



Linda S. Adams  
Secretary for  
Environmental Protection



## Department of Toxic Substances Control

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Maureen F. Gorsen, Director  
5796 Corporate Avenue  
Cypress, California 90630



Arnold Schwarzenegger  
Governor

Sent Via Email

September 19, 2007

Ms. Yvonne Meeks  
Portfolio Manager – Site Remediation  
Pacific Gas and Electric Company  
4325 South Higuera Street  
San Luis Obispo, CA 93401

**COMMENTS ON PG&E RESPONSES TO COMMENTS ON HYDROGEOLOGY AND GROUNDWATER SECTIONS OF THE FEBRUARY 2005 DRAFT RFI/RI REPORT FOR THE PACIFIC GAS AND ELECTRIC COMPANY (PG&E), TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA (EPA ID NO. CAT080011729)**

Dear Ms. Meeks,

The Department of Toxic Substances Control (DTSC) has completed the review of the December 5, 2006 responses to DTSC comments on the hydrogeology and groundwater sections of the February 2005 draft RCRA Facility Investigation/ Remedial Investigation (RFI/RI) Report. DTSC understands that due to a format change in the RFI/RI report between the February 2005 and the current three volume approach, PG&E has presented responses to comments that only pertain to the hydrogeology and groundwater portions of the 2005 report in anticipation of compiling Volume 2, Groundwater RFI/RI report. Furthermore, DTSC understands that there could be potential information overlaps between the groundwater investigation Volume 2 and the soil investigation Volume 3 of the RFI/RI report. Therefore, DTSC will provide specific guidance to PG&E, where necessary, on the placement of information between Volume 2 and Volume 3.

Based on our review of the December 5, 2006 submission, DTSC noted several issues with the proposed responses. Enclosed is a Memorandum from Mr. Christopher Guerre of the Geologic Services Unit specifying those concerns. As always, DTSC is open to clarifying our comments with you if needed. DTSC requests that PG&E proceed with the preparation of the revised RFI/RI Volume 2 in accordance with the established project schedule and in response to our comments enclosed.

Ms. Yvonne Meeks  
September 19, 2007  
Page 2 of 2

If you have any questions regarding this matter, please feel free to contact me at (714) 484-5439.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Aaron Yue', with a stylized flourish at the end.

Aaron Yue  
Project Manager  
Geology, Permitting and Corrective Action Branch

aky:090701A

cc: Mr. Casey Padgett  
Senior Attorney  
U.S. Department of the Interior  
Office of the Solicitor  
1050 Walnut Street, Suite 220  
Boulder, CO 80302

Ms. Kris Doebbler  
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## Department of Toxic Substances Control

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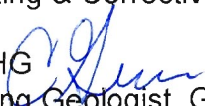
Maureen F. Gorsen, Director  
5796 Corporate Avenue  
Cypress, California 90630



Arnold Schwarzenegger  
Governor

### MEMORANDUM

**TO:** Aaron Yue  
Project Manager  
Geology, Permitting & Corrective Action Branch, Cypress Office

**FROM:** Chris Guerre, CHG   
Senior Engineering Geologist, Geological Services Unit  
Geology, Permitting & Corrective Action Branch, Cypress Office

**DATE:** September 19, 2007

**SUBJECT:** PG&E RESPONSE TO COMMENTS ON THE HYDROGEOLOGY AND  
GROUNDWATER SECTIONS OF THE FEBRUARY 2005 DRAFT RFI/RI  
REPORT.  
PG&E TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

PCA 22120 SITE CODE 540015 WP 48 MPC 36 WR 640371

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### DOCUMENTS REVIEWED

Letter from Pacific Gas and Electric (PG&E) to Aaron Yue, dated December 5, 2006, titled: Responses to DTSC Comments on Hydrogeology and Groundwater Sections, February 2005 Draft RFI/RI Report, PG&E Topock Compressor Station, Needles, California.

Letter from PG&E to Casey Padgett, dated December 5, 2006, titled: Responses to DOI Comments on Hydrogeology and Groundwater Sections, February 2005 Draft RFI/RI Report, PG&E Topock Compressor Station, Needles, California.

The Geological Services Unit (GSU) of the Department of Toxic Substances Control (DTSC) has reviewed the above-referenced documents regarding PG&E response to comments provided by Consultative Workgroup (CWG) members on the draft version of the 2005 RFI/RI Report. PG&E's responses to the comments will be used in preparing the groundwater section of the the RFI/RI Report, Volume 2 – Groundwater (revised Report).

The GSU has reviewed the responses to comments and has identified areas where additional discussion is needed in the revised Report or where the responses do not address the initial comment. Past comments are presented in italics below and utilize PG&E's December 5, 2006 numbering system. Questions regarding this memorandum should be directed to Chris Guerre at (714) 484-5422 or [cguerre@dtsc.ca.gov](mailto:cguerre@dtsc.ca.gov).

