



# California Regional Water Quality Control Board Lahontan Region



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## **PRELIMINARY COMMENTS ON FEASIBILITY STUDY FOR CHROMIUM POLLUTION, PG&E COMPRESSOR STATION, HINKLEY, SAN BERNARDINO COUNTY**

On August 31, 2010, the Water Board received the document, "Feasibility Study (Study)" for final site cleanup at the Pacific Gas and Electric Company's (PG&E) Compressor Station in Hinkley. The Study, prepared by Haley & Aldrich, was submitted in compliance with Order No. 5.1 of Cleanup and Abatement Order (CAO) No. R6V-2008-0002. The Study develops a final remedy for chromium pollution to groundwater and includes an evaluation to comply with Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304".

Upon notification by Water Board staff that the Study lacked discussion and an evaluation of estimated cleanup time and cost to achieve the average background concentration of 1.2 µg/L hexavalent chromium [Cr(VI)] as required in the CAO, PG&E submitted a letter of Supplemental Data, dated October 14, 2010, containing the missing information.

Using more than 20 years of assessment, pilot testing, and interim remedial actions, PG&E identifies five possible remedial approaches capable of cleaning up chromium in groundwater to background levels. Of those five approaches, PG&E recommends implementing Alternative 4 involving in-situ remediation to clean up the plume core to 50 µg/L total chromium [Cr(T)] and groundwater pumping at the toe or downgradient-most end of the plume for plume containment using extraction wells and agricultural land treatment. While the Supplemental Data shows a potential cleanup time of 220 years to achieve cleanup to the average background concentration of 1.2 µg/L hexavalent chromium [Cr(VI)], PG&E only recommends clean up to the maximum background concentration of 3.1 µg/L Cr(VI) due to the lack of regulatory basis or precedent for cleaning up to the average background level.

*California Environmental Protection Agency*

## **Preliminary Comments and Recommendations**

The following are the Water Board staff's preliminary comments for the Study and Supplemental Data. These comments are subject to change or may be augmented following additional technical evaluation by the Department of Toxic Substances Control and input received during the initial public comment period on the Study that ends January 10, 2011.

1. The Study or its addendum must describe the existing levels of hexavalent and total chromium concentrations in groundwater throughout the Project Area. The Study only states in Section 3.3.2 that the chromium data from the February 2010 sampling set was used for the purposes of defining the Remedial Area in the Study. Of the numerical values listed for chromium in the Study, the highest value mentioned is 50 µg/L Cr(T). The February 2010 monitoring data shows that up to 8,450 µg/L Cr(VI) and 8,170 µg/L Cr(T) were detected in the Source Area at well SA-MW-05D, exceeding the hazardous waste limit of 5,000 µg/L. In contrast, Section 3.3.3 goes into great detail in describing the various total dissolved solids (TDS) and nitrate concentrations in groundwater along the entire length of the chromium plume.
2. The Study states in numerous sections that in-situ remediation at the site is currently operating at full scale. Section 4.3 states that, "To date, three pilot and three full-scale IRZs (in-situ remediation zones) have been implemented." Water Board staff disagree with this statement, since in-situ remediation is only operating at pilot study areas. Full-scale in-situ remediation operations that extend out to the 50 µg/L Cr(VI) chromium plume boundaries have not yet been implemented at the site. We request the addendum clarify this information from the Study.
3. In Study Section 3.3, a description of high concentrations of total dissolved solids (TDS) in groundwater in the area of the chromium plume is attributed to historical agricultural use unrelated to PG&E's activities. The Study, however, fails to mention that PG&E's past land treatment units also likely contributed to higher than normal TDS concentrations in groundwater. PG&E operated the East land treatment unit on the north side of Community Boulevard for about ten years. PG&E also operated the Ranch land treatment unit between Highway 58 and Santa Fe Avenue for about four years. These past PG&E operations contributed to increased TDS levels in groundwater that now extend over a 1.5 mile distance in the chromium plume. Furthermore, TDS data in Study Figure 2-4 indicate that operations at the Compressor Station have also added to TDS impacts to groundwater above background concentrations.
4. In discussing plume boundary control in Section 4.1.1, the Study states that, "...data show that groundwater extraction from this well network is largely effective in achieving hydraulic capture of the northern portion of the Remedial Area plume, thus containing it." This statement is inaccurate based on data submitted throughout

