

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION**

**CLEANUP AND ABATEMENT ORDER [PROPOSED]
NO. R6V-2015-PROP**

WDID NO. 6B369107001

**REQUIRING PACIFIC GAS AND ELECTRIC COMPANY
TO CLEAN UP AND ABATE WASTE DISCHARGES
OF TOTAL AND HEXAVALENT CHROMIUM TO THE
GROUNDWATERS OF THE MOJAVE HYDROLOGIC UNIT**

San Bernardino County

The California Regional Water Quality Control Board, Lahontan Region (Water Board), finds:

Discharger

1. The Pacific Gas and Electric Company (PG&E) owns and operates the Hinkley Compressor Station (hereafter the "Facility"), located at 35863 Fairview Road, Hinkley in San Bernardino County. For the purposes of this Order, the Pacific Gas and Electric Company is the Discharger.
2. This is a new order issued to PG&E to clean up and abate the effects of the discharge of chromium waste or threatened pollution or nuisance. For the purposes of this Order, references to "chromium" include both total (Cr(T)) and hexavalent (Cr(VI)) forms, unless otherwise specified. This Order combines outstanding requirements in previous orders, adds new requirements and deadlines for future cleanup and abatement actions, and replaces previous orders with requirements now incorporated into this Order. Previous orders replaced by this Order are listed in Attachment 1, "CAO and Investigative Orders Replaced by CAO No. R6V-2015-PROP."

Source of Groundwater Contamination

3. The Facility began operating in 1952 and discharged untreated cooling tower wastewater containing hexavalent chromium, used as a corrosion inhibitor, to unlined ponds until 1964. Wastewater percolated through soil to the water table, approximately 80 feet below, creating chromium contamination in groundwater. The area beneath the former unlined ponds is also referred to as the "source area" in this Order. A different corrosion inhibitor was used between 1966 and 1972, with the latter date being when the unlined ponds were replaced with lined ponds. Chromium has not been used to control corrosion at the Facility since 1965.

Hydrogeology

4. In general, the groundwater flow in the Hinkley Valley is primarily to the north, towards the Harper Dry Lake Valley, located about 8 miles north and west (downgradient) of the Facility. The groundwater gradient along the north-south axis of the chromium plume ranges from 0.002 to 0.007 feet per foot (vertical drop over horizontal length), with an

average rate of 0.004 feet per foot. The Mojave River, located approximately one mile south of the Facility, contributes more than 80 percent of the natural groundwater recharge to the Hinkley Valley.

5. The hydrogeology at the Facility and north to the vicinity of Thompson Road consists of an upper, unconfined aquifer and a lower, confined aquifer separated by a clay layer that forms a regional aquitard. The hydrogeology in the western and northernmost areas consists of just the upper, unconfined aquifer, as the lower aquifer and clay aquitard pinch out (terminate against the upward sloping bedrock). Depth to groundwater in the Hinkley Valley ranges from 75 to 95 feet below ground surface.

Extent of ~~Third Quarter 2014~~ Chromium Contamination

6. ~~On October 30, 2014,~~ On April 30, 2015, the Water Board received PG&E's "Third ~~Quarter 2014~~ First Quarter 2015 Groundwater Monitoring Report and Domestic Well Sampling Results" (~~2014 3rd~~ 2015 1st Quarter Report). Data and information in the ~~2014 3rd~~ 2015 1st Quarter Report show monitoring and extraction well locations where hexavalent and total chromium concentrations exceed maximum background levels of 3.1 ~~µppb~~ and 3.2 parts per billion (discussed in Findings 14 and 15) in groundwater. Well SA-MW-05D, located at the Facility, shows the highest reported concentrations as:

- Hexavalent Chromium ~~3,900~~ 3,600 ppb (parts per billion)
- Total Chromium ~~4,100~~ 3,700 ppb

7. ~~The PG&E's 2014 3rd Quarter~~ Groundwater Monitoring Report shows chromium in groundwater at concentrations exceeding maximum background levels as three separate plumes in an area approximately 8 miles in length and approximately 2 miles in width, throughout the Hinkley Valley and into Harper Dry Lake Valley. Figure 5-5, "Chromium Results for Third Quarter 2014 Groundwater Monitoring and Domestic Well Sampling and Compliance Maximum Plume Outline in Upper Aquifer", from the 2014 3rd Quarter Report shows three non-contiguous chromium plumes in the upper aquifer within this 8-mile area. In the lower aquifer, chromium is detected up to levels exceeding the hexavalent chromium drinking water standard of 10 ppb (see Finding ~~27-28~~) in a localized area east of Mountain View Road and near Santa Fe Road. For example, the 2014 3rd Quarter Report shows lower aquifer monitoring well MW-100C containing 19.0 ppb Cr(VI). The background water quality in the lower aquifer water for chromium is generally at non-detectable levels, per monitoring wells MW-11C and MW-14C, between the Facility and east of Mountain View Road near Santa Fe Road. "Non-detect" refers to the lowest concentration that a laboratory analytical instrument can detect while minimizing uncertainty.
8. The locations of the upper aquifer plumes are based on Figure 5-5 of the 2014 3rd Quarter Report, and are shown in Attachment 2, "Location of Chromium Plumes (Third Quarter 2014)":
 - a) The southern plume is contiguous to the original source of waste chromium discharged at the Facility. The southern plume extends northward from the Facility property to just north of Thompson Road, generally following the northerly direction of groundwater flow. The southern plume includes the currently contiguous "western finger" of the chromium plume in the upper aquifer, west of Serra Road, between Highway 58 to the south and Acacia Street to the north.

- b) Two northern plumes are detached (i.e., non-contiguous) from the southern plume and from each other. The southern-most northern plume, called the North Hinkley Valley northern plume, extends from just south of Sonoma Street to just south of a topographic high feature known as Red Hill at the Hinkley Gap. The north-most northern plume, referred to as the Harper Dry Lake Valley northern plume, extends from northwest of Red Hill up to just south of Brown Ranch Road. The boundaries of the northern plumes are poorly defined or undefined by existing groundwater monitoring wells.
- c) In general, lesser chromium concentrations (mostly in the single digits) occur in the two detached northern plumes, with the exception of three a hot spots of higher chromium concentrations at MW-154S1, MW-193S3, and MW-196S3, compared to chromium concentrations in the southern plume. At MW-154S1, chromium concentrations greater than 10 ppb have been detected since 2012. At MW-193S3, chromium concentrations have been reported at greater than 100 ppb since 2013, but are now at 65 ppb Cr(VI) as of the 2015 1st Quarter Report. PG&E reported elevated chromium concentrations greater than 20 ppb at MW-196S2 to the Water Board via email on December 18, 2014, subsequent to the 2014 3rd Quarter Report. The location of MW-196S2 is northwest of MW-193S3, in the downgradient flow direction. The chromium plume is undefined to the north and west of MW-196S2 where domestic wells and agricultural wells exist. Domestic wells also exist within 1,500 feet of MW-193S3. Chromium detected in domestic well 16N-01, located in the northeast corner of the Harper Dry Lake Valley and 12 miles from the Facility, is not believed to be from PG&E's release.
9. Finding 12 in Amended R6V-2008-0002A4 (discussed below in Findings 17, 18, and 19, 18, 19 and 20) provides a calculation of the length for the chromium plume since the time of the initial 1952 discharge as 7.32 miles¹. This value represents the potential migration distance of the leading edge of the plume. This estimate is based on a groundwater flow velocity estimate of 2 feet per day, provided by PG&E and supported by data from the United States Geological Survey and the Mojave Water Agency. The value is a conservative average value from a range of measurements. Using the rate of 2 feet per day groundwater flow velocity, the chromium plume has the potential to migrate an additional 1,460 feet or 0.28 miles since Order R6V-2008-002A4 was issued two years prior to this Order. Added to the original calculation provided, there is a total potential migration distance of 7.6 miles, putting the plume into the Harper Dry Lake Valley which is hydraulically downgradient of the Facility. The 7.6-mile calculation is consistent with the approximately 8-mile distance shown on plume maps in the 2014 3rd Quarter Report described in Finding 7.
10. The release from PG&E's Facility is the only known source of anthropogenic chromium in groundwater in the Hinkley upper and lower aquifers. Based on the data and calculations cited in Finding 9 and footnote 1, chromium detections above maximum background levels in groundwater extending from the Facility through the Hinkley Valley into Harper Dry Lake Valley are considered a result of historical releases at the Facility, and are subject to investigation and remediation required by this Order.

