Declaration was certified by the Imperial County Planning Commission during a meeting on July 12, 2006.

Notification

30. The Board has notified the Discharger and all known interested agencies and persons of its intent to update WDRs for said discharge, and has provided them with an opportunity for a public meeting, and to submit comments.
31. The Board, in a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED, that Board Order No. R7-2005-0063 be rescinded, and in order to meet the provision contained in Division 7 of the California Water Code and regulations adopted there under, the Dischargers shall comply with the following:

A. Specifications

1. The treatment or disposal of wastes at this facility shall not cause pollution or nuisance as defined in Section 13050 of Division 7 of the California Water Code.
2. Waste material at this facility must be contained at all times.
3. Containment of waste shall be limited to the areas designated for such activity. Any revision or modification of the designated waste containment area, or any proposed change in operation that alters the nature and constituents of the waste produced must be submitted in writing to the Regional Board Executive Officer for review and approval before the proposed change in operation or modification to the designated area is implemented.
4. Prior to drilling a new well at the Facility, the Discharger shall notify, in writing, the Regional Board Executive Officer of the proposed change.
5. Any substantial increase or change in the annual average volume of material to be discharged under this Order must be submitted in writing to the Regional Board Executive Officer for review and approval.
6. Liquid or solid geothermal waste discharged to and/or contained in Class II surface impoundments, tanks or mud sumps shall not overflow their respective containment.
7. A minimum freeboard of two (2) feet shall be maintained in Class II surface impoundments at all times.

8. Final disposal of residual waste from mud sumps and/or tanks shall be accomplished to the satisfaction of the Regional Board Executive Officer upon abandonment or closure of operations.
9. Following well completion, the respective mud sumps or tanks shall have all drilling mud and cuttings tested and disposed of in accordance with applicable laws and regulations.
10. Prior to the removal of solid material discharged to mud sumps, an analysis of the solids must be conducted, and the material must be disposed of in a manner consistent with that analysis, and applicable laws and regulations.
11. Public contact with wastes containing geothermal wastes shall be precluded through fences, signs, or other acceptable alternatives.
12. The mud sumps shall be constructed, operated and maintained to ensure their effectiveness, in particular:
 - a. Erosion control measures shall be implemented;
 - b. Liners in the mud sumps shall be maintained to ensure proper function; and
 - c. Solid material shall be removed from the mud sumps in a manner that minimizes the likelihood of damage to the liner.
13. Upon ceasing operation at the facility, all waste, natural geologic material contaminated by waste, and surplus or unprocessed material, shall be removed from the site and disposed of in accordance with applicable laws and regulations.
14. Surface drainage from tributary areas or subsurface sources, shall not contact or percolate through waste discharged at this site.
15. The Discharger shall use the constituents listed in Monitoring and Reporting Program No. R7-2006-0062 and revisions thereto, as "Monitoring Parameters".
16. The Discharger shall implement the attached Monitoring and Reporting Program No. R7-2006-0062 and revisions thereto, in order to detect, at the earliest opportunity, any unauthorized discharge of waste constituents from the facility, or any impairment of beneficial uses associated with (caused by) discharges of waste to the mud sumps.
17. Water used for the process and site maintenance, shall be limited to the amount necessary for the process, dust control, and for cleanup and maintenance.
18. The Discharger shall not cause or permit the release of pollutants, or waste constituents in a manner that could cause or contribute to a condition of contamination, nuisance, or pollution.

B. Prohibitions

1. The discharge of solid geothermal waste into mud sumps as a final means of disposal is prohibited without authorization by the Regional Board Executive Officer.

2. The Discharger shall not cause degradation of any groundwater aquifer or water supply.
3. The discharge of waste to land not owned or controlled by the Discharger is prohibited.
4. The discharge of geothermal brines to mud sumps is prohibited.
5. Drilling fluid shall not come in contact with geothermal brine.
6. Use of geothermal brine or drilling muds for dust control on access roads, well pads, or within the facility is prohibited.
7. The discharge of hazardous or designated wastes to areas other than a waste management unit authorized to receive such waste is prohibited.
8. Permanent (longer than one (1) year) disposal or storage of drilling waste to mud sumps is prohibited, unless authorized by the Regional Board Executive Officer.
9. All mud sumps must be lined. Drilling waste shall not penetrate through the lining during the containment period.
10. Geothermal drilling waste in mud sumps or tanks shall not enter any canal, drainage, or drains (including subsurface drainage systems), except as allowed under an appropriate NPDES permit.
11. The Discharger shall appropriately dispose of any materials, including liquids and sediment removed from the tanks and mud sumps.
12. The Discharger shall neither cause nor contribute to the contamination or pollution of groundwater via the release of waste constituents in either liquid or gaseous phase.
13. Direct or indirect discharge of waste to any surface water or surface drainage course is prohibited.

