CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

TIME SCHEDULE ORDER R5-2026-0900
FOR
PACIFIC GAS AND ELECTRIC COMPANY
FORMER GEOTHERMAL INC. FACILITY
TO COMPLY WITH
WASTE DISCHARGE REQUIREMENTS ORDER R5-2019-0076

The Assistant Executive Officer of the California Regional Water Quality Control Board, Central Valley Region, (Central Valley Water Board or Board) finds that:

1. Waste Discharge Requirements (WDRs) Order R5-2019-0076, adopted by the Central Valley Water Board on 5 December 2019, prescribes requirements for the Former Geothermal Inc. Landfill (Facility) owned and operated by Pacific Gas and Electric Company (PG&E or Discharger).

2. The Facility is located approximately 2.5 miles southeast of Middletown in Lake County, Section 7, T10N, R6W, Mount Diablo Base and Meridian (MDB&M). It is situated on a 460-acre property comprised of Lake County Assessor's Parcel Numbers (APNs) 014-004-01 and 014-004-31. The address associated with the Facility is 19020 Butts Canyon Road, Middletown, California 95461 (site).

3. The WDRs include requirements for post-closure maintenance and corrective action.

4. The facility is currently in corrective action for groundwater impacts caused by historical operation of the former unlined surface impoundments including unpermitted discharge of waste into surface water and groundwater, as well as the ongoing direct contact of groundwater with the unlined waste mass.

HISTORICAL OPERATIONS AND SITE HISTORY

5. The Facility, prior to closure as a landfill, was owned and operated by Geothermal Inc. The operation accepted and disposed of waste produced by geothermal exploration, steam power generation, and other geothermal related activities in seven unlined surface impoundments and three disposal trenches. This included hydrogen sulfide scrubber wastes. 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).

6. As reported in the Discharger's November 2005 Groundwater Corrective Action Plan (CAP), impacts to groundwater were first noted during the operation of the ponds in the early 1980s. The groundwater in the vicinity of the former ponds has been impacted with inorganic constituents of concern (COCs) including boron, sulfate, chloride, and Total Dissolved Solids (TDS). Waste management activities that contributed to groundwater impacts during its operating period, as reported in the Discharger's ROWD, were:

   a. Wastewater stored in the unlined ponds infiltrated through the former pond bottoms and sides and into underlying soil and groundwater.

   b. Wastewater seepage discharged to the surface drainage might have moved some distance downgradient from the former ponds, allowing it to infiltrate into the soil and then to groundwater. The seepage through the dikes was collected through the French drains installed along western side of the former Pond 1, between the former Ponds 1 and 2, and southern edges of the former Ponds 1, 2, 3, and 4, and discharged to a sump at the southwest corner of the former Pond 1. The collected seepage in the sump was pumped into the surface drainage, immediately south of the former Pond 1, which discharges to the Western Ponding Area.

   c. Direct releases from the former Pond 6 into the northern drainage and seepage through the eastern berm of the former Pond 6 onto the Freeman property to the east.

   d. A lack of separation between waste and groundwater in some areas of the closed landfill during wetter periods has been observed.

CORRECTIVE ACTION

7. Following Geothermal Inc.'s filing for bankruptcy in November 1987, the Central Valley Water Board pursued an enforcement action against all responsible parties (RPs), including generators of the waste received at the Facility and Geothermal Inc. (Resolution No. 91-200, adopted on 6 September 1991). Waste generators were identified as RPs based on Geothermal Inc. waste disposal records. On 8 May 1992, the Attorney General sent a letter to a list of eight RPs, including companies or entities that later acquired the environmental liability for waste at the Facility from a waste generator, to inform them about the enforcement action and preference to secure voluntary cooperation in cleanup and closure of the Facility.

8. In December 1995 the Discharger submitted the Remedial Action Alternatives Evaluation report, which evaluated conceptual options for closure, remedial actions, and alternative corrective actions.

9. In August 1998 the Discharger submitted the Technical Evaluation of Phytoremediation and Work Plan for Demonstration Study, which proposed a demonstration study to evaluate the effectiveness of using a phyto-cover over the waste instead of the conceptual landfill closure cell. Central Valley Water Board staff approved the study with the stipulation that the phyto-cover provides equivalent protection to the closure cell method and that it complies with the requirements of California Code of Regulations, title 27 (Title 27).