Regulatory History

¹ The calculation is: (2 feet/day x 365 days/year x 53 years) / 5,280 feet/mile = 7.32 miles of potential migration of the leading edge of the plume. 53 years assumes the time between issuance of CAO No. R6V-2008-0002A4 and the waste discharge is 60 years, minus 7 years for waste chromium to percolate to groundwater.

11. Discharges from the Facility were first regulated by the Water Board in 1972 under Board Order No. 6-72-44. In late 1987, PG&E reported to the State that total chromium and hexavalent chromium concentrations exceeding the California drinking water standard of 50 ppb total chromium were found in groundwater beneath and downgradient of the Facility (see Finding 3 of Cleanup and Abatement Order No. 6-87-160).
12. On December 29, 1987, the Water Board issued Cleanup and Abatement Order (CAO) No. 6-87-160 to PG&E, requiring a site investigation and initiation of soil and groundwater cleanup actions. Amendments to the 1987 CAO were issued in 1994 and 1998, requiring PG&E to conduct further site assessments, cleanup actions and reporting.
13. On August 6, 2008, the Water Board Executive Officer issued CAO No. R6V-2008-0002 to PG&E, ordering further cleanup of chromium and abatement of the effects of chromium in soil and groundwater from historical discharges at the Facility. CAO No. R6V-2008-0002 also required PG&E to submit a Feasibility Study evaluating cleanup options to hydraulically contain and remediate the known extent of the chromium plume in groundwater to background concentrations.
14. The Water Board Executive Officer amended CAO No. R6V-2008-0002 on November 12, 2008. CAO No. R6V-2008-0002A1 set the following average and maximum background levels for Cr(VI) and Cr(T) in groundwater based on a 2007 study conducted by PG&E as follows:
 - 1.2 ppb Cr(VI), average background level
 - 1.5 ppb Cr(T), average background level
 - 3.1 ppb Cr(VI), maximum background level
 - 3.2 ppb Cr(T), maximum background level
15. The maximum background levels of 3.1 ppb Cr(VI) and 3.2 ppb Cr(T) are used to determine the effectiveness of remediation actions and to determine if the chromium plume has migrated into areas previously unaffected by the discharge of waste. These levels also provide for the basis for determining which wells are considered to contain waste chromium attributed to historic discharges from the Facility.
16. In 2011, the approach PG&E used to develop these background values underwent scientific peer review. The reviewers were critical of several aspects of the study approach. Further, PG&E's 2007 background study did not investigate potential background values in the North Hinkley or Harper Dry Lake/Water Valleys. Therefore, it is acknowledged that the accuracy of the currently adopted background values, particularly for the Northern area, is uncertain. A revised background study, conducted by the United States Geological Survey, is underway, expected to be completed within five years. The USGS background study is investigating natural chromium occurrences throughout the Hinkley Valley, including in the North Hinkley and Harper Dry Lake/Water Valleys. Following study completion, the Water Board may consider updating chromium background levels and setting final cleanup levels. In the interim, the levels stated in Finding 14 will continue to be used as background values.
17. 46. The Water Board Executive Officer issued a second amendment to CAO No. R6V-2008-0002 on April 7, 2009 allowing for the lateral migration of the 4 ppb Cr(VI) eastern

plume boundary during implementation of remedial actions (4 ppb Cr(VI) was the level formerly used to define the chromium plume in CAO No. R6V-2008-0002). Accordingly, this Order allows for migration of the 4 ppb chromium plume boundary to accommodate remediation goals under the conditions specified in Orders section V.J.H. A map showing the location of allowed plume migration area is included as Attachment 3, "Area of Allowed Plume Expansion."

18. ~~17.~~ The Water Board approved and the Executive Officer issued a third amendment to CAO No. R6V-2008-0002 on March 14, 2012, CAO No. R6V-2008-0002A3, replacing plume containment requirements in CAO No. R6V-2008-0002. The Water Board Executive Officer issued a fourth amendment to CAO No. R6V-2008-0002 on January 8, 2013, CAO No. R6V-2008-0002A4, requiring PG&E to conduct further investigations to fully define the chromium boundary in groundwater to the 3.1 ppb Cr(VI) and 3.2 ppb Cr(T) levels.
19. ~~18.~~ Orders in CAO No. R6V-2008-0002A4 required PG&E to define the extent of chromium in the upper aquifer to the maximum background levels. Order A.2.a required that monitoring well locations were not to exceed one-quarter mile distance (1,320 feet) from other monitoring wells in accessible areas. Order C.2 requires that maps include chromium plume boundary lines drawn to connect any monitoring well located within one-half mile (2,600 feet) of any other monitoring well having chromium concentrations exceeding background levels. Accordingly, this Order requires installation of monitoring wells and mapping consistent with these criteria.
20. ~~19.~~ In response to requirements in CAO No. R6V-2008-0002A4, PG&E submitted the April 24, 2014 document, "Status Report for the Northern Areas." The document proposed to investigate chromium in groundwater in seven areas in the northern plumes. By late 2014, only two areas had been investigated and a third area will have a monitoring well cluster installed on the north side of Red Hill and east of Hinkley Road in early 2015. PG&E has not fully defined the chromium plume boundaries in other areas of the upper aquifer based on its claim of an inability to gain access to private properties and endangered species habitat. Thus, some boundaries in the two northern plumes are not fully defined because they exceed the 1,320-ft distance criteria for monitoring wells and/or do not define chromium concentrations to maximum background levels.
21. ~~20.~~ In compliance with CAO No. R6V-2008-0002, PG&E submitted a Feasibility Study and addenda in 2010 and 2011, identifying strategies for implementing final site cleanup for achieving background conditions of chromium, including timeframe estimates for reaching various cleanup milestones. In the June 30, 2014 document, "Remedial Timeframe Assessment", PG&E updated the estimates from the 2010 Feasibility Study to reflect current conditions and knowledge regarding site cleanup. The updated estimates range from six to 23 years to remediate 99 percent of the 50 ppb plume; and 11 to 50 years to remediate 99 percent of the 10 ppb plume. The ranges reflect remediation times for different modeled hydrologic layers of the upper aquifer (finer-grained versus coarser-grained model layers) and different assumptions of in-situ remediation modeling. These estimates inform the basis for the cleanup requirement deadlines in this Order.
22. ~~21.~~ On January 7, 2011, CAO No. R6V-2011-0005 was issued to PG&E requiring interim continuous drinking water (bottled water) for residents having Cr(VI) or Cr(T) in domestic wells above the maximum background levels. The Order also established a quarterly domestic well sampling program in Hinkley. Amended CAO No. R6V-2011-0005A1,

issued on October 11, 2011, required permanent continuous drinking water (whole house water or WHW) that met drinking water standards for residents having chromium in domestic wells above the maximum background levels. A second amended Order, CAO No. R6V-2011-0005A2, was issued on June 7, 2012, incorporating PG&E's expanded WHW program for all Hinkley residents within the affected area having detectable chromium in domestic wells. A third amendment, CAO No. R6V-2011-0005A3, issued February 18, 2014, set bottled water quality requirements at the average background value for hexavalent chromium. These Orders are listed in Attachment 1, "CAO and Investigative Orders Replaced by CAO No. R6V-2015-PROP."