### **General Comments**

1. The revised RFI/RI Report should utilize data collected up to July 31, 2007. Data collected after this date will be reported in other reports or addendums to the RFI/RI Volume 2 Report. The December 5, 2006 PG&E letters reviewed identified an anticipated March 2007 RFI/RI cutoff date.
2. Information (e.g., aquifer tests, flow logging) currently being obtained through the investigations of bedrock wells (i.e., PGE-7, PGE-8, MW-48, and MW-23) should be included in the revised RFI Report.

### **PG&E RESPONSES TO STAKEHOLDER RFI COMMENTS (PARTS A & B)**

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DTSC COMMENT [S4-18] (3/10/06 GSU Memo, Comment 18)

*Page 2-8, Section 2.4.2, third paragraph. This section discusses river level data collected in Topock Gorge between 1930 through 1980. The section and Figure 2-8a should be updated to include recent river level data that are available for Topock Gorge.*

*PG&E RESPONSE: Section 2.4.2 and Figure 2-8a were provided as an illustration of river fluctuation and trends over a longer period of time, and were not meant to be comprehensive. The revised Report text and figure will be updated with any additional available information.*

*DTSC FOLLOWUP: DTSC desires a comprehensive summary that includes more recent data that should be available. Section 2.4.2 and Figure 2-8a should be updated to include recent river level data that are available for Topock Gorge.*

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DTSC COMMENT [S4-20] (3/10/06 GSU Memo, Comment 20)

*Page 2-10, Section 2.5.2. Provide a detailed structural contour map of the top of the Miocene Conglomerate. Use the map to support a discussion of the potential influence of the bedrock surface configuration on groundwater flow.*

PG&E RESPONSE: *The revised Report will include a structural contour map of the bedrock surface. The text will be modified to present a discussion of the effects of the bedrock surface on groundwater flow.*

DTSC FOLLOWUP: Please ensure that all data used to derive the structural contour map of the bedrock surface are clearly described within the revised Report text and/or on the figure itself.

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DTSC COMMENT [S4-29] (3/10/06 GSU Memo, Comment 29)

*Page 2-17, Section 2.5.4.1. This section should also discuss the estimated volume of groundwater that is recharged from the Colorado River and how far inland the mixing zone between the Alluvial Aquifer and surface water is observed.*

PG&E RESPONSE: *The revised Report will update the discussion in this section to clarify the water balance relationship between the river and groundwater. There is a net discharge of groundwater to the river. Only during the spring months (and some years early summer) does the river recharge the alluvial aquifer at the Topock Site area. Further north in Mohave Valley, the river is the main source of groundwater recharge.*

DTSC FOLLOWUP: As originally requested, please also ensure the revised Report discusses how far inland the mixing zone between the Alluvial Aquifer and surface water is observed.

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DTSC COMMENT [S4-34] (3/10/06 GSU Memo, Comment 34)

*Page 2-20, Section 2.5.5.1, first paragraph. The illustration of horizontal hydraulic gradients outside of the floodplain area should be supported by groundwater elevation contour maps generated using monthly averages of groundwater elevations, rather than the two-year average of groundwater elevations used for Figure 2-21. The time intervals contoured should be representative of high and low river stands.*

PG&E RESPONSE: *The revised Report will discuss horizontal hydraulic gradients outside the floodplain area using groundwater elevation maps made using selected monthly averages of groundwater elevations.*

DTSC FOLLOWUP: Note: The time intervals contoured shall be representative of high and low river stands (see also PG&E Response to ADEQ Comment [S1-24] (6/28/05 Memo)).

DTSC COMMENT [S4-50] (3/10/06 GSU Memo, Comment 50)

*Table 2-3. Add a note that indicates how the upper, middle, and lower portions of the Alluvial Aquifer are defined. Add a note that indicates where the items listed in the last column can be found in the RFI Report. For the borings, indicate the deeper encountered unit.*

PG&E RESPONSE: *The drilling summary table in the revised Report will include the aquifer interval definitions and will be updated with full listing of drilling locations. For borings not completed as wells, the deeper encountered unit will be listed.*

DTSC FOLLOWUP: As originally requested, please also add a note to Table 2-3 that indicates where the items listed in the last column can be found in the RFI Report.

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DTSC COMMENT [S4-51] (3/10/06 GSU Memo, Comment 51)

*Table 2-4. CH2M HILL (2004) is not included in the reference list. Well MR-24BR should be listed as a pre-Tertiary Bedrock well rather than as a Miocene Conglomerate well.*

PG&E RESPONSE: *The revised Report will clarify the monitored zone for MW-24BR as Miocene and/or pre-Tertiary Bedrock in Table 2-4 to be consistent with other tables and discussions in the revised Report.*

DTSC FOLLOWUP: As originally requested, please ensure that the CH2M HILL (2004) reference in Table 2-4 is included in the reference list. Additionally, the geophysical data obtained during Spring 2007 during investigation of well PGE-7 should be utilized in establishing the stratigraphic unit monitored by well MW-24BR.