10. In 2002, the Central Valley Water Board issued Cleanup and Abatement Order (CAO) R5-2002-0204, which required the Discharger to close all the waste management units in accordance with the requirements of Title 27.

11. During April 2002, the Discharger submitted an addendum to the 1995 Remedial Action Alternatives Evaluation. The addendum presented results of the phytoremediation study and a recommendation for closure of the facility using an evapotranspiration (ET) cover placed over the waste after the pond water was 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 use 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.

12. On 24 June 2002, Central Valley Water Board staff issued a letter 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 RPs submitted a 16 July 2002 letter include an updated proposed closure plan, which was intended to address Central Valley Water Board staff's 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 that could provide conduits to groundwater along the roots; and included an HDPE geomembrane layer and geocomposite drainage layer with two feet of cover soil.

13. Between 2003 and 2006, the Discharger closed all units at the Facility by removing all free liquid from the waste, stabilizing all solid waste by mixing in borrow soil, and consolidating the waste into unlined ponds 4 and 6 to create the existing landfill. A compliant single-lined cover with HDPE geomembrane was placed over the waste.

14. After establishment of a Qualified Settlement Fund for the site, into which RPs paid their allocated share of cleanup, PG&E purchased and took title of the entirety of the former Geothermal Inc. property as of 16 August 2004.

15. During closure of the facility, groundwater impacts were known to exist as a result of historical operation of the facility. The primary COCs were Total Dissolved Solids (TDS), sulfate, boron, and chloride. Due to the lack of separation between waste and groundwater in some areas during some parts of the year, groundwater impacts may have continued. To address this issue, the Discharger was required to take further corrective action to achieve 5 feet of separation between waste and highest groundwater and to remediate impacts to groundwater.

16. Between 2006 and 2007, the Discharger planted groves of eucalyptus trees around the landfill to achieve the required 5 feet of separation between waste and groundwater. The trees were also the primary corrective action for groundwater contamination, providing phytoremediation of the plume. The Discharger also lowered the outfall of nearby Freeman Lake to lower the local water table.

17. In 2007, a deed restriction was placed on the site, prohibiting the use of groundwater for growing crops and requiring that no wells be drilled or used without authorization from the Central Valley Water Board.

18. Groundwater data from 2007 through 2012 showed that, although the eucalyptus groves and the lowering of Freeman Lake had a limited impact on the local groundwater table elevation, five feet of separation between groundwater and waste was not maintained at all times. Groundwater still rose and came into contact with waste in some areas during the wetter parts of the year. The groundwater plume also remained relatively unchanged.

19. In 2012, the Discharger submitted a Feasibility Study to evaluate additional corrective actions to come into compliance with the CAO and Title 27. The evaluation identified several uncertainties, which prompted the development of the Site Conceptual Model Update, which was completed in 2014. In 2015, the Discharger produced a Waste Separation Feasibility Study and Corrective Action Plan, which recommended installing monitoring devices in the waste to measure groundwater separation, refining the site conceptual model, and, based on the data collected from those efforts, designing and implementing a hydraulic barrier wall and drainage improvements.

20. In 2016, multi-level piezometers were installed in the waste mass to better evaluate groundwater separation.

21. In 2017, the Discharger continued to install monitoring devices and collect data to refine their site conceptual model, with the final report (*Site Conceptual Model Update*) being submitted in June 2017.

22. On 16 June 2017, the Discharger submitted the Corrective Action Plan for Waste Separation Engineered Alternative and Groundwater Cleanup report (June 2017 CAP), which evaluated various options and recommended the implementation of a partial hydraulic barrier wall and landfill drainage improvements to achieve the required 5-feet of separation paired with monitored natural attenuation to address the groundwater impacts.

23. In January 2018, the Discharger submitted the Addendum to the Site Conceptual Model Update and Plume Delineation Report Regarding HSU-3 Beneficial Use Designation which established hydrostratigraphic unit 3 (HSU-3) and concluded that the HSU-3 is not suitable or potentially suitable for the municipal and domestic supply ("MUN") beneficial use designation based on the State Water Resources Control Board Resolution No. 88-63 (the Sources of Drinking Water Policy [the Policy]).