23. ~~22.~~ On April 9, 2008, the Water Board issued general waste discharge requirements (WDRs), Order No. R6V-2008-0014, that allows PG&E to implement various remediation projects to provide chromium plume containment and to clean up chromium pollution in groundwater. To date, the Water Board has issued multiple Notices of Applicability permitting PG&E to conduct in-situ (below ground) remediation in the southern plume, inject freshwater into wells along Serra Road to prevent western plume migration, and implement tracer tests and pilot studies.
24. ~~23.~~ Since 1991, the Water Board has issued individual WDRs to PG&E to apply extracted chromium-contaminated groundwater to crop fields as a means of converting Cr(VI) to trivalent chromium (Cr3). On March 12, 2014, the Water Board issued WDRs, Board Order No. R6V-2014-0023 allowing the discharge of extracted groundwater on up to 500 acres of agricultural fields in the Hinkley Valley to be used to facilitate cleanup of groundwater contamination in the southern plume. Attachment 4, "Active Water Board Orders and Notices Authorizing Clean up Actions" lists active WDRs and Notices of Applicability issued to PG&E since 2008.
25. ~~24.~~ In compliance with CAO No. R6V-2008-0002A3, PG&E has been operating a groundwater extraction system to maintain hydraulic containment of the southern chromium plume south of Thompson Road. Hydraulic containment is determined by comparing hydraulic gradients or flow direction vectors calculated from specific monitoring well pairs and triplets within the mandated capture zone. Since 2nd quarter 2014, monitoring data indicate remedial actions have reduced the area in the capture zone where chromium concentrations exist greater than 10 ppb and 50 ppb. That is, as groundwater extraction in the southern plume continues, the leading (northern) edge of the southern chromium plume is being pulled to the south (the plume area is decreasing), and the chromium concentrations within the capture area are decreasing. Therefore, the existing capture metrics are now too far north to verify containment of the chromium plume. The existing capture metrics adopted in CAO No. R6V-2008-0002A3 are shown in Attachments 5 through 7 "Hydraulic Capture Metrics," "Hydraulic Capture Monitoring Plan, Shallow Zone of Upper Aquifer," and "Hydraulic Capture Monitoring Plan, Deep Zone of Upper Aquifer."
26. ~~25.~~ On October 3, 2014, PG&E submitted the "Work Plan to Conduct Hydraulic Testing and Capture Analysis, Winter 2014-2015", proposing to conduct hydraulic testing activities in the northern area of the southern chromium plume. The purpose of the testing is to evaluate an alternate and more southerly capture zone configuration for the chromium plume. The Assistant Executive Officer approved PG&E's work plan on December 19, 2014. The December 19, 2014 approval letter temporarily amended CAO No. R6V-2008-0002A3 to require monitoring and reporting to determine if during the testing, chromium concentrations are increasing in nearby wells; to require contingency

plan implementation if such increases are noted; and to set notification requirements. This Order incorporates the requirements and corresponding deadlines of the December 19, 2014 letter as if set forth fully herein. If the winter 2014-2015 testing activities do not result in a proposal for alternate capture metrics that is approved by the Executive Officer, the existing capture metrics in Attachments 5 through 7 will remain in effect to determine compliance with plume containment requirements. The Water Board's Executive Officer may amend this Order at any time to incorporate alternate capture metrics.

Exceedances of Water Quality Objectives and Impairment of Beneficial Uses

27. ~~26.~~ The 1995 Water Quality Control Plan for the Lahontan Region (Basin Plan) established water quality objectives for the protection of beneficial uses. The beneficial uses of the groundwater in the Mojave Hydrologic Unit designated in the Basin Plan include municipal and domestic supply, agricultural supply, fresh water replenishment, and industrial service supply.

28. ~~27.~~ Basin Plan water quality objectives to protect the municipal and domestic supply beneficial use include the following Maximum Contaminant Levels (MCLs) that have been established by the California Department of Public Health (now the California Division of Drinking Water):

Hexavalent Chromium	10 ppb (effective July 1, 2014)
Total Chromium	50 ppb

29. ~~28.~~ The concentrations of hexavalent chromium and total chromium detected in groundwater samples taken from wells on and off the Facility of up to 3,900 and 4,100 ppb Cr(VI) and Cr(T), respectively, exceed water quality objectives specified in the Basin Plan to protect drinking water supplies. These concentrations adversely affect the groundwater in the Mojave Hydrologic Unit for its beneficial uses.

30. ~~29.~~ The level of waste chromium in groundwater on and off the Facility constitutes a pollution as defined in Water Code section 13050, subdivision (I):

“Pollution” means an alteration of the quality of waters of the state by waste to a degree which unreasonably affects either of the following:

(A) The waters for beneficial uses.

(B) Facilities which serve these beneficial uses.

31. ~~30.~~ California Water Code section 13304, subdivision (a) states in part:

A person...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 to 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 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. A cleanup and abatement order issued by the

state board or a regional board may require the provision of, or payment for, uninterrupted replacement water service, which may include wellhead treatment, to each affected public water supplier or private well owner.

~~32.~~ ~~34.~~ Findings in this Order identify where chromium wastes have been discharged or deposited into waters of the state in groundwater in violation of the water quality objectives in the Basin Plan, or where PG&E has caused or permitted, or threatens to cause or permit waste to be discharged or deposited where it is or probably will be discharged into waters of the state, creating or threatening to create a condition of pollution or nuisance. PG&E is therefore subject to Water Code section 13304(a), requiring cleanup and abatement of waste discharges.

Need for Requirements in this Order

~~33.~~ ~~32.~~ Soil and groundwater remediation actions have taken place since 1988. Despite this, chromium in groundwater in both the upper and lower aquifers continues to exist at levels greater than background values, and at levels that adversely affect beneficial uses. The chromium plume in the upper aquifer remains incompletely defined. Therefore, this Order requires PG&E to: continue southern plume containment, continue and enhance corrective actions in both aquifers; conduct corrective actions in the northern plumes area, when applicable, and define the extent of chromium in the upper aquifer. To ensure progress toward restoration of beneficial uses of the groundwater, this Order sets deadlines for PG&E to reach and maintain specific concentrations of chromium in groundwater, including interim targets such as 50 ppb; 10 ppb; ~~background values of 3.4 ppb Cr(VI) and 3.2 ppb Cr(T) in the upper aquifer~~; and non-detectable levels of chromium in the lower aquifer near the Desert View Dairy.

~~34.~~ ~~33.~~ Monitoring and reporting are required under this Order, pursuant to Water Code section 13267, which authorizes a regional board to require persons who have discharged, discharges or is suspected of having discharged, or who proposes to discharge waste within its region to furnish technical or monitoring reports. 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 report. The required technical reports are necessary to evaluate PG&E's compliance with the terms and conditions of this Order, and to assure protection of waters of the state and restoration of beneficial uses. Consistent with Water Code section 13267, this Order requires implementation of a monitoring and reporting program that is intended to verify the effectiveness of remediation, track progress toward meeting remediation targets, evaluate threats to and monitor water quality in private supply wells. The burden of the monitoring and reporting is outweighed by the need for information gained by the monitoring and reporting requirements because the monitoring is not more than is necessary to meet the requirements of the Order. Monitoring requirements for this Order are specified in Attachment 8, "Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP."

~~35.~~ ~~34.~~ This Order requires PG&E to clean up and abate the effects of historical chromium discharges from the Facility. Several different cleanup methods are being implemented by PG&E to meet the requirements of past enforcement actions, including groundwater extraction and management; in-situ (subsurface) remediation, and freshwater injection. Cleanup methods are currently conducted under Board Orders (waste discharge

requirements, WDRs) or Notices of Applicability containing specific monitoring for remediation effectiveness, plume boundary control, plume containment, remediation byproducts, and private supply well protection. This Order does not alter or revise the monitoring required by current Board Orders, but instead prescribes monitoring and reporting in addition to what is required in those Board Orders (see Attachment 4, "Active Water Board Orders and Notices Authorizing Cleanup Actions").

- ~~36.~~ ~~35-~~ On December 19, 2014, PG&E submitted a document titled "Draft Groundwater Monitoring and Reporting Program, PG&E Hinkley Compressor Station" (Draft MRP), proposing a number of changes to existing monitoring and reporting programs for the Hinkley groundwater cleanup project. The Draft MRP proposed reducing the number and frequency of monitoring well sampling for the contiguous southern plume area and the non-contiguous northern plumes area north of Salinas Road; consolidating all requirements for monitoring into one site-wide plan; streamlining the current chromium monitoring well network to eliminate redundant monitoring. The Draft MRP also proposed modifying the domestic well monitoring program by reducing the sampling frequency of certain wells and eliminating other wells.
- ~~37.~~ ~~36-~~ Water Board staff has reviewed PG&E's Draft MRP, ~~and do not agree that reducing the number of monitoring wells and frequency of monitoring to the full extent proposed is appropriate at this time. The basis for this is as follows~~ The following conclusions from that evaluation form the basis of the MRP in this CAO:
- a) The program presented in PG&E's Draft MRP for southern plume monitoring meets the monitoring objectives to track remediation effectiveness, chromium plume tracking and domestic well protection, with several additions incorporated into the "Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP", Attachment 8.
 - b) Remediation system expansion is still ongoing in the southern plume area. For example, expansion of the Ranch agricultural treatment unit (ATU) was completed in third quarter 2014; construction of new ATUs in the southern portion of the southern contiguous plume are planned and under construction. In-situ remediation zones may be expanded over current operations. Expansion of remediation system will result in increased groundwater extraction, infiltration, and treated water injections over what has occurred in the past. For this reason, quarterly sampling at key monitoring domestic wells is required until expanded systems have been operating for a length of time to detect and react to any unforeseen changes to water quality, as specified in the Mitigation Monitoring and Reporting Program (MMRP) in the ATU WDRs referenced in the "Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP. in the southern plume area. Also, in the "western finger" area, quarterly sampling is required to verify that recent remediation efforts are effective in achieving target concentrations.
 - c) The extent of chromium in groundwater remains incompletely defined in the northeastern part of the southern plume area and much of the northern plumes area. Additionally, because containment actions are not being currently implemented, the two northern plumes continue to migrate with natural groundwater flow, continuing to threaten beneficial uses. Until the chromium plume is completely defined and contained from migration, quarterly monitoring of certain private supply and monitoring wells is needed to track chromium concentrations changes and protect public health. The "Groundwater