2010 showing that the northern portion of the chromium plume is not being captured by PG&E's groundwater extraction. PG&E has been notified of its failure to contain the plume in accordance with directives in CAO R6V-2008-0002. Third Quarter 2010 monitoring data for the Desert View Dairy indicates further violation of plume containment beyond the Dairy property. We request that PG&E provide in an addendum a more accurate description of the limits of the plume containment efforts to date and offer additional measures to effectively contain plume migration.

5. The description of the five alternatives for final site clean up contains incomplete discussions. For instance, the descriptions for Alternatives 2 through 5 state that emphasis is placed on rapid reduction of Cr(VI) concentrations in the plume core ( $>50 \mu\text{g/L}$ ) to expedite re-establishing beneficial use of the Upper Aquifer. However, this premise is short-sighted given the current proposed public health goals. Beneficial uses may not be considered restored by achieving  $50 \mu\text{g/L}$  Cr(VI). Additionally, the Study descriptions of each alternative imply that the primary cleanup method will be shut off following achievement of cleanup to the  $50 \mu\text{g/L}$  Cr(T) concentration boundary. The exception being Alternative 4 which states that, "(fate and transport modeling and cost estimates assume IRZ is discontinued after 5 years of operation)". Moreover, the descriptions and model simulations in Appendix E imply that natural attenuation will be the principal method for achieving cleanup to background concentrations after remediation to the  $50 \mu\text{g/L}$  Cr(T) boundary occurs. PG&E needs to explicitly describe in an addendum the timing and area of implementation for each proposed active remedial actions. PG&E must also include at least one alternative where remedial actions continue until background concentrations of Cr(VI) are achieved in the groundwater within the Project Area.
6. The Study contains conflicting information concerning the degree of chromium clean up using in-situ remediation. Section 4.3.1 states that in-situ treatment in the Central and Source Areas was able to achieve clean up of chromium to background levels in approximately 50 to 60 percent of the treated wells. Yet, the section concludes that it would be extremely difficult to fully treat Cr(VI) to background in all areas of the plume due to variations in groundwater flux and heterogeneities in the formation. In comparison, data in in-situ monitoring reports imply that more aggressive treatment implementation would enable clean up chromium in groundwater to background levels in all or almost all treatment wells. Water Board staff requests PG&E evaluate the benefits of more aggressive treatment actions which include in-situ treatment for a longer period of time (10 and 20 years), closer-spaced extraction and injection wells, and the application of additional in-situ zones.
7. Water Board staff requests PG&E provide an estimate for chromium mass (hexavalent, trivalent, and total chromium) to be left in the environment following completion of each of the remediation alternatives. Alternative 1 indicates that all chromium mass will be left in the groundwater over a wide area in the form of hexavalent chromium. Alternatives 2 through 4 imply that chromium mass will be left



in the soil within 5 feet of ground surface and/or at the water table, approximately 80 feet below ground surface, in the trivalent solid state. Lastly, Alternative 5 indicates that most of the chromium mass will be removed from the environment by ex-situ treatment while some will be left in the soil within 5 feet of ground surface in the trivalent solid state. An estimate of chromium mass to be left in the environment for each remedial approach is needed to compare the different alternatives. In addition, provide a comparison of the amount of chromium mass to be left in the environment to the amount of chromium naturally in soil at the site.

