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Staff Report

Summary and Discussion:
Peer Review
of
Pacific Gas & Electric Company's
2007 Groundwater Chromium
Background Study Report

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I. Background

Site History

The Pacific Gas and Electric Company (PG&E) Compressor Station is located in the Hinkley Valley of San Bernardino County, just southeast of the town of Hinkley. The Compressor Station has operated since 1952. From 1952 to 1965, hexavalent chromium-based corrosion inhibitor was added to water used in the cooling towers, and the untreated cooling tower water was discharged to unlined evaporation ponds. The unlined ponds have since been closed, covered, and replaced by lined evaporation ponds. In 1987, PG&E reported to the State total chromium and hexavalent chromium concentrations exceeding the California drinking water standard of 50 parts per billion (ppb) total chromium in groundwater beneath and down gradient of the site.

Groundwater in the Hinkley Valley occurs in two aquifers, known as the upper aquifer and the lower aquifer, which are separated by a layer of fine-grained clay and silts. This layer, the "blue clay", restricts or prevents groundwater flow between the two aquifers. The chromium plume (as currently defined) primarily exists in the upper aquifer, although in 2009 a limited area of the lower aquifer showed hexavalent chromium concentrations above background values where the blue clay is thin or absent. PG&E has determined the extent of this limited area of contamination in the lower aquifer, since the surrounding lower aquifer has no detectable chromium concentrations.

Currently, groundwater beneath the Compressor Station contains hexavalent chromium concentrations up to 4,100 ppb. There is no drinking water standard specific to hexavalent chromium; however, in July 2011 the state of California's Office of Environmental Health Hazard Assessment (OEHHA) adopted a Public Health Goal (PHG) for hexavalent chromium in drinking water of 0.02 ppb. A PHG is not an enforceable standard, but an estimate of the level of a contaminant in drinking water that would pose no significant health risk from consuming the water on a daily basis over a lifetime. Adoption of a PHG is the first step in setting an enforceable standard for a contaminant in drinking water.

Background Study Development

State Water Board Resolution No. 92-49 requires that dischargers clean up waste to either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored while at the same time restoring water quality to provide for existing and future beneficial uses. In July 2002, PG&E submitted a study proposal for determining background levels of total and hexavalent chromium in groundwater in the Hinkley area, entitled *Scope of the Background Chromium Study* (the 2002 Background Study Plan).

The 2002 Background Study Plan proposed collecting groundwater samples from twelve monitoring locations over four quarters in a year. Monitoring locations were

situated upgradient and crossgradient to the Compressor Station and the contaminated groundwater plume, up to 6,000 feet away. No samples were proposed in the lower aquifer, since data at the time indicated it was not impacted by chromium contamination.

In November 2003, Water Board staff sent the 2002 Background Study Plan to three University of California professors for review. The reviewers agreed that the approach contained in the 2002 Background Study Plan was generally appropriate, but each reviewer had suggestions regarding the plan. As a result of the 2003 peer review, the criteria for selecting wells for the study was refined, depth-discrete sampling within the upper aquifer was added, an assessment of groundwater flow paths was done, and additional statistical methods were included.

PG&E revised the 2002 Background Study Plan according to Water Board staff's direction and the peer reviewers' comments, and in 2004 submitted the *Revised Background Chromium Study at the PG&E Compressor Station, Hinkley, California* (the 2004 Revised Background Study Plan). In November 2004, Water Board staff conditionally approved the 2004 Revised Background Study Plan, including proposals to sample from fifteen to twenty wells over four consecutive quarters, and conduct depth-discrete sampling in five wells.

Background Study Sampling and Results

PG&E conducted sampling for the Background Study throughout 2006. In mid-2006, PG&E submitted a progress report stating that sampling was being conducted at 18 private well locations, and depth-discrete samples were collected at two of the five proposed wells. The reported stated that additional wells would be evaluated for depth-discrete sampling where feasible. Other than the reduced number of depth-discrete samples, the progress report indicated that PG&E was following the 2004 Revised Background Study Plan approved by Water Board staff.