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ADEQ COMMENT [E-comment S1-2] (6/28/05 ADEQ Memo, page 2)

**Concentration Contouring** – *Concentration contouring would be very useful for depicting vertical and horizontal distribution. It would be helpful if the RFI contained concentration contouring for chromium and TDS to depict the vertical and horizontal extent of contamination and to facilitate discussion and the next steps in the Resource and Recovery Act (RCRA) remedial process. Concentration contours are very useful in examining the spatial behavior of the plume.*

PG&E RESPONSE: *The February 2005 draft Report included plume contour maps using 50 µg/L Cr(VI) for site-wide plume delineation. The revised Report will include updated figures that depict the horizontal and vertical Cr(VI) distribution and plume contouring, and will be similar to the contour maps in PG&E's 2006 IM performance*

*monitoring reports. Contouring TDS concentrations in map and cross section view is not warranted, based on the horizontal and vertical variability in data in groundwater at the site.*

DTSC FOLLOWUP: As TDS (Total Dissolved solids) is a constituent of potential concern and was part of the waste stream that was discharged along with the hexavalent chromium to groundwater at the site, PG&E will need to illustrate the spatial distribution of TDS within the aquifer, both vertically and laterally, within the revised Report. If contouring is not warranted, then it is suggested that TDS concentrations for bedrock, the upper, middle, and lower zones be depicted in map views. Cross section views should also depict TDS concentrations to illustrate the horizontal and vertical variability in data.

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ADEQ COMMENT [S1-23] (6/28/05 Memo)

*Figure 2-22, 2-22b, 2-22c Groundwater Contour Maps – Please verify that elevations in extraction wells are not being used for contouring. Or if they are, are they being corrected for well in-efficiencies? How were wells selected for this contouring? Selection of wells for contouring can affect the outcome of contouring and selection criteria should be explained as a part of documentation. What was considered as the break off point for Upper Unconsolidated Aquifer/Alluvium?*

PG&E RESPONSE: *PG&E agrees that extraction wells are not reliable data points for water level contouring. Further, because well inefficiencies can be significant, but are difficult to estimate, none of the PG&E published reports including the RFI, have used extraction wells water levels, corrected or uncorrected. The revised Report will include representative groundwater gradient maps for the IM performance monitoring area and site-wide shallow well groundwater gradient maps generated and reported in PG&E's groundwater monitoring reports.*

DTSC FOLLOWUP: The revised Report should also discuss how wells were selected for contouring and the division/"break off point" between aquifer zones as requested in ADEQ's comment.

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ADEQ COMMENT [S1-25] (6/28/05 Memo)

*From examining Figure 2-22c – it appears that only 3 wells in close proximity were used for contouring in conjunction with MW34-80 and possibly river elevations. Contouring is a subjective process that is made more complicated, if vertical gradients are present. Please provide explanation for use of river elevations in groundwater contouring and for using a very limited number of wells in creating this figure. Contouring does not currently include newly installed wells such as MW-34-100. It is possible that additional wells may be needed to adequately contour this zone.*

**PG&E RESPONSE:** *The revised Report will include groundwater gradient maps for depth intervals in the floodplain area (from IM performance monitoring reporting) using previously existing and newly installed monitoring wells (2005-2007). The revised Report will qualify the depths and distribution of well screen/data available to map gradients in the actively pumped IM area.*

**DTSC FOLLOWUP:** The revised Report should also discuss the use of river elevations in groundwater contouring as requested in ADEQ's comment.

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**ADEQ COMMENT [S1-38]** (6/28/05 ADEQ Memo, page 9)

*Section 9.2.5 Surface Water Samples. It is important to note that none of the sampling locations in the river at the time of this draft report were positioned adjacent to the highest plume concentrations in the floodplain wells, especially, none were in line and adjacent to MW-34-100 (and the wells located west of this well with greater concentrations). ADEQ notes that there are also no surface water sample locations adjacent to the East Ravine or downriver of this ear towards the mouth of Topock Gorge. Modeling runs performed by Hill suggest that the plume could potentially be pulled in this direction by groundwater withdrawal in Arizona water supply wells. From Technical Workgroup Meeting discussions, the sample collection depth has been identified as 6 inches from the top of the water column in the Colorado River. ADEQ requests that text describe the collection point as 6 inches beneath the water surface. All this is important information that should be provided in the RFI to frame interpretation of the results. Without it, the results are misleadingly optimistic. For example, if chromium were to reach the river, the lower water column is the more likely location where it would be detected/found. Samples collected in the upper 6 inches would not be suitable for examining this issue. Therefore conclusions regarding potential influence of the plume on surface water cannot be made.*

*PG&E has prepared a surface water sampling proposal which will be implemented in July 2005. This includes depth specific sampling and additional sampling locations to address the concerns above. This is an important step in responding to ADEQ's concerns. The RFI should include information about the new procedures that will be implemented.*

*This section also should also cross reference Section 13.13.1 which discusses detections of Cr(VI) in the Colorado River during the June 2002 sampling event. Please see ADEQ comments regarding conclusions made by Hill.*

**PG&E RESPONSE:** *As ADEQ indicates, PG&E's expanded surface water sampling program, including in-channel sampling, has been conducted since summer 2005. Note that all surface water samples collected under the expanded surface water program*