Monitoring and Reporting Program, CAO No. R6V-2-015-PROP", shown in Attachment 8, however, allows ~~quarterly sampling of certain multi-depth monitoring wells to be reduced to a semi-annual and annual basis~~ sampling frequency modifications over time under certain conditions. Such conditions include when statistical trends indicate changes in sampling frequency are warranted as described in the "Groundwater Monitoring and Reporting Program, CAO No. R6V-2-015-PROP" ~~chromium levels decrease in wells to levels below criteria set for quarterly monitoring.~~

38. ~~37.~~ Certain monitoring wells may be eliminated from the sampling program, or their sampling frequency reduced based on well "redundancy" (i.e., monitoring wells within 200 feet of each other installed in the same aquifer layer). Over the more than 25 years of site investigation and cleanup, numerous monitoring wells have been installed for different investigations. Where the density of wells is such that duplicate wells are monitoring the same aquifer zone, removing such wells will not compromise monitoring objectives.

Replacement Water for Affected Private Supply Wells

39. ~~38.~~ The groundwater aquifer in the Hinkley Valley is the sole source of water supply for domestic and community supply wells in the area. The ~~2014 3rd~~ 2015 1st Quarter Report indicates ~~128 99~~ private water supply wells were sampled for hexavalent chromium. Of these, ~~40 nine~~ wells contained hexavalent chromium greater than maximum background levels. The highest hexavalent chromium concentration measured in a private supply well in ~~third first quarter 2014~~ 2015 was ~~4.8 4.2~~ ppb. No private supply wells sampled contained hexavalent chromium greater than the 10 ppb MCL. However, as shown in Figure 5-5 of the ~~2014 3rd~~ 2015 1st Quarter Report, private supply wells are located near and downgradient of monitoring wells containing Cr(VI) concentrations at or above the MCL.

40. ~~39.~~ California Water Code section 13304, subdivision (f) states:

Replacement water provided pursuant to subdivision (a) shall meet all applicable federal, state, and local drinking water standards, and shall have comparable quality to that pumped by the public water system or private well owner before the discharge of waste.

41. ~~40.~~ In State Water Board Water Quality Order 2005-007 (*Olin Order*), the State Water Board clarified that an "affected well," for which regional water boards have discretion to require replacement water pursuant to Water Code 13304(a), was one that did not meet the federal, state and local drinking water standards. The *Olin Order* also held that the Regional Water Boards may require dischargers to submit water replacement plans prior to documentation of contaminant levels exceeding the relevant standard. The *Olin Order* held that where water quality data exhibit trends indicating the likelihood of future exceedances, it is prudent and appropriate for regional water boards to take such action before actual well exceedances occur (*Olin Order* at p. 7).

Replacement Water Service

42. ~~41.~~ From 2011 to 2014, in response to CAO No. R6V-2011-0005 and amendments, PG&E provided bottled water and/or whole-house water (WHW) to residences or businesses within the affected area and having detectable chromium in well water. On July 1, 2014, the California Division of Drinking Water's adoption of the 10 ppb Cr(VI)

drinking water standard became effective. PG&E ceased providing bottled water and/or WHW on October 31, 2014, since no residence or business had hexavalent chromium above the new standard. However, consistent with the *Olin Order*, if future monitoring data indicate water in private supply wells within the domestic well sampling area defined in the "Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP", Attachment 8, affected area (defined in Finding 43) is are likely to exceed drinking water standards for Cr(VI) and the detections are linked to PG&E's historical releases, PG&E will be required to submit plans to provide replacement water supply to such wells in either a modification of this Order, or a separate order.

- ~~43.~~ 42. Accordingly, this Order requires that PG&E submit replacement water plans where private supply well concentrations in the affected area exhibit increasing trends indicating the likelihood of future exceedances of the hexavalent chromium Maximum Contaminant Level (MCL), or if a private supply well has hexavalent chromium reaching within 20 percent of the hexavalent chromium MCL (i.e., 8 ppb). Interim replacement water (i.e., bottled water) shall be provided within 2-10 working business days of receipt of a laboratory report identifying the first detection of chromium in a private supply well at or above the MCL. ~~Permanent~~ Long-term replacement water shall be provided within 45 days of such detection. This action requires that PG&E conduct sampling of domestic wells in the Hinkley and Harper Dry Lake Valleys. This requirement for replacement water does not supersede previous, existing or future requirements to implement mitigation measures contained in the 2013 Environmental Impact Report pertaining to replacement water for private supply wells affected due to remedial activities; for example, those requirements specified in Board Order No. R6V-2014-0023.
- ~~43. The affected area is defined as all domestic or community wells located laterally within one mile downgradient or cross-gradient from the 3.1 ppb Cr(VI) or 3.2 ppb Cr(T) plume boundaries (whether contiguous or non-contiguous) based upon monitoring data drawn in the most current quarterly site-wide groundwater monitoring report submitted by PG&E. The affected area may change based on new data collected and evaluated each quarter.~~
44. **Affected wells** are defined as domestic or community wells in the domestic well sampling area defined in the "Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP", Attachment 8, affected area containing chromium in concentrations (measured at any time by PG&E or by local, state or federal agencies) that are above the primary drinking water standards of 10 ppb Cr(VI) or 50 ppb Cr(T).

Independent Consultant

45. The Water Board recognizes the significant community interest in the site and the challenges community members may have in evaluating and understanding the technical aspects of this site and cleanup actions. The Hinkley community is in a rural setting in the unincorporated area of San Bernardino County. Community members are made up of different income levels and ethnicities. The Lahontan Water Board is committed to principles of environmental justice. This means providing fair treatment of people of all races, cultures and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. (Gov. Code § 65040.12(e).) Fair treatment means that "no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies." (U.S. EPA <http://www.epa.gov/environmentaljustice/basics/index.html>.) The goal of environmental

justice is “for everyone to enjoy the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.” (*Id.*)

46. Therefore, it is important to the Water Board that environmental justice is promoted by ensuring that the cleanup and abatement of chromium contamination of this area promotes equity and affords fair treatment, accessibility and protection for all members of the community. To effectively participate in evaluating and understanding the technical aspects of cleanup actions, the Water Board finds it is essential that the community have access to independent consultants. The cost of this effort shall be borne by PG&E pursuant to Water Code section 13304.

Legal and Regulatory Authorities

47. This Order conforms to and implements policies and requirements of the Porter-Cologne Water Quality Control Act (Division 7, commencing with Water Code section 13000) including (1) sections 13267 and 13304; (2) applicable State and federal regulations; (3) all applicable provisions of statewide Water Quality Control Plans adopted by the State Water Resources Control Board (State Water Board) and the Water Quality Control Plan for the Lahontan Region (Basin Plan) adopted by the Lahontan Water Board including beneficial uses, water quality objectives, and implementation plans; (4) State Water Board policies and regulations, including State Water Board Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California; Resolution No. 88-63, Sources of Drinking Water; Resolution No. 92-49, Policies and Procedures for Investigation, and Cleanup and Abatement of Discharges under Water Code Section 13304; California Code of Regulations (CCR) Title 23, Chapter 16, Article 11; CCR Title 23, section 3890 et. seq.; and (5) relevant standards, criteria, and advisories adopted by other State and federal agencies.