C. Provisions

1. The Discharger shall comply with Monitoring and Reporting Program No. R7-2006-0062 and future revisions thereto, as specified by the Regional Board Executive Officer.
2. Unless otherwise approved by the Regional Board Executive Officer, all analyses shall be conducted at a laboratory certified for such analyses by the California Department of Health Services. All analyses shall be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants", promulgated by the USEPA.
3. Prior to any change in ownership of this operation, the Discharger shall transmit a copy of this Board Order to the succeeding owner/operator, and forward a copy of the transmittal letter to the Regional Board.

4. Prior to any modification that would result in a material change in the quality or quantity of discharge, or material change in the location of the discharge, the Discharger shall report all pertinent information in writing to the Regional Board Executive Officer, and obtain revised requirements before any modification is implemented.
5. All clay lined mud sumps shall be certified by a California Registered Civil Engineer or Certified Engineering Geologist.
6. The Discharger shall ensure that all site-operating personnel are familiar with the content of this Board Order, and shall maintain a copy of this Board Order at the site.
7. This Board Order does not authorize violation of any federal, state, or local laws or regulations.
8. The Discharger shall allow the Regional Board, or an authorized representative, upon presentation of credentials and other documents, as may be required by law, to:
 - a. Enter upon the premises regulated by this Board Order, or the place where records must be kept under the conditions of this Board Order;
 - b. Have access to and copy, at reasonable times, any records that shall be kept under the condition of this Board Order;
 - c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Board Order, and
 - d. Sample or monitor at reasonable times, for the purpose of assuring compliance with this Board Order or as otherwise authorized by the California Water Code, any substances or parameters at this location.
9. The Discharger shall comply with all conditions of this Board Order. Any noncompliance with this Board Order constitutes a violation of the Porter-Cologne Water Quality Act, and is grounds for enforcement action.
10. The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Discharger to achieve compliance with this Board Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.
11. The Discharger shall comply with the following:
 - a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
 - b. The Discharger shall retain records of all monitoring information, copies of all reports required by the Board Order, and records of all data used to complete the application of the Board Order, for a period of at least five (5) years from the date of the sample, measurement, report or application. This period may be extended by the Regional Board Executive Officer at any time.

- c. Records of monitoring information shall include:
 - i. The date, exact place(s), and time of sampling or measurement(s);
 - ii. The individual(s) who performed the sampling or measurement(s);
 - iii. The date(s) analyses were performed;
 - iv. The individual(s) responsible for reviewing the analyses; and
 - v. The results of such analyses.
 - d. Monitoring must be conducted according to test procedures described in the Monitoring and Reporting Program, unless other test procedures have been specified in this Board Order or approved by the Regional Board Executive Officer.
- 12. The Discharger is the responsible party for the WDRs, and the monitoring and reporting program for the facility. The Discharger shall comply with all conditions of these WDRs. Violations may result in enforcement action, including Regional Board Orders or court orders that require corrective action or impose civil monetary liability, or modification or revocation of these WDRs by the Regional Board.
 - 13. The Discharger shall furnish, under penalty of perjury, technical monitoring program reports submitted pursuant to the specifications provided by the Regional Board Executive Officer. Specifications are subject to periodic revision as may be warranted.
 - 14. The monitoring reports shall be certified to be true and correct, and signed, under penalty of perjury, by an authorized official of the company.
 - 15. This Board Order does not convey property rights of any sort, or any exclusive privileges; nor does it authorize injury to private property, invasion of personal rights, or infringement of federal, state, or local laws and regulations.
 - 16. This Board Order may be modified, rescinded, or reissued for cause. The filing of a request by the Discharger to modify, or rescind or reissue a Board Order does not stay any Board Order condition. Likewise, notification of planned changes or anticipated noncompliance does not stay any Board Order condition. Causes for modification include: changes in land application plans, sludge use, or disposal practices; or promulgation of new regulations by the State or Regional Boards, including revisions to the Basin Plan.

I, Robert Perdue, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, on November 16, 2006.

Ordered by: _____
ROBERT PERDUE
Executive Officer

Date: _____