24. On 3 July 2018, the Central Valley Water Board conditionally approved the June 2017 CAP. Conditions of the approval were that the construction of the cutoff wall meet applicable requirements of Title 27, and that the Discharger must dewater the area encircled by the cutoff wall to achieve physical separation of waste and groundwater, rather than just isolating the partially saturated waste mass from the aquifer. The Discharger responded on 16 October 2018, requesting modifications to the schedule based on the new WDRs, which were in development.

25. On 5 December 2019, WDRs Order R5-2019-0076 was adopted. WDRs Finding 51 explains that the WDRs do not require the Discharger to meet the prescriptive standard for five-foot groundwater separation (see Title 27, § 20240, subd. (c)) because compliance was neither technically nor economically feasible at that time. Nevertheless, the WDRs required continued corrective action for groundwater impacts caused by the lack of separation between waste and groundwater, which must include some amount of separation.

26. WDRs Order R5-2019-0076, Requirements I.D and I.E, required a French Drain Investigation and a Revised Surface Drainage Improvements Design, both of which were intended to identify and develop improvements for conveying and percolating surface water away from the waste mass and mitigate further impacts to groundwater. The Discharger submitted both reports and completed the respective site improvements.

27. On 17 September 2020, the Central Valley Water Board issued a letter titled Groundwater Impacts and Requirements of the Waste Discharge Requirements, which clarified the requirements of the WDRs and gave the Discharger direction on how to maintain compliance with the WDRs, Title 27, and applicable policies of the Central Valley Water Board. The letter reiterated that the Discharger must evaluate, and implement further corrective action to address, the lack of separation between waste and groundwater and resultant groundwater impacts within a reasonable timeframe.

28. On 13 November 2020, the Discharger submitted a new Corrective Action Plan (2020 CAP). In compliance with Title 27 and the WDRs, the 2020 CAP established the following goals as a basis for evaluating corrective action approaches:

    - Prevent surface water and groundwater from contacting the waste and degrading groundwater.

    - Restore groundwater impacts to pre-landfill (background) conditions.

    With those goals in mind, the Discharger developed and evaluated three potential corrective action strategies. Those strategies were compared based on additional parameters, including implementability, effectiveness, cost, regulatory acceptance, flexibility, and sustainability. Based on this analysis, the Discharger chose "Groundwater Extraction and Treatment - Maintain existing corrective actions (existing tree plantations and planned drainage improvements) and implement groundwater extraction and treatment." The Discharger's proposed approach included phased implementation of an extraction well network to maximize dissolved-phase COC mass removal, limiting groundwater-waste interaction, and avoiding the pumping-induced migration of background concentrations of COCs in bedrock to the alluvium. The CAP acknowledges that the extraction network will likely be reconfigured and modified to achieve the defined goals as additional data becomes available via pump tests and monitoring data. The Discharger proposed to treat extracted water with a Reverse Osmosis system (RO) and then discharge the treated water to a surface water under an NPDES permit.

29. Between 2020 and 2023, the Discharger updated the Water Quality Protection Standards to establish background for each hydrostratographic unit and installed several additional monitoring wells to close data gaps.

30. On 9 February 2023, the Central Valley Water Board issued a letter titled Review of Corrective Action Plan, which approved the Discharger's 2020 CAP and required submission of the 2020 CAP's proposed Phase 1 Groundwater Extraction Workplan by 31 May 2023.

31. On 16 May 2023, the Discharger submitted the Response to Review of Corrective Action Plan, in which it asked for clarification on several technical issues and requested an extension of the due date for submittal of the Phase 1 Groundwater Extraction Workplan to 31 October 2023. Central Valley Water Board staff approved this extension request and provided the requested clarifying information.

32. On 2 November 2023, the Discharger submitted the Corrective Action Plan Implementation Schedule and Approach, which provided a summary of modifications to the 2020 CAP and a schedule for implementation. The changes included removal of the existing 32 acres of eucalyptus trees due to lack of effectiveness to draw down local groundwater and create separation, as well as the fire danger they pose. The changes also included a shift to a two-phase approach to evaluate and implement other hydrogeologic control measures:

(1) Phase 1 of the Corrective Action Plan included:

(a) Removal of the eucalyptus plantations (see above);
(b) Monitoring surface water drainage and making improvements as needed post-plantation-removal;
(c) Construction and startup of Phase 1 groundwater extraction and treatment system;
(d) Investigation, evaluation, and planning/design (if applicable) for further lowering Freeman Lake; and
(e) Design and evaluation of hydraulic barrier elements.