Consideration of California Water Code section 106.3

48. Water Code section 106.3 establishes a state policy that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes, and directs state agencies to consider this policy when adopting regulations pertinent to water uses described in the section, including the use of water for domestic purposes. This Order promotes that policy by requiring PG&E, in accordance with time schedules, to clean up its past hexavalent chromium discharges to reach, at a minimum, maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use. This Order also requires replacement drinking water where PG&E has affected individual domestic water supplies to the point where maximum contaminant levels are exceeded, and replacement water plans when there is a threat of exceedance.

California Environmental Quality Act

49. This Order is a project for purposes of the California Environmental Quality Act (CEQA) and is subject to the provisions of CEQA (Public Resources Code, section 21000 et seq.). The Water Board is the lead agency for this Project, and certified an Environmental Impact Report (EIR) at a public meeting on July 17, 2013 (Resolution R6V-2013-0060). The EIR analyzed the impacts of foreseeable cleanup activities, including those that may

be implemented under this Order, such as groundwater extraction and application to agricultural treatment units, in-situ remediation, and freshwater injection.

50. The EIR describes potentially significant environmental impacts that may occur as a result of implementing cleanup activities. Potentially significant and unavoidable impacts were identified for the following water quality and biological resources:
- a. Impacts to water quality in the Hinkley Valley aquifer due to remedial actions:
 - Temporary chromium plume bulging;
 - Temporary increase in remedial byproducts, including those related to agricultural treatment units:
 - Total dissolved solids
 - Uranium and other radionuclides
 - b. Impacts to biological resources due to construction of agricultural units:
 - Conflicts with wildlife movement (i.e., desert tortoise migration corridors could be lost due to new agricultural fields for remediation purposes)
51. This Order requires cleanup of chromium-contaminated groundwater to interim remediation targets, including background conditions, which may result in one or more significant and unavoidable impacts described above. Findings required by CEQA sections 15091 through 15093, regarding any significant environmental effect of the project, including a statement of overriding considerations, were adopted by the Water Board in Board Order No. R6V-2014-0023.

IT IS HEREBY ORDERED that, pursuant to the Water Code sections 13267 and 13304, PG&E shall clean up and abate the effects of the discharge and threatened discharge of chromium to waters of the state, and shall comply with the provisions of this Order:

- I. PG&E shall implement on-going corrective actions, including but not limited to agricultural treatment units (ATUs), in-situ remediation, and freshwater injections. Corrective actions shall be conducted in accordance with approved workplans, WDRs, Notices of Applicability (see Attachment 4, "Active Water Board Orders and Notices Authorizing Clean Up Actions"), monitoring programs, or as modified with the Water Board's or its Executive Officer's approval.
- II. PG&E shall not cause or permit any additional waste chromium to be discharged or deposited where it is, or probably will be, discharged into waters of the State.
- III. PG&E shall upload all technical documents, such as workplans, reports, letters, memorandums, etc., to the State Water Resources Control Board's Geotracker database, within **one** business day of the document date, so that they can be viewed by the public at the link:
https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL0607111288

IV. Chromium Plume Definition in the Upper Aquifer

PG&E shall define the extent of total and hexavalent chromium in the upper aquifer from the source area at the compressor station into the Harper Dry Lake Valley where

chromium discharge threatens beneficial uses. As of the date this Order is issued, undefined plume areas are: east of Summerset Road and Acacia Street; eastern boundary for the Hinkley Valley northern plume; northwest of MW-154S1, north and west of MW-196; and east and west of Hinkley Road starting at MW-161 and north to Grasshopper Road.

- A. To achieve defining the chromium plume to the maximum background levels, PG&E shall conduct the following actions in areas where access is currently allowed:
- ~~1. Install monitoring well Red Hill 5, east of Hinkley Road at Burnt Tree Road, as proposed in the "Status Report for Northern Areas," dated April 24, 2014 (see Finding 19) and confirmed in an October 22, 2014 electronic message. Following installation and development, add the well to the Groundwater Monitoring and Reporting Program (Attachment 8 of this CAO) beginning first quarter 2015.~~
 1. 2. Within 30 days of the date this Order is issued, submit a workplan proposing a multi-depth monitoring well location within the 2,700-foot distance separating Summerset Road and MW-110S on Acacia Street in the southern plume where chromium concentrations at both locations exceed maximum background levels. The workplan shall include proposed well designs and describe the method and manner of installation. In addition, the workplan shall evaluate potential well installation areas north and west of MW-196 out to one mile. If a location is accessible, the workplan shall propose multi-depth monitoring wells and describe the method and manner of installation. If the location is not accessible, explain why.
 2. ~~3.~~ Install the wells required in Order IV.A.21 within 90 days of the Executive Officer's approval. Following development and sampling, add the new wells to the Groundwater Monitoring Program (see Attachment 8) beginning in **third quarter 2015**.
- B. PG&E shall submit a workplan to install monitoring wells (for further plume definition) to the Water Board **within 30 days of any change in land access status. Changes in land access status include, but are not limited to**, being provided access to private property by the owner, acquisition of private property, and approval from agencies, such as Department of Fish and Wildlife, to lands that may be considered endangered species habitat or threatened species habitat. The workplan shall state the date of the change and propose a multi-depth monitoring well(s) to determine chromium concentrations in groundwater at that location. The workplan shall include proposed well designs and describe the method and manner of installation.
- C. Unless otherwise ordered, all monitoring wells required by the Water Board shall be installed, developed, and sampled **within 6 months of the date of approval** when access to land is allowed.
- D. All monitoring wells installed under requirements in this Order shall be added to the Groundwater Monitoring and Reporting Program (MRP) (see Requirement VIII, Attachment 8) upon the first sampling event. Monitoring well designs and boring logs shall be included as attachments in quarterly groundwater monitoring reports. All new wells shall be sampled at a **quarterly frequency**.

V. Southern Plume Containment

A. For the purposes of this Order, southern plume containment is defined as:

1. No further migration or expansion of the chromium plume to locations where hexavalent chromium and total chromium is below maximum background levels, or
2. No further migration or expansion of the 50 ppb Cr(VI)/Cr(T) or 10 ppb Cr(VI)/Cr(T) boundaries to outside the area(s) of hydraulic capture in all directions in the southern chromium plume.

~~B. As of the date this Order is issued, PG&E shall continuously implement previously approved, or as subsequently approved by the Executive Officer, groundwater extraction to contain the southern chromium plume. Currently, groundwater extraction between Santa Fe Avenue and Thompson Road is at an annual average pumping rate of 1,111 gallons per minute and discharged to agricultural treatment units.~~

~~B.~~ **C. Beginning July 15, 2015**, and every three months thereafter, PG&E shall submit quarterly capture metric reports containing **monthly** capture metric information to verify containment of the southern plume from migration. Report information shall include groundwater elevation data, groundwater extraction rates, capture metrics, and maps showing the location for all referenced wells and monitoring data and chromium plume boundaries. The report shall provide a conclusion as to whether the 50 ppb Cr(VI)/Cr(T) or 10 ppb Cr(VI)/Cr(T) boundary line has migrated or expanded 1,000 feet or more in distance from boundaries to outside the area(s) of hydraulic capture established as of the date this Order is issued.

~~C.~~ **D.** Compliance with containment requirements will be determined by (1) comparing hydraulic gradients or groundwater flow direction vectors calculated from groundwater elevation data from select well pairs/triplets and piezometers (2012 capture metrics), as outlined in Attachments 5-7, and (2) comparing the 50 ppb Cr(VI)/Cr(T) and 10 ppb Cr(VI)/Cr(T) boundaries to plume maps as of the date this Order is issued. PG&E is in violation of this Requirement if at any time any of the following conditions occurs:

1. The third consecutive month of data (e.g., January, February, and March) indicates that the well pair/triplet capture metrics are still not being met; or
2. If approved capture metrics are not met 3 out of 12 months during the course of one year (e.g. July 2015 through July 2016); or
3. If the 50 ppb Cr(VI)/Cr(T) or 10 ppb Cr(VI)/Cr(T) boundaries migrate or expand to outside the area(s) of hydraulic capture 1,000 feet or more from current boundaries during any monitoring event.