In February 2007, PG&E submitted the *Groundwater Background Study Report, Hinkley Compressor Station, Hinkley, California*, prepared for PG&E by CH2MHill, dated February 28, 2007 (the 2007 Background Study Report). The 2007 Background Study Report presented the sampling data and the results of statistical analysis of the data.

At a public hearing in November 2008, the Lahontan Water Board adopted amended Cleanup Order No. R6V-2008-0002A1, establishing the following background chromium concentrations for the Hinkley area, based on data in the 2007 Background Study Report:

- Maximum background total/hexavalent chromium = 3.2/3.1 ppb
- Average background total/hexavalent chromium = 1.5/1.2 ppb

Except for those from PG&E, no public comments were received regarding the amended CAO and its recommended background chromium levels.

Peer Review of 2007 Background Study Report

In July 2010, PG&E's *Second Quarter 2010 Groundwater Monitoring Report* showed hexavalent and total chromium concentrations exceeding the maximum background concentrations in three residential supply wells and four shallow monitoring wells in the north and east of the formerly defined plume boundaries. In August 2010, Water Board staff received a Feasibility Study report from PG&E that presented alternatives for final cleanup of waste chromium in groundwater to the established average and maximum background levels. Water Board staff held public information meetings in Hinkley in December 2010 to discuss the plume expansion and PG&E's Feasibility Study alternatives.

Groundwater monitoring reports submitted by PG&E continue to indicate chromium above background values in areas to north, west and east of previously defined plume boundaries. The ongoing expansion of the plume and release of the Feasibility Study, followed by OEHHA's July 2011 adoption of a PHG for hexavalent chromium of 0.02 ppb, renewed public interest in the background chromium values and how they were derived.

Of particular concern were deviations from the 2004 Revised Background Study Plan, where PG&E added a significant number of wells concentrated in one area, without the specific locations or numbers accepted in advance by Water Board staff. The 2004 Revised Background Study Plan proposed sampling fifteen to twenty well locations during each sampling event. By the Study's end, a total of forty-eight well locations in the Hinkley area were sampled. Of these forty-eight wells, thirty were added after the first two sampling events, with twenty-three of those wells concentrated in one area near a well which showed the highest concentrations of chromium detected in the first two sampling events (well BGS-04). The explanation given in the 2007 Background Study Report was that the additional wells were added to compensate for not completing required depth-discrete sampling at three well locations.

In addition, since the chromium plume had expanded beyond the previously delineated boundaries, concerns were expressed that the background study had incorporated wells that did not represent background chromium, but instead were affected by PG&E's waste chromium discharges.

In response to public concerns heard at the March 2011 Water Board meeting, the Lahontan Water Board directed staff to obtain scientific peer review of the 2007 Background Study Report.

During summer 2011, three peer reviewers were identified through Cal/EPA's Scientific Peer Review Program. The reviewers were selected for their expertise in analytical chemistry, groundwater modeling, statistics, hydrogeology and chromium remediation, and underwent a rigorous conflict-of-interest disclosure process. Reviews were

completed in October 2011, and in December 2011, Water Board staff held a public meeting in Hinkley to summarize the peer reviewers' comments.

II. Regulatory and Planning Considerations

This section discusses the use of background values for the Water Board's regulatory and planning efforts at Hinkley, and how those efforts could be affected by changes to the adopted background values.

Environmental Impact Report for Comprehensive Groundwater Cleanup

Water Board staff are in the final steps of developing an Environmental Impact Report (EIR), as required by the California Environmental Quality Act (CEQA) to analyze the environmental effects of issuing General Waste Discharge Requirements to PG&E to implement comprehensive groundwater cleanup activities in Hinkley. The EIR must be finalized so that the General Waste Discharge Requirements and a new Cleanup and Abatement Order (CAO) can be considered by Water Board. The draft EIR is scheduled for public review in May 2012, and for Water Board consideration, along with the General Waste Discharge Requirements and a new CAO, in fall 2012. The background concentration values are important to the EIR in three ways:

1. Maximum background levels are used to depict the plume boundary, and to define the existing environment in terms of what is and what is not considered contamination. CEQA requires disclosure of the existing environmental conditions at the time of the EIR preparation.
2. They define the area of remedial action and the project study area. CEQA requires a clear and defined project description.
3. They define the proposed alternatives in terms of how much cleanup may occur, and where the impacts may be located.