*have shown no detectable Cr(VI) in any river water samples. The revised Report will be updated with data from the expanded surface water monitoring program through March 2007.*

DTSC FOLLOWUP: ADEQ noted the lack of surface water sample locations adjacent to the East Ravine. As the East Ravine is a concern to DTSC (see response to GSU General Comment 3, Section 11) with anomalously high hexavalent chromium detected in nearby shallow bedrock well MW-23, DTSC requests that PG&E add a new Shoreline Location to the Surface Water Monitoring Program for a period of one year. This location should be located due east of groundwater well MW-23 between Shoreline Locations R-22 and I-3 in the vicinity of the open "pond" that laps up onto the bedrock surface. Although this location is not on the main channel, data from this location could help to ensure that the Colorado River is not currently being impacted from site related activities. Data collected from this surface water location shall be reported in routine Groundwater and Surface Water Monitoring Reports and not reported in the revised Report.

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ADEQ COMMENT [S1-43] (6/28/05 ADEQ Memo, page 11)

*Section 11.0, Conceptual Site Model, page 11-1: "Both groundwater beneath the compressor station and surface water in the Colorado River have designated beneficial uses that include municipal and domestic water supply, although much of the groundwater contains levels of TDS that inhibit its use of potable water supply." Arizona aquifers are protected as drinking water sources regardless of TDS and water quality.*

PG&E RESPONSE: *Applicable or relevant and appropriate requirements for groundwater will be identified as required by CERCLA.*

DTSC FOLLOWUP: Appropriate sections of the revised Report should clearly incorporate ADEQ's comment that Arizona aquifers (defined as yielding more than five gallons a day) are protected as drinking water sources regardless of TDS and water quality.

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MWD COMMENT [S2-41] (6/30/05 MWD written margin comments on Section 2.5, page 2-12) *Short-duration single well tests also have limitations due to well interferences, etc.*

PG&E RESPONSE: *The revised Report will clarify the features of short-term aquifer tests in the hydraulic testing discussion.*

DTSC FOLLOWUP: The term “features” is somewhat vague in the preceding PG&E response. The revised Report shall acknowledge and address limitations of short-duration single well tests.

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MWD COMMENT [S2-49] (6/30/05 MWD written margin comments on Section 2.5, page 2-19) *Average gradients will be influenced by the duration of period used.*

PG&E RESPONSE: *The revised Report will provide an updated discussion and presentation on the horizontal and vertical hydraulic gradients.*

DTSC FOLLOWUP: The updated discussion in the revised Report should indicate and illustrate why a particular time interval (e.g., one month versus two weeks) was chosen to average gradient data from well transducers.

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MWD COMMENT [S2-50] (6/30/05 MWD written margin comments on Section 2.5, page 2-20)

*“Groundwater elevations from the upper, middle, and lower portion of the alluvial aquifer in June 2004 are shown and contoured in Figures 2-22A through 2-22C, respectively.” There are very limited, i.e. snapshot. Elevations vary daily, weekly, monthly and annually. “As described in Section 2.4, the limited amount of rainfall recharge in the nearby mountains enters the Alluvial Aquifer via upward seepage from the bedrock underlying the Alluvial Aquifer.” This suggests the bedrock is a viable conductor for groundwater movement and therefore contaminant transport.*

*“It is evident that the direction of groundwater gradient near the river changes during the course of each day seasonally in response to changes in river level (Section 2.4.2).” Unclear. Do you mean to say “each day” and “seasonally”? Inconsistencies on how groundwater moves onsite. This argument is counter to earlier comments. “There are no apparent continuous aquitards present at the site.” Need nested bedrock well to show this.*

PG&E RESPONSE: *The revised Report will provide an updated discussion and presentation on the horizontal and vertical hydraulic gradients and summarize the information presented in the Bedrock Evaluation Technical Memorandum regarding assessment of bedrock water-bearing characteristics.*

DTSC FOLLOWUP: PG&E will need to respond to the “each day seasonally” concern identified above if this unclear, undefined term will be carried forward into the revised Report.

MWD COMMENT [S2-86] (6/30/05 MWD written margin comment on Section 9.1, page 9-1)

*Please provide clarification: What were the objectives? What was achieved? What were the results? Were there data quality objectives established? Did the data collected meet the objectives?*

*PG&E RESPONSE: All of the RFI data collection efforts were conducted according to work plans that were submitted to, and approved by, DTSC. The work plans contain information on objectives and the rationale for the sampling. The completed phases of the RFI sampling met the objectives presented in the initial work plans. A listing of the work plans prepared under the RFI program is provided in Section 9.2 and will be updated in the revised Report.*

DTSC FOLLOWUP: Discussion of soil and sediment data quality contained in either the revised Report or RFI Volume 3 (Soils) should refer the reader to the Soil and Sediment Data Usability Assessment Memorandum (CH2M Hill, 2006a) to provide additional data quality information regarding historical soil and sediment data.