(2) Phase 2 of the Corrective Action Plan included:

(a) Continued surface water drainage and making improvements as needed;
(b) Evaluation of Phase 1 groundwater extraction and treatment system;
(c) Design and implementation of the Phase 2 groundwater extraction and treatment system, if necessary;
(d) Freeman Lake Spillway modification, if deemed feasible and necessary by the evaluation in Phase 1; and
(e) Hydraulic barrier design and construction, if necessary.

33. On 22 December 2023, Central Valley Water Board staff issued the Response to Proposed Changes to Corrective Action Plan, concurring that it constituted a technically feasible approach to achieving compliance in a reasonable timeframe and requiring submission of an updated implementation schedule with a completion date of no later than 31 December 2029.

34. On 25 January 2024, the Discharger submitted a workplan to remove the eucalyptus groves and regrade those areas to drain away from the landfill. Central Valley Water Board staff approved this workplan on 21 February 2024. Work was completed between May and October 2024.

35. On 7 June 2024, the Discharger submitted the Corrective Action Plan Implementation Schedule Update.

36. On 9 October 2024, in response to the Central Valley Water Board indicating that a Draft Time Schedule Order was being prepared, the Discharger submitted a proposed schedule for activities identified in the 2020 Correction Action Plan to be used in the development of the Draft Time Schedule Order.

37. This Order is being issued to memorialize the approved 2020 Corrective Action Plan, as modified by the 2 November 2023 Corrective Action Plan Implementation Schedule and Approach document, the 7 June 2024 Corrective Action Plan Implementation Schedule Update and the 9 October 2024 Time Schedule Order schedule submittal. The scope of work and compliance schedule were provided by the Discharger and concurred with by Central Valley Water Board staff.

REGULATORY CONSIDERATIONS

38. Finding 50 of the WDRs states:

In controlling the COC plume and groundwater coming in contact with the waste in the closed landfill, the Discharger shall monitor the effectiveness of the corrective actions already implemented, additional corrective actions, if any, to be implemented as a result of French drain investigation, and the surface drainage improvements to be implemented. A summary of the evaluation of effectiveness of corrective actions shall be included in semiannual monitoring reports as required by MRP R5-2019-0076.

39. Water Code section 13300 states:

Whenever a regional board finds that a discharge of waste is taking place or threatening to take place that violates or will violate requirements prescribed by the regional board, or the state board, or that the waste collection, treatment, or disposal facilities of a discharger are approaching capacity, the board may require the discharger to submit for approval of the board, with such modifications as it may deem necessary, a detailed time schedule of specific actions the discharger shall take in order to correct or prevent a violation of requirements.

40. California Water Code section 13267, subdivision (b) states:

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.

41. The technical reports required by this Order are necessary to evaluate compliance with this Order and WDRs Order R5-2019-0076, and to assure protection of public health and safety and the environment. The burden, including costs, of the required reports bears a reasonable relationship to the need therefore and the benefits to be obtained thereby.

42. Pursuant to Water Code section 13268, failure to submit a report required pursuant to section 13267 may subject the Discharger to administrative civil liability (i.e., monetary penalties) up to $1,000 per violation per day.

43. Title 27 section 20430 establishes the requirements for implementing a CAP required under section 20385.

44. In accordance with Water Code section 13300, the Central Valley Water Board finds that there is a discharge of waste that will violate requirements prescribed by the Central Valley Water Board in WDRs Order R5-2019-0076.

IT IS HEREBY ORDERED THAT, pursuant to Water Code sections 13300 and 13267, the Discharger shall:

1. Comply with WDRs Order R5-2019-0076 and Title 27 in accordance with the following scope of work and compliance schedule provided by the Discharger.

	Task	Report Date
a.	Submit quarterly progress reports describing the work completed to date regarding each of the reporting requirements described below.	**Beginning 30 January 2026, every three months** (i.e., by 30 January, 30 April, 30 July, and 30 October of each year)
b.	Submit a Phase 1 Groundwater Extraction and Treatment System Design and Implementation Plan. The Plan shall include: - Locations, design specifications, and a schedule to install an extraction well network sufficient to create separation between waste and groundwater at all times and capture the plume of impacted groundwater; - An appropriate treatment and disposal system that can adequately treat and dispose of all pumped groundwater; - Pump test results, hydrologic characterization, and other supporting information used to design the system; and - Performance benchmarks to be used to evaluate the effectiveness of the system.	**1 June 2026**