If information about the existing environment or about the project description changes during the CEQA process, additional analysis may be required. The trigger is whether the new information or the change in the project results in a) new significant impacts; b) substantially more severe impacts; or c) is so fundamental to the environmental evaluation that review of the project would be fundamentally changed by consideration of the new information. Those circumstances could require either re-circulation of all or part of the document, or a supplemental or subsequent EIR if the changes occur after the EIR has been certified by the Board.

Water Board staff and its EIR consultant have taken the approach of defining the EIR project area and potential cleanup activities as broadly as reasonably foreseeable. If the Water Board chooses to reconsider the adopted background values based on peer review comments, the existing broadly-defined EIR study area is likely large enough to accommodate potential changes to plume boundary, if the background value was

changed as a result of the Water Board's action. Note that if the background chromium value was reduced (say, from 3.1 ppb to 2 ppb, for example), the plume boundary would be drawn larger than it is now; if the value were increased, to say, 4 ppb, the plume boundary would be drawn smaller. Changes to the depiction of the plume boundary due to changing background levels would not change the cleanup alternatives already developed and analyzed, but could change the estimates of time to achieve cleanup.

Any such changes would need specific evaluation in the context of CEQA regulations to determine if EIR re-circulation or supplemental analysis requirements would be triggered.

Amended Cleanup and Abatement Order (CAO) No. R6V-2011-0005A1

This amended CAO uses the adopted maximum background values as one trigger to require replacement drinking water, and to define an "affected area" for the purposes of assessing domestic wells for eligibility for replacement drinking water. The affected area, as defined in the CAO, is domestic wells within one mile downgradient or crossgradient from the 3.1/3.2 ppb maximum background hexavalent/total chromium plume boundaries, based on monitoring well data from the most recent quarterly site-wide monitoring report.

The amended CAO requires, in part, that PG&E provide replacement water to residents to whose wells exceed the maximum background levels, and to identify wells where chromium levels may be below the maximum background, but attributable to PG&E's discharge in the affected area. If a well in the affected area shows chromium above the hexavalent chromium Public Health Goal of 0.02 ppb, then PG&E is required to determine whether the chromium is partially or completely, more likely than not, due to PG&E's discharge of waste.

Changing the background values would change the extent of the affected area; for example, if the background values were adjusted upward, then the extent of the chromium plume boundary would be smaller than currently depicted, so the affected area would not extend out as far as it does now, and fewer homes may be assessed for replacement water. If the value were adjusted downward, then the plume boundary would be larger than depicted now, and more homes may be eligible.

Changing background values would not release PG&E from the requirement to assess wells in the affected area with values above the hexavalent chromium Public Health Goal of 0.02 ppb to determine if the chromium is due to PG&E's discharge of waste. The primary change would be to the extent of the affected area.

Background Values to Establish Cleanup Levels

The Water Board must establish background concentrations of chromium as one factor to consider when setting cleanup levels for a contaminated site. Cleanup levels are needed to assess remediation progress and to determine when cleanup is complete

and the restoration of affected water to background conditions (i.e., the water quality that existed before the discharge) or beneficial use standards has been attained.

Changing the adopted background concentrations would not affect the types of cleanup technologies or alternatives that would be analyzed in the EIR; the main impact would be to estimates of the time needed to achieve complete cleanup, and the area over which cleanup would occur, as discussed above regarding the EIR.

Given the large extent of the plume, it may be that a one-size-fits-all approach to background concentrations and cleanup levels will not prove appropriate for the Hinkley Valley. Based on our current understanding, a range of background and cleanup concentrations could be applicable for the Hinkley Valley, due to variations in geology, geochemical conditions, groundwater flow patterns, and feasibility of cleanup technologies. Advances in technology (for example, improvements in stable isotope techniques to trace the source of groundwater or chromium) could allow for a more refined application of different background values in the future. The Water Board may consider revising background values based on compelling new information or future technological improvements; therefore, background values are subject to Water Board revision. Recognizing the value of consistency and continuity in regulatory processes, it is also important to incorporate new and improved information.