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MWD COMMENT [S2-122] (6/30/05 MWD written margin comments on Section 13.3.1, page 13-14)

*Re-tests were outside of holding times. Please provide complete laboratory QA/QC for these data.*

*PG&E RESPONSE: The revised Report will include an updated and expanded discussion of the surface water sampling results and characterization. The data review and verification sampling for the suspected false-positive Cr(VI) results from June 2002 sampling will be presented and qualified as appropriate.*

DTSC FOLLOWUP: The revised Report should reference the document reporting the June 2002 sampling results and summarize associated laboratory QA/QC data.

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DTSC COMMENT (6/27/06 GSU Memo, General Comment 3, Section 11)

*Section 11 describes pathways to groundwater associated with selected wastewater management practices for the Topock Compressor Station. The section discusses groundwater pathways related to the former percolation bed in Bat Cave Wash (SWMU 1/AOC 1) and injection well PGE-08 (SWMU 2/AOC 2). This section should be revised to discuss the groundwater pathways associated with the following SWMUs and AOCs.*

- *SWMU 5. The RFI Report should consider the sludge drying beds as a potential source to groundwater. Review of the historical aerial photographs indicates*

*ponded water in the drying beds which potentially allowed wastewater to migrate through joints in the concrete. The beds were also used for wastewater treatment which also had associated impounded water.*

- *SWMU 6. Between 1969 and 1985, approximately 30,000 gallons per day were discharged to the chromium reduction tank. Hexavalent chromium concentrations in influent and effluent were on the order of 0.6 to 6 milligrams per liter (mg/L) and 0.42 mg/L, respectively. The tank represents a source to groundwater because the base of this tank was not lined or paved (see Section 4.1.5.1).*
- *AOC 10 (East Ravine). The groundwater pathway is likely to be complete in the East Ravine. A 1955 aerial photograph shows two drainage ditches conveying liquids or runoff from the compressor station area to the ravine. Aerial photographs from 1964 and 1967 show ponded water in the ravine. The volume of wastewater discharged to the ravine is unknown, but could be assumed to have been sufficient to percolate to groundwater.*

*PG&E should expand Section 13.1.2.2 to discuss these potential sources to groundwater. Depending on the findings of additional soil investigation, PG&E may need to expand the extent of the chromium plume depicted in the RFI Report and other monitoring reports to include the area of the sludge drying beds and chromium reduction tank.*

#### **PG&E RESPONSE:**

*Section 5 of Volume 1 of the revised RFI/RI Report (submitted to DTSC and the federal agencies on September 6, 2006) describes the closure activities and status of all SWMUs and AOCs within the site investigation and closure process. Based on closure activity documentation, including confirmation soil sampling, and the closure certification acceptance issued by DTSC in 1995, the sludge drying beds and chromium reduction tank were classified as closed SWMUs. Therefore, SWMUs 5 and 6 were not carried forward in the RFI/RI process. Additionally, the 2<sup>nd</sup> bullet Comment 3 should be clarified that the chromium reduction tank was a 10' high by 5' diameter steel tank set within an unlined pit, and that there was no indication of liquid releases at this unit during the RFA facility inspection (A.T. Kearney 1987).*

*As part of the upcoming Work Plan for RFI/RI soil investigation, Part B (sites within the Compressor Station property), PG&E does plan to drill some deep soil borings at the facility as part of the investigation of AOC 13 (Unpaved Areas within the Compressor Station) and may complete one or more of these borings as monitoring wells if groundwater is encountered. Although this activity will not be associated with the closed SWMUs 5 and 6, it will provide additional subsurface soil and groundwater characterization in the vicinity of these closed SWMUs.*

*For AOC 10 (East Ravine), PG&E acknowledges that the supplemental deeper drilling and sampling investigation would be appropriate to determine if groundwater is present and to complete the characterization of a potential groundwater pathway at AOC 10. Accordingly, it is recommended that the Work Plan for RFI/RI soil investigation, Part A (draft submitted November 16, 2006) include supplemental deeper soil and groundwater characterization activities for AOC 10. The draft Work Plan for the Part A soil investigation will be revised to include deeper drilling to bedrock in one or more soil boring locations in AOC 10 (where feasible).*

DTSC FOLLOWUP: SWMUs 5 and 6 will be carried forward in the RFI/RI process and further investigated as indicated in Section 5 of PG&E's RFI/RI Report - Volume 1 (CH2M Hill, 2007a).

SWMU 6, Chromate Reduction Tank: The 1990 Closure Report (Mittelhauser Corporation, 1990) suggests that the Chromate Reduction Tank could have leaked and released contaminants to groundwater. Page 6-4 of the 1990 Closure Report states, "The soil floor of the hole in which the Chromate Reduction Tank sat was unlined. There was a "bathtub ring" on the walls of the hole and the soil floor appeared compacted, as if water had stood in the hole." The Closure Report further states, "The bottom of the tank had a 2-foot-square fiberglass patch on the inside and a 1-foot-diameter welded steel patch on the outside." The revised Report should acknowledge that the SWMU 6, Chromate Reduction Tank is a potential historical site source for chromium that is planned to be further investigated during upcoming soil sampling investigations within the facility's fence line.