~~D.~~ **E.** Should any of the above conditions occur, then by the 15th of the month following the quarterly report submittal, PG&E shall submit a contingency plan to re-establish capture as soon as practical. The contingency plan shall propose contingency

- monitoring wells located downgradient and cross gradient to the original capture zone boundary set in 2012 and a monitoring program for verifying plume capture. Upon approval by the Executive Officer, PG&E shall implement the contingency plan according to the schedule that has been approved or issued. All contingency assessments and subsequent corrective actions shall be described in **monthly** capture metric reports due by the 15th of each month. Reports shall provide data and information to demonstrate progress towards resuming plume capture. Reports shall also include maps that show the location of all referenced wells, monitoring data, original plume boundary lines, and water supply wells within one-half mile of the original capture zone boundary lines.
- E.** ~~F.~~ PG&E shall notify the Water Board **within one week** when contingency actions are taken. The notice shall identify the date or instance leading to the contingency action, what the action is, and monitoring actions to be undertaken for verifying the contingency action is effective. A map shall accompany all data showing referenced wells, monitoring data, plume boundary lines, and water supply wells within one-half mile of the capture zone boundary lines.
- F.** ~~G.~~ As remediation continues with time, it is expected that chromium concentrations will decrease and plume lines will constrict inward and southward. In such an instance, it may not be prudent or optimal to continue operating an extraction well network and waste groundwater for the sole purpose of hydraulic containment for low chromium concentrations. As described in Finding 25-26, PG&E may propose a more optimal alternate hydraulic capture zone than the current one in place. An alternate proposal shall consist of the following information: groundwater elevation and chromium monitoring data, maps showing change in chromium plume configuration over time, proposed alternate capture zone and capture metrics, and a contingency plan proposing corrective actions and contingency monitoring wells cross and downgradient of the alternate hydraulic capture zone for monitoring chromium concentrations. The alternate hydraulic capture zone and metrics shall be implemented upon approval by the Executive Officer.
- G.** ~~H.~~ Should an approved alternate hydraulic capture zone be implemented, it is expected that some rebounding chromium concentrations may occur in groundwater in the original hydraulic capture zone. The Water Board will not find PG&E out of compliance with this Requirement if the approved contingency plan, including corrective actions and monitoring program, is implemented and the 50 ppb Cr(VI)/Cr(T) or 10 ppb Cr(VI)/Cr(T) boundaries do not migrate or expand 1,000 feet or more in place during any monitoring event from capture boundaries established prior to the alternate hydraulic capture boundaries.
- H.** ~~I.~~ Consistent with CAO R6V-2008-0002A2, this Order allows for the lateral migration of the 4 ppb hexavalent chromium eastern plume boundary in the southern plume to no more than 1,000 feet (see Attachment 3, "Area of Allowed Plume Expansion") during implementation of remedial actions, provided PG&E can contain chromium from migrating to the north. If PG&E is unable to provide data and information that clearly indicates chromium in this expanded area is being captured in the downgradient flow direction, it will constitute a violation of Requirement V for southern plume containment.

VI. Cleanup Requirements

- A. As of the date this Order is issued, PG&E shall continuously² implement previously approved accepted on-going corrective actions, including but not limited to, agricultural treatment units (ATUs), in-situ remediation, and freshwater injections (see Finding Nos. 22 23 and 23-24). Corrective actions shall be conducted in accordance with approved accepted current and future workplans, WDRs, Notices of Applicability, monitoring programs, or as modified with the Executive Officer's approval. Changes or reduction in corrective actions (the latter is defined by more than 10 percent reduced operation on a monthly basis) shall require Water Board concurrence prior to implementation.
- B. PG&E shall submit an annual operational plan in conjunction with the Annual Cleanup Status and Effectiveness Reports, as required in Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP, Attachment 8. Corrective actions will also be conducted at a level specified in the annual operational plan. Reductions in corrective actions of more than 10 percent on a monthly basis as compared to the annual operational plan shall require notification to Water Board staff prior to implementation.
- C. B. Enhanced eCorrective actions may be are needed in the areas listed below based on monitoring results. slow or poor results of on-going corrective actions to reach cleanup of chromium in groundwater.

1. Southern Plume

a) "Western Finger"

PG&E shall clean up and abate chromium concentrations greater than maximum background levels west of Serra Road between Highway 58 and Acacia Street. During 2014, greater than maximum background levels existed at monitoring well locations MW-121, MW-153, and MW-169.

- i. PG&E shall continue on-going remedial activities in accordance with the Water Board's October 30, 2013 conditional acceptance of the Western Area Action Plan (extraction of contaminated groundwater) and the Water Board's February 25, 2014 comment letter on the Action Plan for Western Area. PG&E shall collect groundwater samples from monitoring wells in the area of the western finger consistent with the Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP". Attachment 8.
- ii. If Cr(VI) concentrations equal or exceed 10 ug/L at one or more of the monitoring wells set forth in Table 1 for two consecutive sampling events, PG&E shall submit a technical report within 60 calendar days from submittal of the quarterly site-wide groundwater monitoring report proposing additional actions to remediate the observed exceedances.

² The term "continuously" as used in section VI.A does not apply to emergency interruptions or routine maintenance.

<u>Table 1. Western Area Sentry Wells</u>
<u>MW-57D</u>
<u>MW-57S</u>
<u>MW-58</u>
<u>MW-59</u>
<u>MW-118S</u>
<u>MW-147D</u>
<u>MW-147S</u>
<u>MW-148S</u>
<u>MW-164S</u>
<u>MW-168D</u>
<u>MW-168S</u>
<u>MW-201D</u>
<u>MW-201S</u>
<u>MW-202D</u>
<u>MW-202S</u>

- iii. No later than 60 days following acceptance of the United States Geological Survey (USGS) Background Study Preliminary Results Report by the Regional Board staff, PG&E shall submit a technical report to the Regional Board Executive Officer regarding the feasibility of achieving background concentrations in the area of the western finger using the existing remedial activities, including an estimated cleanup timeframe if applicable. If additional remedial actions are required to achieve background levels, the technical report shall include a proposal to implement such activities. If at any time USGS background study information becomes publically available demonstrating the chromium in the western finger is predominantly naturally occurring, no further remedial activities will be required in this area upon approval from the Regional Board Executive Officer.
- ~~i. Continue implementing on-going corrective actions in accordance with the Water Board's October 30, 2013, conditional acceptance of the Western Area Action Plan (extraction of contaminated groundwater).~~
- ~~ii. Reach and maintain maximum background levels in all monitoring wells in the "Western Finger" west of Serra Road by July 31, 2016.~~

b) Lower Aquifer

PG&E shall clean up and abate chromium concentrations greater than non-detect levels in the lower aquifer. During 2014, greater than non-detect concentrations exist at: MW-23C, MW-28C, MW-31C, MW-42C, MW-92C, and MW-100C.

- i. Continue implementing on-going groundwater extraction east of Mountain View Road to remediate chromium in lower aquifer groundwater, as proposed in PG&E's November 7, 2014 "Plan for

Enhancement of Lower Aquifer Remedy” and in accordance with the Water Board’s conditional acceptance dated December 22, 2014.

- ii. By **March 31, 2015**, install extraction well EX-37, east of Mountain View Road and south of Santa Fe Road, as proposed in the November 7, 2014 Memorandum from Arcadis and CH2MHill.
 - iii. Begin pumping from EX-37 by **June 30, 2015**. Disposal options for extracted groundwater may include but are not limited to temporary or permanent storage tank(s), agricultural fields, and the South Central Reinjection Area (SCRIA).
 - iv. Reach and maintain non-detectable chromium concentrations in all lower aquifer monitoring wells by **December 31, 2018**.
- c) For all remaining areas of the southern plume, reach the following cleanup goals in the upper aquifer by the listed timeframes:
- i. Reach and maintain 50 ppb Cr(VI) and Cr(T) in 90% of ~~all monitoring wells having chromium detection above the 50 ppb Cr(VI) and Cr(T) plume~~ as of the date this Order is issued, by **December 31, 2024 2025**, as reported in the fourth quarter 2025 groundwater monitoring report. The 90th percentile shall be based on the number of monitoring well locations where chromium concentrations exceed 50 ppb Cr(VI) and Cr(T) as of the date this Order is issued, as shown in Table 8.1 of Attachment 8.
 - ii. Reach and maintain 10 ppb Cr(VI) and Cr(T) in 80% of ~~all monitoring wells having chromium detection between the 10 ppb Cr(VI) and Cr(T) and 50 ppb Cr(VI) and Cr(T) plumes as defined~~ on the date this Order is issued, by **December 31, 2026 2032**, as reported in the fourth quarter 2032 groundwater monitoring report. The 80th percentile shall be based on the number of monitoring well locations where chromium concentrations exceed 10 ppb Cr(VI) and Cr(T) as of the date this Order is issued, as shown in Table 8.1 of Attachment 8.
 - iii. Every four years, PG&E will evaluate chromium cleanup actions to reach the cleanup goals and submit a four-year comprehensive cleanup status and effectiveness report, per the requirements of Attachment 8, CAO MRP. If actions are not achieving expected reductions in chromium concentrations, a workplan outlining recommendations and an implementation schedule to increase effectiveness will be submitted by the deadlines listed in Attachment 8, CAO MRP. PG&E may request an extension of the cleanup goals and timelines which will be subject to Water Board review and approval.