III. Summary and Discussion of 2011 Peer Reviewers' Comments

Water Board staff outlined the following topics on which to focus the reviewers:

1) Quality of spatial sampling of background chromium
2) Quality of temporal sampling of background chromium
3) Assumption of statistical normality
4) Quality of groundwater modeling
5) Any additional scientific issues, including whether the 2007 Background Study Report was based on sound scientific knowledge, methods and practices.

A summary and discussion of the peer reviewers' key comments follows. Copies of the peer reviewers' comment letters are included in Appendix 1.

Quality of spatial sampling of background chromium

Summary of Peer Review Comment: Sampling wells screened over both upper and lower aquifers does not provide valid data for determining background concentrations. Laboratory data from wells containing mixed aquifer waters do not represent chromium concentrations from any specific aquifer (i.e., the upper or lower aquifer); therefore,

those data should not be used in a scientifically-based background study of chromium in groundwater.

Discussion: Of the wells used for the background study, most of them (44 out of 48 or 92%) were either screened over more than one aquifer zone (i.e., the upper and lower aquifer), or the screen depths were unknown and well construction information was unavailable.

The 2004 Revised Background Study Plan included a proposal for depth-discrete sampling of five wells, out of pool of 41 potential locations. Only two wells had depth-discrete samples collected during the background study, due to access and well construction issues. One well was screened only in the upper aquifer; the other was screened through the both aquifers. The results for both wells were non-detect for total and hexavalent chromium at all depths sampled. This dataset is too small to draw conclusions about differences in chromium concentrations between the upper and lower aquifers outside the plume area.

Geochemical differences at varying depths in the aquifer outside the plume area may result in naturally lower chromium concentrations in the lower aquifer versus the upper aquifer, but this has not been verified with Hinkley background study sampling data. Wells screened in each aquifer are needed to determine any differences in chromium concentrations between the two aquifers outside the plume area, and to set appropriate background values for each aquifer if needed.

Water Board staff note that the reduced amount of depth-discrete sampling reported in the 2007 Background Study Report was not consistent with the accepted 2004 Revised Background Study Plan.

Summary of Peer Review Comment: A statistical clustering effect could result from the uneven spatial distribution of wells. Chromium concentrations at a particular area (for example, well BGS-04) could be assigned a disproportionately large weight if those wells around BGS-04 sample higher concentration areas. This clustering effect could be tested for and removed through statistical techniques, which does not appear to have been done.

Discussion: PG&E added a significant number of wells concentrated in one area, without the specific locations or numbers accepted in advance by Water Board staff. The 2004 Revised Background Study Plan proposed sampling fifteen to twenty well locations during each sampling event. By the Study's end, a total of forty-eight well locations in the Hinkley area were sampled. Of these forty-eight wells, thirty were added after the first two sampling events, with twenty-three of those wells concentrated in one area near a well which showed the highest concentrations of chromium detected in the first two sampling events (well BGS-04), so the averaged results from these wells could be biased higher than if the samples were not clustered in these areas.

As noted by the peer reviewer, there are statistical methods to examine if this created bias in the dataset, and to correct for it. Another approach to correct for potential clustering bias could be to exclude the wells which were added after the second sampling event, and consider only the data obtained from the first and second sampling events.

The addition of thirty wells to the Background Study is not consistent with the accepted 2004 Revised Background Study Plan.

Quality of temporal sampling of background chromium and the assumption of statistical normality

Summary of Peer Review Comments: One reviewer stated the approach of averaging data from each well to compensate for the fact that four quarters of data were not available for each well is not recommended. However, another reviewer stated that the approach of averaging well data appeared reasonable.

Discussion: According to the 2007 Background Study Report, chromium sampling results for each well were averaged, and these averages were used in the final statistical evaluation of the data. Averaged values were used to address potential bias in the dataset since four quarters of data were not available for each well (this is referred to as "temporal imbalance").

One reviewer stated that averaging data can alter the statistical nature of the data, leading to incorrect conclusions regarding the distribution of the data, specifically whether the data are "normally distributed" or not. This is important because concluding that data are normally distributed affects the choice of statistical analysis used to calculate average and maximum values.