AOC 10 (East Ravine): The revised Report should acknowledge that groundwater investigation will be required for the East Ravine. This will likely require drilling into bedrock due to existing site geology. Concern exists that the East Ravine is a source of groundwater impact due to the following factors: significant amounts of fluids were impounded behind the largest dam (Area 10c - CH2M Hill, 2007a/ 2006b) during the 1960's; the chromium concentrations detected in soil samples from the 10c impoundment area are the highest (3,360 mg/kg) detected on the entire facility (CH2M Hill, 2006b); the impoundment 10c area contains a white powdery material similar to the white material in Bat Cave Wash; a greenish gray layer has also been identified in the 10b area of the East Ravine; and chromium has recently been detected in groundwater in bedrock well MW-23 in 2006 and 2007 at concentrations greater than 1,000 ug/L (CH2M Hill, 2007b).

DTSC COMMENT (6/27/06 GSU Memo, General Comment 4, Section 11)

*The conceptual site models (CSMs) included in Section 11 are intended to support the risk assessment. The RFI Report should also include a conceptual model of chromium plume migration from all known and potential source areas to the present groundwater plume position. The RFI Report should discuss the potential fate and transport of chromium discharged to Bat Cave Wash, the chromium reduction tank, and into injection well PGE-08. In addition, the RFI Report should discuss the potential contaminant migration pathways associated with the East Ravine (e.g., potential for water to travel through thin sediments to bedrock, potential to travel through bedrock to floodplain area). The discussion related to injection well PGE-08 should address the potential effect of upward hydraulic gradients and the Chemehuevi Fault on migration of injected water.*

PG&E RESPONSE:

*The revised Report will present and discuss conceptual site models for the potential fate and transport of chromium discharged to Bat Cave Wash (SWMU 1) and the injection of treated blow-down wastewater in well PGE-8 (SWMU 2). These discussions will be based on the site data that will be available as of March 2007 (assumed cut-off date for the revised Report). The data from the planned hydraulic testing of the PG&E bedrock wells and updated model runs for groundwater flow for the Alluvial Aquifer at SWMU 1 will be incorporated. As noted in the response to Comment 3, the chromium reduction tank was certified as a clean-closed SWMU with no evidence of adjacent liquid releases, and therefore development of an area-specific CSM (including fate and transport assessment) for this SWMU is not warranted and will not be included in the revised Report.*

*Regarding the East Ravine (AOC 10), additional drilling and soil sampling characterization is planned as part of the upcoming RFI/RI soil investigation. Based on the proximity to bedrock outcrop surrounding the East Ravine, it is anticipated that one or more of the deepened soil borings (see Response to General Comment 3) will confirm the depth to bedrock and support the current interpretation that the alluvium in this area is thin (i.e., < 30 feet thick) and significantly above the water table. Where use of drilling equipment is feasible, selected borings will be drilled to bedrock and soil samples analyzed to characterize the complete alluvium interval. Samples of groundwater will be collected in the deeper borings if encountered. The results of the deepened soil borings in East Ravine will be included in the revised Report as available relative to the RFI/RI cut-off date.*

*The feasibility of incorporating the results of proposed additional drilling and evaluation of the groundwater pathway within the unpaved areas of the Compressor Station (AOC 13) in the revised Report will be assessed after the Work Plan for the Part B soil investigation is submitted and approved by the agencies.*

DTSC FOLLOWUP: The revised Report should acknowledge that groundwater investigation will be required for the East Ravine. The revised Report must also discuss a conceptual site model for the potential fate and transport of chromium discharged to the East Ravine (AOC 10) that will be further evaluated through groundwater investigation. The revised Report should acknowledge that SWMU 5 and 6 are potential historical site sources of chromium that are planned to be further investigated during upcoming soil sampling investigations within the facility's fence line. Also see DTSC response to the preceding comment.

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DTSC COMMENT (6/27/06 GSU Memo, General Comment 5, Section 11)

*Section 11 repeatedly makes the assertion that the groundwater pathway associated with incidental surface releases (e.g., cooling towers, southeast fenceline, East Ravine) is incomplete. The revised report should include a more robust discussion that supports this assertion. The discussion should be supported by calculations (if needed) and appropriate references.*

DTSC FOLLOWUP: PG&E did not respond to this comment as part of the RFI/RI Volume 2 Report responses. The revised Report must address this groundwater pathway concern.