8. The estimated cleanup times given for each of the five alternatives are unacceptably long with respect to restoring beneficial uses of groundwater within the Project Area. The Supplemental Data lists an estimated cleanup time for the recommended alternative, Alternative 4, as being 6 years for the 50 µg/L Cr(T) concentration boundary, 150 years for the 3.1 µg/L Cr(VI) concentration boundary, and 220 years for the 1.2 µg/L Cr(VI) concentration boundary. The latter two estimated cleanup times represent 144 years and 214 years in which no active remediation will be occurring at the site other than possible groundwater extraction for plume containment in the north. Since the Study indicates that active remediation is technically reasonable and feasible to achieve cleanup from 8,170 µg/L to 50 µg/L Cr(T) concentration in six years, continuing such efforts for up to 20, or even 40 years would likely significantly reduce hexavalent chromium concentrations and, thus, the overall cleanup time to achieve background concentrations. Water Board staff recommends evaluating at least one alternative with ongoing active remediation actions until maximum background concentrations are reached. These alternatives should describe rates of cleanup and estimated chromium concentrations at 10, 20, and 40 years.
9. Water Board staff requests PG&E clarify its recommendation in an addendum to include at least one revised alternative that hastens cleanup times and provides better measures to ensure that the existing plume size will not expand in size, pursuant to Water Board's 2008 and 2009 Cleanup and Abatement Orders. In addition, evaluate benefits and impacts of various remedies and scales of implementation for a revised alternative.

### **General Considerations**

As part of developing and evaluating alternatives with active remediation occurring over larger areas and continuing over longer time periods, Water Board staff requests PG&E evaluate in an addendum a new alternative that combines Alternatives 2, 3, and 5 for simultaneous implementation in an aggressive manner (e.g. greater pumping rates, additional and extended in-situ treatment zones, longer active remediation time, etc.). An evaluation of these combined alternatives should include description of benefits (increased reduction of chromium concentrations in groundwater) and adverse effects.



Alternative 2 provides for plume containment at the toe or downgradient-most end of the plume using extraction wells and agricultural land treatment. This method appropriately implemented could prevent further chromium migration in groundwater to unaffected areas. Since PG&E already owns the Desert View Dairy and the Gorman fields in the north, implementation of this alternative would be almost immediate. Additional extraction wells are likely needed to ensure containment of potential plume migration along the northwestern and southeastern plume boundaries.

Alternative 3, which primarily proposes plume-wide in-situ remediation, may be appropriate for implementation over the entire off-site plume length (approximately 1.8 miles), to the containment zone in the north. This alternative is easily implemented considering that in-situ remediation facilities are already in place and would only require additional wells and piping to expand treatment out to the 3.1 µg/L Cr(VI) plume boundary. Some property acquisition might also be required. Potential by-products of reduced metals, such as iron, manganese, and arsenic, would only occur for a limited distance and over a limited time during overall remediation activities.

Alternative 5, which primarily proposes groundwater extraction and ex-situ treatment using an aboveground treatment facility, may be appropriate for implementation in the Source Area in lieu of in-situ remediation for two reasons: chromium exists at hazardous waste concentrations and the method offers complete removal of chromium from the environment, preventing potential conversion back to hexavalent chromium in the future. Implementing this alternative would require constructing a new treatment facility on the Compressor Station property, already in PG&E's control, similar to the facility built to remediate hexavalent contamination in Topock.

As proposed in the Study for each alternative, it is appropriate to continue operating the freshwater injection wells in the northwestern plume area to prevent plume migration in that direction.

Following achievement of remediation by the three alternatives to 3.1 µg/L Cr(VI), monitored natural attenuation could be used to verify final site cleanup to the average background value of 1.2 µg/L Cr(VI).

#### **Report Requested**

Water Board staff requests that by **January 31, 2011**, PG&E provide an addendum that addresses the comments and requests for information in this letter. The addendum must include an evaluation and estimates of cleanup using a combined approach, implementing simultaneous active remediation (combining Feasibility Study Alternatives 2, 3, and 5) for the 10-year, 20-year, and 40-year timeline, for achieving cleanup to 50 µg/L Cr(T), 3.1 µg/L Cr(VI), and 1.2 µg/L Cr(VI). Also, disclose potential environmental impacts (e.g., chromium mass, drawdown, subsidence, TDS increase, etc.) from implementing this combined remedial approach.

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If you have any concerns about these comments, please contact Lisa Dernbach at (530) 542-5424 or me at (530) 542-5436.



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