Data that are normally distributed, when plotted on a graph, look like a "bell-shaped curve", with the graph falling off evenly, or symmetrically, on either side of the average value of the data. Water quality datasets often do not show this bell-shaped curve pattern when graphed, mostly because of the presence of non-detect values. These non-detect values make a graph of the data look skewed, with the peak over to the left, rather than in the middle of the graph. Such datasets are called "non-normal" data in statistics, and often require different statistical tests than one would use for normal data, to accurately calculate summaries such as average and maximum values.

One peer reviewer stated that there is evidence for non-normal distribution in the data of the Background Study, such as differences between the mean and median of the data (with normally distributed data, the mean and median values would be the same). The peer reviewer recommends that the assumption of the data distribution be supported with additional evidence, such as more rigorous modeling of the aquifer.

Water Board staff note that the statistical analysis done for the 2007 Background Study Report was consistent with the accepted 2004 Revised Background Study Plan. However, since the number of wells and number of samples per well differed from the accepted 2004 Revised Background Study Plan, the statistical methods used may not be applicable to that expanded dataset.

Quality of groundwater modeling

Summary of Peer Review Comments: Not enough information is provided to confirm the adequacy of model calibration. No attempt is reported to test the model against the concentration data. The spatial variability of the hydrological parameters in the model was not reported.

Discussion: These comments relate to the issue of whether the groundwater modeling contained in Appendix B of the 2007 Background Study Report, and Appendix B of the 2004 Revised Background Study Plan are appropriate to assure that the background study wells are representative of naturally occurring chromium, (i.e., are located in areas that have not been affected by waste discharges of chromium).

The 2003 peer reviewers recommended that PG&E perform groundwater flow modeling to screen suitable sampling locations outside the influence of the chromium plume as defined at the time. PG&E did this in its 2004 Revised Background Study Workplan, and estimated past pumping rates from 1952 to 1991 by estimating the irrigated agricultural acreage in the Hinkley Valley based on historic aerial photographs and recorded pumping rates from the 1990s, the earliest time that such records were available. The groundwater model then predicted historical flow paths based on those pumping estimates, and the results of that modeling, with a buffer zone, were used to screen suitable locations for the Background Study sampling wells.

This approach was consistent with the 2003 peer reviewers' recommendations, and accepted by Water Board staff in the 2004 Revised Background Study Workplan.

Many of the questions that were posed by the peer reviewer had been answered in documents that were not part of the documents provided to the 2011 peer reviewers. PG&E, in its recently submitted *Proposed Work Plan for Evaluation of Background Chromium in the Upper Aquifer of the Hinkley Valley*, has provided responses to the modeling issues raised by the peer reviewers.

Summary of Peer Review Comment: It is possible that "undisturbed" hydrogeologic areas in the Hinkley Valley do not exist due to extensive groundwater pumping and irrigation in the area.

Discussion: A reviewer noted that historical groundwater flow patterns affected by pumping, irrigation, and climate events may have produced a different plume pattern than is observed now, leaving behind dispersed levels of waste chromium which could make background levels difficult to assess. The long period of time since the release of chromium from the cooling towers (between 1952 and 1966), and the lack of detailed information on the locations and rates of historical pumping constrain modeling attempts to accurately depict localized plume migration patterns since the 1950s.

As described above, PG&E modeled historic plume migration since the 1950s, and defined an acceptable area for background sampling outside the plume area based on that modeling. The modeling done by PG&E for the 2007 Background Study Report was consistent with that approved in the 2004 Revised Background Study Workplan, and incorporated the original (2003) peer reviewers' recommendations.

A finer-scale historical groundwater modeling effort could be investigated, although it is unclear if additional historical information or estimation methods would improve modeling beyond what PG&E already previously completed in 2006. There will always be uncertainty in any modeling effort. Determining, with acceptable confidence, areas of the Hinkley Valley to sample that are representative of chromium concentrations absent PG&E's discharge of waste will be challenging. Naturally occurring chromium concentrations vary over time due to differences in geologic materials, groundwater flow patterns, geochemical conditions in groundwater, and other factors. These factors make it difficult to use adjacent groundwater quality to determine what historic (pre-waste discharge) chromium levels were in the plume area.

Additional issues identified

Summary of Peer Review Comment: A peer reviewer noted issues related to analytical chemistry laboratory practices, including test method calibration, establishment of reporting limits, and quality control check procedures.