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DTSC COMMENT (6/27/06 GSU Memo, General Comment 6, Section 13)

*With the additional data collected since June 2004, PG&E has sufficient data to prepare a more sophisticated CSM of chromium plume migration than is described in Section 13.1.3 and shown in Figure 13.2. GSU anticipates that the CSM for chromium plume migration will use the fence diagrams and/or block diagrams required by the February 3, 2006 DTSC letter, and will include a narrative that addresses key issues affecting chromium migration. Some items that should be addressed by the CSM presented in Volume 2:*

- a. Probable historical chromium transport directions and rate of movement from various source areas to current plume center of mass. Discuss direction and rate of plume migration under the following conditions.*
- Groundwater extraction at PGE-01, PGE-02, PGE-06, and PGE-07 and groundwater mound induced by discharge to Bat Cave Wash.*
  - After cessation of pumping from water supply wells, but continued discharge to Bat Cave Wash.*
  - After cessation of discharge to Bat Cave Wash.*

*Support discussion with groundwater flow model simulations of induced gradients and groundwater flow regime.*

*b. Factors affecting observed chromium plume configuration and distribution of chromium mass at various depths in the Alluvial Aquifer (e.g., upper, middle, lower). Some items to be addressed:*

- Possible mechanisms for a relatively shallow plume mass at some upland locations (e.g., MW-31, MW-50), a fully penetrating plume mass at other locations (e.g., MW-20, MW-26/MW-51), and a deep plume mass at other locations (e.g., MW-37D, MW-50).*
- Possible mechanisms for chromium plume distribution observed at elevations less than 325 feet mean sea level (e.g., MW-46-175, MW-50-200) in alluvial fan deposits.*
- Potential effect of salinity of discharged wastewater on chromium plume migration.*

PG&E RESPONSES to Individual General Comment #6 Items:

*a. Historical chromium transport directions and rate of movement of the chromium plume in the Alluvial Aquifer at SWMU 1 will be addressed and presented in the final Groundwater Model Report for the scenarios listed in this comment. A summary of this presentation will be incorporated in the revised RFI/RI Report. It should be noted that there are no records available that indicate the replacement compressor station supply wells PGE-6 and PGE-7 were ever operated for facility supply, and hence groundwater pumping from these wells will not be included in the modeling scenarios.*

*b. Aquifer heterogeneity is the likely primary factor that affects the observed chromium plume configuration and distribution of chromium mass in the Alluvial Aquifer. The revised Report will include a general discussion of the complexity of the depositional environments that comprise the Alluvial Aquifer and the effects of geochemistry on the distribution of chromium in the plume. However, to attempt to describe specific mechanisms for observations at specific wells would require speculation beyond what is considered appropriate or meaningful in the context of an RFI/RI. The revised Report will also include a discussion regarding the effects of salinity on groundwater transport at the site. It should be noted that all available records indicate that the cooling tower blow-down would be classified as brackish to slightly saline water (between 1,000 and 20,000 mg/L TDS). The TDS of this water would not be drastically different from the TDS of natural groundwater in bedrock or in the deeper interval of the Alluvial Aquifer.*

DTSC FOLLOWUP to General Comment 6a and 6b:

6a: There appears to be some uncertainty regarding the use of wells PGE-6 and PGE-7 as station water supply wells. Modeling of chrome transport with PGE-6 and PGE-7 extraction should be considered if additional operations information becomes available for these wells or if other modeling scenarios are not able to reasonably depict site



conditions. Potential for the chromium groundwater plume to be influenced by extraction at nearby Arizona wells (i.e., Topock-1, Topock-2, Topock-2A, Topock-3, Smith well, Sanders well, PGE-09N, and PGE-09S) should also be discussed and included in the revised Report and Groundwater Model Report.

6b: One goal of a conceptual site model is to explain observed site conditions. Therefore, as originally requested in General Comment 6b, PG&E shall consider factors affecting observed chromium plume configuration and distribution of chromium mass at various depths in the Alluvial Aquifer (e.g., upper, middle, lower). Also see the subsequent DTSC comment regarding saline-driven plume transport.

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DTSC COMMENT (6/27/06 GSU Memo, General Comment 7, Section 13)

*In various discussions over the last two years, several stakeholders have raised concerns regarding saline-driven transport of the chromium plume. PG&E has responded that saline-driven transport is not a significant factor for the chromium plume migration and is not always associated with the chromium plume. Given that this issue continues to be raised, GSU recommends that Volume 2 include a stronger discussion of naturally-occurring salinity stratification observed in the site vicinity and reported in the literature for the Mojave Desert. Hence, the salinity discussion at the top of Page 13-3 should be more fully developed. In addition, the CSM for chromium plume migration should address salinity.*

*PG&E RESPONSE: The published water quality data for comparable alluvial groundwater basins in the Mojave Desert, California and western Mojave County, Arizona (e.g., USGS and ADEQ reports) will be reviewed and discussed in the revised Report as appropriate. The conceptual site model for chromium plume migration presented in the revised Report will address the salinity and other general chemistry characteristics of the Alluvial Aquifer.*

DTSC FOLLOWUP: In addition, an expanded discussion regarding saline-driven plume transport is also requested. Site-specific salinity and density information, along with standard processes and mechanisms, should be used to discuss the potential for saline-driven flow at the Topock site. In particular, the revised Report should address factors raised by Hunt and Flowers (2007b) regarding density mixing processes. During a recent presentation (Hunt and Flowers, 2007a), Professor James Hunt summarized that brine releases can sink through an aquifer and become emplaced on top of bedrock or within fine-grained units and act as a persistent source for dissolved phase plume contamination. The presentation included the PG&E Hinkley, California Compressor Station as an example of a hexavalent chromium plume formed from releases of dense brines. The plume was hypothesized to persist due to the slow, continued release of contaminants from an emplaced subsurface brine. As the Hinkley site had operations

and waste management practices similar to Topock, it is reasonable for PG&E to evaluate this potential contaminant transport mechanism at Topock. The revised RFI Report should thoroughly discuss this topic as it could impact the selection of remedial measures and development of the conceptual site model.