2. Northern Plumes

- a) PG&E shall clean up and abate chromium “hot spots” in the two northern plumes, or any division of the two plumes. “Hot spots” are defined as:
- i. any domestic well having Cr(VI) equal to or exceeding 10 µg/l during any one sampling event; or
 - ii. any monitoring, extraction, remediation well or piezometer having hexavalent chromium concentrations greater than 10 µg/L within one half mile upgradient of any active domestic well and meeting any of the following conditions (triggers):
 1. Fifty percent (50%) or more increase above Cr(VI) concentrations reported in second quarter 2015 that persist for two consecutive sampling events;
 2. Increasing statistical trend (using Mann-Kendall) over four sampling events.
- b) Within 30 days of receiving laboratory reports contain data indicating one or more of these triggers are met, submit a workplan and implementation schedule proposing the method and manner to remediate chromium “hot spots” in groundwater. Identify all wells that trigger this action and describe their general location. The workplan shall propose a cleanup action to begin within 45 days of the date of the workplan. Describe remedial equipment needed and expected operational actions to return Cr(VI) concentrations back to second quarter 2015 levels or less. Provide an estimated cleanup time and basis for the estimate if possible.
- c) If at any time USGS background study information becomes publically available demonstrating the chromium in the Northern Area or in specific Northern Area hot spots is predominantly naturally occurring, no further remedial activities will be required in this area upon approval from the Regional Board Executive Officer.
- ~~a. PG&E shall clean up and abate chromium “hot spots” in the two northern plumes, defined as any monitoring, extraction, remediation well or piezometer data having hexavalent or total chromium concentrations greater than 10 ppb as of the date this Order is issued. As of the date this Order is issued, “hot spots” exist at MW-154S1, MW-193S3, and MW-196S2. PG&E shall also clean up groundwater in the upgradient flow direction of any domestic/community/agricultural well with data showing chromium concentrations greater than 3.1 ppb Cr(VI) or 3.2 ppb Cr(T): wells 11-10, 21N-03, 21N-04, 21N-05, 28N-04, 28N-05, and 33N-02.~~
- ~~b. **By August 31, 2015**, submit a workplan to remediate “hot spots” in groundwater within one mile of any domestic well containing concentrations greater than 3.1 ppb Cr(VI) or 3.2 ppb Cr(T). Identify the domestic well number and describe its general location. The workplan shall propose a cleanup action to begin **by January 2, 2016** to remediate groundwater so as to reach maximum chromium background levels in the domestic well **within an 18-month period** of implementation.~~
- ~~c. **By November 30, 2015**, where no or insufficient monitoring well data exist, submit a workplan to remediate chromium in groundwater upgradient of domestic wells where data shows concentrations greater than 3.1 ppb Cr(VI) or 3.2 ppb~~

~~Cr(T). Identify the domestic well number and describe its general location. The workplan shall propose a cleanup action to begin **by April 1, 2016** to remediate groundwater so as to reach maximum chromium background levels in the domestic well **within a 36-month period** of implementation.~~

- ~~d. By **February 28, 2016**, submit a workplan and implementation schedule to remediate remaining “hot spots” in the two northern plumes not already addressed in Requirements VI.2.a and b. Identify the monitoring well number and describe its general location. Provide a time schedule for remedial actions proposed and the estimated time to reach maximum background chromium levels for wells having concentrations between 10 ppb and 99 ppb Cr(VI)/Cr(T) as of the date this Order is issued and to 10 ppb Cr(VI)/Cr(T) for wells having concentrations of 100 ppb Cr(VI)/Cr(T) or greater as of the date this Order is issued.~~
- ~~e. If after October 31, 2015, new “hot spots” in monitoring, extraction, remediation wells and piezometer wells are identified in future quarterly groundwater monitoring reports, **within 45 days of the quarterly report due date**, submit a workplan and implementation schedule proposing the method and manner to remediate the “hot spot.” Identify the well number and describe its general location. Provide an estimate cleanup time and basis for the estimate.~~

VII. Replacement Water Supply

- A. **Beginning with second third quarter 2015**, within each quarterly groundwater monitoring report required in section ~~VIII X~~ below, provide an analysis whether any domestic well within the domestic well sampling area defined in the “Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP”, Attachment 8, a revised affected area contains hexavalent chromium concentrations exhibiting an increasing trend indicating likely future exceedances of the hexavalent chromium MCL within one year, or any private supply well with hexavalent chromium concentrations within 20 percent of the hexavalent chromium MCL (i.e., 8 ppb Cr(VI)).

1. Interim Replacement Water Supply

- a) Within 2 10 business days of receipt of a laboratory report identifying an affected well as defined by Finding 44 (i.e., an active domestic or community well containing chromium linked to PG&E’s historical releases in concentrations that are above the primary drinking water standards of 10 ppb Cr(VI) or 50 ppb Cr(T)), the submittal of each quarterly report delineating a revised affected area, supply interim uninterrupted replacement water (i.e., bottled water or equivalent) to users of such affected wells. ~~to all those served by domestic and community wells in the affected area (Finding 43) where those wells are determined to be affected as defined in Finding 44 of this Order.~~
- b) Within 7 days of the submittal of each quarterly report delineating a revised affected area, provide a report to the Water Board listing all properties that have been provided interim uninterrupted water

service. The report shall include the well number and describe the general area in Hinkley or the Harper Dry Lake Valley the well is located, such as the southern plume, the Hinkley Valley northern plume, or Harper Dry Lake Valley northern plume. If bottled water is provided, PG&E shall also list the bottled water service being used and the water volume being delivered. Furthermore, if other than commercially available bottled water is being provided, the report shall include documentation to show that interim water supply meets state primary and secondary drinking water standards.

2. **Permanent Long-term Replacement Water Supply**

a) Within 45 days of a private supply well identified in VII.A., above, in quarterly groundwater monitoring reports, submit a workplan proposing ~~permanent~~ **long-term** whole house replacement water supply for all indoor uses. The workplan shall include the well number(s) and describe the general area in Hinkley Valley or the Harper Dry Lake Valley the well is located. Proposed ~~permanent~~ **long-term** replacement water shall meet all California primary and secondary drinking water standards, and shall have comparable quality for chromium concentrations to that historically pumped by the private well owner in the past. ~~prior to waste chromium exceeding the MCL within the well, or within 80 percent of the MCL.~~ The workplan shall include the following:

- i. An evaluation of at least three different methods to provide ~~permanent~~ **long-term** replacement water supply.
- ii. A discussion on the feasibility and timing to implement each method including the needs for permits, approvals, and environmental analysis.
- iii. An evaluation of the quantity of water (gallons per minute) that can be provided by each method compared with typical individual household supply needs.
- iv. An evaluation of the quality of water that can be provided by each method in comparison to California primary and secondary drinking water standards.
- v. An analysis of wastes that may be generated by each method, disposal options, costs, and an analysis of potential byproducts in groundwater created by each method. For example, reverse osmosis generates salts and potentially others compounds that are typically sent to septic systems.
- vi. An operation, maintenance, and, replacement plan, such as for filters, equipment, etc., of each evaluated method.
- vii. A water quality monitoring and reporting plan to verify quality and performance of each evaluated method.
- viii. A complete cost analysis including construction, operations, maintenance, and replacement plan of each evaluated method.
- ix. A contingency plan to ensure uninterrupted replacement water supply.