Discussion: The peer reviewer, through Water Board staff, posed specific questions to the two chemistry labs that performed the sample data analysis for PG&E's 2007 Background Study. Based on the answers received from the labs, the reviewer concluded that the data obtained from the labs may not be valid to determine the actual concentrations of chromium in certain samples.

Water Board staff requested a review of the peer reviewer's comments by our independent contract lab, Excelchem, and used that review to frame questions for additional information from PG&E on quality control issues. PG&E provided the additional information, and responses to the peer reviewer's comments, in a report dated January 20, 2012.

Excelchem staff reviewed PG&E's responses and the additional data provided by PG&E, and concluded that problems with instrument instability and calibration for up to sixteen hexavalent chromium results (out of a total of 122 results, not including duplicate samples) make those data unreliable, and should not be used. The rest of the data are adequate (relative to the quality of the analytical chemistry testing) for the purposes of the background study.

Excelchem's reviews and conclusions regarding the laboratory quality control issues, along with PG&E's January 20, 2012 report, are provided in Appendix 2.

IV. Options for Water Board Consideration

The Water Board must consider whether the existing background values are valid and defensible for the purposes of defining the chromium plume in groundwater and evaluating cleanup progress, in light of the peer reviewers' comments. If the Water Board decides they are not, should the adopted values be re-assessed, or rescinded? This section presents four options to consider.

1. Rescind the adopted background values.

Discussion: The Water Board could rescind the background values adopted in R6V-2008-0002A1 based on the results of the peer review.

If that were done, the question of determining interim concentrations to evaluate and communicate the plume's extent, and assess cleanup progress would still remain. Some options exist to set interim values: the Water Board could consider using 1) the previously approved interim chromium value of 4 ppb for both hexavalent and total chromium, or 2) existing regulatory limits or goals for chromium in drinking water as the level by which to characterize the plume boundary and cleanup progress.

The previous interim chromium value of 4 ppb came from a 2001 Water Board staff sampling program of domestic wells located beyond the plume. This value was used to define the plume prior to the Water Board's 2008 adoption of the current background values. These samples came from long-screened domestic wells with unknown well construction details, or screened across both upper and lower aquifers, an approach which was criticized by peer reviewers of the 2007 Background Study Report.

The issue becomes more complex when using existing regulatory limits or goals for setting interim background values. The existing drinking water standard for total chromium is 50 ppb. Based on Hinkley area data, this value is too high to realistically represent background total chromium, and not is specific to hexavalent chromium. The recently adopted PHG for hexavalent chromium of 0.02 ppb could be considered, but is likely too low to clearly define the boundary

between the chromium plume resulting from PG&E's past discharges and background chromium.

Substituting either the total chromium drinking water standard or the hexavalent chromium PHG for the adopted background values would not add clarity or promote effectiveness in the regulatory efforts of the Water Board to address cleanup of the site. This approach would also create the most uncertainty for the EIR project description, leading to potential significant delays in the release of the EIR.

2. *Retain the adopted background values.*

Discussion: While acknowledging the valid issues brought up by the peer review, the Water Board could determine that the adopted values should be retained, because of uncertainty in determining background values that are significantly different or more representative of "true" background values than those currently adopted. The current average and maximum chromium background values adopted in CAO R6V-2008-0002A1 will remain in place for defining the chromium plume in groundwater and assessing clean up.

This option would create the least uncertainty for the EIR process, as it does not change the current EIR approach. However, given the issues identified by the peer reviewers, this approach will likely not foster confidence in the regulatory efforts of the Water Board among project stakeholders.

3. *Retain the adopted values until a new sampling plan can be accepted, implemented, and new background values calculated.*

Discussion: Two main issues identified by peer reviewers drive the need to consider a new sampling effort: 1) the issue of using properly constructed monitoring wells that are screened specifically in the aquifer of interest; and 2) where to place monitoring wells that will, with acceptable confidence, represent the groundwater quality absent the discharge of waste chromium.