	Task	Report Date
c.	If deemed necessary, submit the Freeman Lake Spillway Modification Evaluation Report. The Report shall include: - Findings of the investigation into the feasibility and effectiveness of lowering the spillway of Freeman Lake to lower local groundwater; - An updated groundwater flow model; - All investigative findings, any known stakeholder concerns, permitting pathway, and any necessary mitigation measures needed; and - A recommendation of whether or not to proceed with the design phase, and the required elevation that the outfall must be lowered to. If the recommendation is to proceed, the submittal must also include a proposal to amend the Corrective Action Plan.	**1 July 2026**
d.	Submit a Phase 1 Groundwater Extraction and Treatment System Implementation Report. The Report shall include a description of the constructed groundwater extraction system, boring logs, well construction diagrams, monitoring devices that will used to monitor effectiveness, and an Operations and Maintenance plan for the system.	**1 March 2027**
e.	Submit a "*Phase 1 Groundwater Extraction and Treatment System Effectiveness Report".* The Report must evaluate the effectiveness of the Phase 1 system at remediating groundwater and creating separation between waste and groundwater and evaluate the need for a Phase 2 Groundwater Extraction and Treatment System.	**1 April 2028**
f.	If deemed necessary by the *Phase 1 Groundwater Extraction and Treatment System Effectiveness Report* required by Item 1.e, above, submit the "*Phase 2 Groundwater Extraction and Treatment System Design and implementation Plan"*. The Plan shall include: - Locations, design specifications, and a schedule to install an extraction well network sufficient to create separation between waste and groundwater at all times and capture the plume of impacted groundwater; - An appropriate treatment and disposal system that can adequately treat and dispose of all pumped groundwater; and - The submittal must include pump test results, hydrologic characterization, and other supporting information used to design the system.	**1 July 2028**

	Task	Report Date
g.	If deemed necessary to achieve separation between waste and groundwater, submit a Hydraulic Barrier Wall Evaluation Report. The Report shall include: - Findings of the investigation into the feasibility and effectiveness; - An updated groundwater flow model; - All investigative findings, any known stakeholder concerns, permitting pathway, and any necessary mitigation measures needed; and - A recommendation of whether or not to proceed with the design phase. If the recommendation is to proceed, the submittal must also include a proposal to amend the Corrective Action Plan.	**31 December 2027**
h.	If identified as necessary pursuant to Item 1.f, above, submit a "*Freeman Lake Corrective Action Implementation Report*". The Report shall include the final construction report from the lowering of the Freeman Lake spillway, as well as copies of all applicable permits.	**15 December 2029**
i.	After implementation of the Hydraulic Barrier Wall Design and Implementation Workplan described in Item 1.g, above, submit a Hydraulic Barrier Wall Design and Implementation Report. The Report shall include all construction documents, as builts, CQA reports, and field logs for the barrier wall.	**31 December 2029**

2. All technical reports and work plans required herein that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering and/or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to Business and Professions Code sections 6735, 7835, and 7835.1. To demonstrate compliance with California Code of Regulations, title 16, sections 415 and 3065, all technical reports must contain a statement of the qualifications and responsible registered professional(s). As required by these laws, completed technical reports and work plans must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

3. Any person signing a document submitted under this Order shall make the following certification

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my knowledge and on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

If, in the opinion of the Executive Officer, the Discharger fails to comply with the provisions of this Order, the Executive Officer may refer this matter to the Attorney General for judicial enforcement, may issue a complaint for administrative civil liability, or may take other enforcement actions.

Failure to submit the reports and plans required by this Order may result in the assessment of administrative civil liability (i.e., monetary penalties) up to $1,000 per violation per day pursuant to Water Code section 13268. Failure to comply with the requirements of WDRs Order R5-2019-0076, as supplemented by this Order, may result in the assessment of civil liability up to $5,000 per violation per day, depending on the violation, pursuant to Water Code sections 13265 and 13350. The Central Valley Water Board reserves its right to take any enforcement actions authorized by law.

Any person aggrieved by this action of the Central Valley Water Board may petition the

State Water Resources Control Board (State Water Board) to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: (http://www.waterboards.ca.gov/public_notices/petitions/water_quality) or will be provided upon request.

JOHN BAUM, Assistant Executive Officer