- x. State how the workplan and recommended method will be presented to the owner(s) and users of the affected well(s).
- b) **Within 45 days** of approval by the Executive Officer of a workplan for providing ~~permanent~~ **long-term** water supply, PG&E shall implement ~~permanent~~ **long-term** replacement water supply for all affected wells identified in section 1 above. Implementation shall be conducted with the well owner's permission.
- c) **Within 150 days** of identification of affected wells identified in section 1 above, provide a report to the Water Board listing all properties that have been provided ~~permanent~~ **long-term** uninterrupted replacement water supply. The report shall include: the affected well number and general area location, the method used to provide replacement water supply, and evidence provided water supply meets state primary and secondary drinking water standards. Describe any problems that may have occurred and how and when they were corrected or remedied. For instance, if sampling indicates that alternate water supply does not meet federal and state MCLs, describe what corrective actions were implemented to fix the problem. If the well owner did not respond or provide permission to access and install ~~permanent~~ **long-term** water supply, provide evidence of such, including actual date and time and manner of communication.
- d) **Within 45 days of the end of the each quarter**, submit quarterly whole house water (WHW) monitoring reports containing monitoring information on the quality of replacement water supply consistent with the alternate water supply monitoring plan, as approved by the Executive Officer. Describe all actions completed during the quarter, such as operation and maintenance. Describe any problems that may have occurred and how and when they were corrected or remedied. Provide proof that monitoring data has been sent to the owner of the affected well(s). Quarterly WHW reports will be due February 15, May 15, August 15, and November 15 of each year.

VIII. Independent Consultant

- A. PG&E shall continue to fund an independent consultant(s) that can provide technical information, education, and advice to community members on matters subject to regulation by the Water Board related to the chromium groundwater pollution in Hinkley. The independent consultant(s) shall not be involved in any aspect of this site (consulting for PG&E or involved in any litigation, and be willing to sign such a document stating such) and be accepted by PG&E and the Water Board or the Executive Officer.
- B. **Annually, on February 1 starting in 2016**, PG&E must submit a report to the Water Board including the scope of work and budget for the previous year and the next twelve month period. This report must provide evidence that adequate funds were made available in the past twelve months and are being made available for the next twelve months to complete the following at a minimum (or submit an alternative plan of equivalent effort and effectiveness in meeting the community's needs):

1. An annual report and presentation to the Water Board on the independent consultant's efforts within the Hinkley community.
2. A minimum of six community newsletters each year to disseminate information to Hinkley residents.
3. A minimum of four public meetings held in the Hinkley community.
4. Availability for one on one communications with individual or groups of Hinkley residents (at least 100 hours of availability).
5. Production of technical reviews, written comments and presentations to respond to Water Board orders, PG&E reports, USGS reports and other technical materials related to the chromium remediation (e.g. new cleanup technology).
6. Outside expert on matter(s) of greatest concern to the community.

C. The annual workplan is subject to Water Board Executive Officer approval.

General Provisions

IX. Plan Approval and Implementation

All plans required by this Order require the Water Board's approval, and shall be incorporated and implemented as part of this Order whether expressly stated above or not. Any violation of an approved plan required by this Order shall be considered a violation of this Order. The Executive Officer is hereby delegated the authority to approve, conditionally approve, or reject plans submitted in accordance with this Order.

X. Groundwater Monitoring and Reporting Program

California Water Code section 13267 authorizes the Regional Water Quality Control Board (Water Board) to require technical and monitoring reports. The Monitoring and Reporting Program (MRP) is incorporated as Attachment 8 in this Order. The MRP establishes monitoring requirements consistent with the California Water Code to evaluate compliance with the terms and conditions of this Order, and to assure protection of waters of the state and restoration of beneficial uses.

XI. Laboratory Analysis

All water sample analyses shall utilize the most recent testing methods. Testing for Total Chromium analysis shall be done using United State Environmental Protection Agency (US EPA) Methods 6010B or 6020A to a reporting limit of 1 ppb. Testing for hexavalent chromium shall be conducted in accordance with US EPA Method SW 218.6 with a reporting limit of 0.42 ppb. A pert per billion is equivalent to micrograms per liter or µg/L also reported by laboratories. The laboratory used shall be certified by the California Environmental Laboratory Accreditation Program (ELAP). If best available technology in the future allows for better testing methods adopted by the State of California or lower detection levels, PG&E shall implement the better method or detection level.

XII. Certifications for all Plans and Reports

All technical and monitoring plans and reports required in conjunction with this Order are required pursuant to Water Code section 13267 and shall include a statement by PG&E, or an authorized representative of PG&E, certifying under penalty of perjury in

conformance with the laws of the State of California that the workplan and/or report is true, complete, and accurate. Hydrogeologic reports and engineered plans shall be prepared or directly supervised by, and signed and stamped by a Professional Geologist or Civil Engineer, respectively, registered in California. It is expected that all interpretations and conclusions of data in these documents to be truthful, supported with evidence, with no attempts to mislead by false statements, exaggerations, deceptive presentation, or failure to include essential information.

All Reports shall be submitted in hardcopy to the South Lake Tahoe and Victorville offices of the Lahontan Regional Water Quality Control Board:

Lisa Dernbach
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

Robin Coale
14440 Civic Drive, Suite 200
Victorville, CA 92392

XIII. Duty to Submit Other Information

When the Discharger becomes aware that it has failed to submit any relevant facts in any report required under this CAO, or submitted incorrect information in any such report, the Discharger shall promptly submit such facts or information to the Water Board.

XIV. Liability for Oversight Costs Incurred by the Water Board

PG&E shall be liable, pursuant to Water Code 13304, to the Water Board for all reasonable costs incurred by the Water Board to investigate unauthorized discharges of waste, or to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, pursuant to this Order. PG&E shall reimburse the Water Board for all reasonable costs associated with site investigation, oversight, and cleanup. Failure to pay any invoice for the Water Board's investigation and oversight costs within the time stated in the invoice (or within thirty days after the date of invoice, if the invoice does not set forth a due date) shall be considered a violation of this Order. If this site is enrolled in a State Water Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program.

XV. No Limitation of Water Board Authority

This Order in no way limits the authority of this Water Board to institute additional enforcement actions or to require additional investigation and cleanup of the site consistent with the Water Code. This Order may be revised by the Executive Officer as additional information becomes available.

XVI. Enforcement

Failure to comply with the requirements, terms, or conditions of this Order will result in additional enforcement action that may include the imposition of administrative civil

liability pursuant to California Water Code sections 13268 and 13350, or referral to the Attorney General of the State of California for civil liability or injunctive relief. The Water Board reserves its rights to take any enforcement action authorized by law.

XVII. Permits or Approvals

This Order does not alleviate the responsibility of PG&E to obtain necessary local, state, and/or federal permits to construct or operate facilities or take actions necessary for compliance with this Order. This Order does not prevent imposition of additional standards, requirements, or conditions by any other regulatory agency. This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "take" will result from any act required by this Order, PG&E shall obtain authorization for an incidental take from appropriate authorities prior to taking action. PG&E is responsible for meeting all requirements of the Endangered Species Acts for any acts required by this Order.

XVIII. Replacement of Prior Orders

This Order replaces all requirements of CAO No. R6V-2008-0002 and amendments; and CAO No. R6V-2011-0005 and amendments. In addition, this Order replaces requirements in Investigative Order Nos. R6V-2011-0079 and R6V-2013-0051; and Executive Officer letter directives dated October 4, 2013, December 12, 2013, and February 26, 2014. See Attachment 1 for descriptions of these Orders and Directives. This Order shall not preclude enforcement against PG&E for failure to comply with any requirement in any other Order issued by the Water Board. The Water Board reserves its rights to take any enforcement action authorized by law.

XIX. Attachments Incorporated Herein

The eight attachments referenced in this Order are hereby incorporated herein:

- 1) CAO and Investigative Orders Replaced by CAO No. R6V-2015-PROP
- 2) Location of Chromium Plumes (Third Quarter 2014)
- 3) Area of Allowed Plume Expansion
- 4) Active Water Board Orders and Notices Authorizing Clean up Actions
- 5) Hydraulic Capture Metrics
- 6) Hydraulic Capture Monitoring Plan, Shallow Zone of Upper Aquifer
- 7) Hydraulic Capture Monitoring Plan, Deep Zone of Upper Aquifer
- 8) Groundwater Monitoring and Reporting Program, CAO No. R6V-2015-PROP

XX. Right to Petition

Any person aggrieved by this action of the Lahontan 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, section 2050 and following. The State Water Board shall receive the petition by 5:00 p.m., 30 days after the date this Order is issued, except that if the thirtieth day following the date

of this Order falls on a Saturday, Sunday, or state holiday, the petition shall 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.

PATTY KOUYOUMDJIAN
EXECUTIVE OFFICER

Date

PROPOSED