PG&E has submitted a *Proposed Work Plan for Evaluation of Background Chromium in the Upper Aquifer of the Hinkley Valley*, in anticipation of this option. The work plan proposes the collection and evaluation of additional data to expand on the 2007 Background Study Report, and to address comments that were provided by the peer reviewers. The work plan proposes a grid sampling approach, with 25 to 40 sampling locations and up to 96 monitoring wells screened at varying depths within the upper aquifer only. The work plan also contains a proposal to investigate additional methods such as stable isotope analysis to help determine sources of chromium or groundwater flow paths to support modeling efforts. The timeframe estimated to complete the study is at least two years from acceptance of the work plan.

Conducting a new background study has the advantage of fully addressing the shortfalls of the 2007 Background Study Report, and could generate a robust dataset on which appropriate statistical methods could be applied. It would probably not result in delays in the EIR adoption schedule since the existing background values would be retained, but could require future supplemental environmental analysis if a new study results in background values that would trigger such requirements.

This approach may not be preferred by Hinkley residents. Twenty-five Hinkley residents submitted a letter and signature petition to Water Board members to oppose this option. The residents would like an end to the uncertainty surrounding the background concentrations, and have requested that rather than start a new background study, the Water Board should use the only data in the 2007 Background Study that was fully compliant with the approved 2004 Revised Workplan to re-calculate a new background number that can be used in the immediate future. This option is discussed in number 4, below.

4. Retain the adopted values until re-assessment of data subsets from the 2007 Background Study Report can be done, to evaluate different background values.

Discussion: Many of the peer reviewers' questions or concerns may be addressed by re-evaluating the existing dataset. For example, statistical assumptions can be confirmed or rejected, different statistical tests suggested by the peer reviewers or others can be run, data with unacceptable lab quality control issues can be rejected, and the wells added in the third and fourth quarters of sampling can be excluded from the dataset. Data from background wells screened only in the upper aquifer could be exclusively considered, although this dataset (four wells and 15 sample results) may be too small to provide a representative background concentration.

Revising the background values by using a subset of the existing data reported in the 2007 Background Study Report could likely be done within six months, using the State Water Board's agreement for statistical consulting services with the University of California - Davis. Board staff would bring the re-calculated background values to a future meeting for the Water Board's consideration.

This option could also be done in conjunction with option 3, above, where Water Board staff would evaluate different datasets for the Board's consideration while pursuing a new background study plan in the longer term.

This approach may not result in delays to the EIR process, since the existing values would be retained for the immediate term. Any value calculated from the existing dataset may not be significantly different from the current values, so the project area and plume geometry would be within the existing project area of the EIR.

V. Recommendation

Water Board staff recommend moving forward using a combination of options 3 and 4: to retain the existing background values adopted in amended CAO R6V-2011-005A1, while staff investigates the feasibility of developing new background levels using subset(s) of the existing dataset generated from the 2007 Background Study Report. Staff would use the State Water Board's existing contract with University of California-Davis to expedite a review of the data and determine feasible datasets that can used to re-calculate background values.

As noted above, in February 2012, PG&E submitted a proposal for a new background study sampling effort. Water Board staff would review this proposal, and consider the need for peer review and/or consultation with other experts, such as the US Geological Survey, so that any new study will yield a valid, credible and defensible result.

Water Board staff propose to bring any re-calculated background values, along with a recommendation on PG&E's new (February 2012) background study proposal for the Board's consideration no later than October 2012.

Appendix 1: Copies of Peer Reviewers' Comment Letters

A1-1: James Jacobs, Clearwater Group

A1-2: Stuart J. Nagourney, The College of New Jersey

A1-3: Yoram Rubin, University of California-Berkeley

Appendix 2: Technical Reviews of Laboratory Quality Control Issues

A2-1: December 15, 2011: Excelchem Laboratories review of Peer review comments

A2-2: December 22, 2011: Addendum to December 15, 2011 Excelchem review

A2-3: December 29, 2011: Water Board Investigative Order No. R6V-2011-0105, Requiring PG&E to provide Information on Laboratory Quality Control Data

A2-4: January 20, 2012: PG&E's Response to Investigative Order No. R6V-2011-0105. Includes responses to Dr. Nagourney's peer review comments in attachment A.

A2-5: February 23, 2012: Excelchem Laboratories review of PG&E's Response to Investigative Order No. R6V-2011-0105