The revised Report should also present a discussion on stratified plumes. This discussion should utilize the API 2006 reference on diving plumes. In particular the site conceptual model should consider Figure 4 of the API 2006 bulletin regarding diving plumes near streams due to bank storage.

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DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 3)

Page 9.10, Section 9.3.4.1. *Please elaborate on the criteria that were used to determine whether historical data should be included in the RFI Report.*

*PG&E RESPONSE: The historical (pre-RFI) data pertaining to site hydrogeology and groundwater conditions were summarized in the Current Conditions Report (Alisto 1997). The historical data most applicable for incorporation in the RFI include the well drilling logs and well testing data for the following investigations: PGE-series supply and injection wells, Old Ponds site investigations, New Ponds site investigations, Park Moabi water supply well, and the Caltrans exploratory borings for the I-40 bridge. The historical water quality data and groundwater elevation data from pre-RFI investigations are useful for general site assessment but are not recommended for full evaluation and analysis in the final RFI groundwater characterization. This is because of the variations and uncertainty of sample collection and analytical methods, and the infeasibility of completing data QC review, and validation of the historical chemical data.*

DTSC FOLLOWUP: The GSU concurs with the general approach regarding the historical hydrogeological data, but does not believe that it is infeasible to assess the quality of the historical data. PG&E has recently conducted a data quality/usability assessment of historical soil and sediment data (CH2MHill, 2006a) and, while not currently considered necessary, could conduct a similar assessment of historical groundwater data. Note: For completeness, the revised Report should cite available historical hydrogeological data from the several underground storage tank groundwater wells completed at the Topock Marina in Arizona.

DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 4)

*Page 10-5, Section 10.1.6. Please describe the methods that were used to derive the soil background data set.*

PG&E RESPONSE: *The soil data collected by the initial RFI contractors (E&E and Alisto) were used to derive the background data set presented in the February 2005 draft RFI/RI Report. The methodology was described in Section 10.1.6.3 and Tables 10-7 and 10-8 in the draft Report. In summary, the background metals concentrations reported for the initial RFI sampling were either the statistically derived "upper tolerance limit" of detected concentrations, or the maximum detected concentrations (for sampling results/detections too limited for statistical analysis). As requested by DTSC in 2006, the initial background soil data set will be replaced with data from a more comprehensive soil background investigation scheduled for first quarter 2007. The results of this sampling will be presented and discussed in the Volume 3 (Soil) of the revised RFI/RI Report.*

DTSC FOLLOWUP: The RFI/RI Report, Volume 3 shall include examples of any statistical calculations and procedures (as text, table, spreadsheet, or appendix) to provide reviewers with a clear understanding of the technique and more easily allow stakeholders to replicate the statistical calculations if so desired. Finally, the additional background soil data that is to be collected in the future (CH2M Hill, 2006b) will be used to supplement the existing background soil data set and not necessarily replace it.

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DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 5)

*Page 11-2, Section 11.1.2, second sentence: This sentence states that there are no potable water supplies in the immediate vicinity of the compressor station. Please restate that the closest potable water supply is the Park Moabi well and that the groundwater pathway does not appear to be complete for this receptor.*

PG&E RESPONSE: *The discussion of active water supply wells in the revised Report will be updated with the requested information.*

DTSC FOLLOWUP: This section of the revised Report should also comment on the status of the following active or recently active water supply wells in the immediate vicinity of the station: Topock-1, Topock-2, Topock-2A, Topock-3, Smith well, Sanders well, PGE-09N, PGE-09S.

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DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 6)

*Page 13-3, Section 13.1.2.1, first paragraph: This section references literature studies that report naturally-occurring hexavalent chromium concentrations up to 50*

*micrograms per liter ( $\mu\text{g/L}$ ) in the region. Volume 2 of the RFI should also provide the range of hexavalent chromium concentrations observed in wells sampled by the Groundwater Background Study.*

*PG&E RESPONSE: Validation of analytical results of the 2005-2006 Groundwater Background Study was completed in July 2006. The determination of the final background groundwater concentrations for Cr(VI) and other metals will not be available until the statistical analysis is completed and approved (anticipated by March or April 2007). Accordingly, it is possible that only a summary of the sampling results and ranges of concentrations from the Groundwater Background Study will be presented in the revised Report.*

DTSC FOLLOWUP: As originally requested, the revised Report should also provide the range of hexavalent chromium concentrations observed in wells sampled during the Groundwater Background Study. The observed range of concentrations will not change regardless of the statistical approach utilized and will provide salient information applicable to the Topock site. See also PG&E response to DOI Comment 139.

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DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 9)

*Table 9-1: Please include PGE-01 and PGE-02 on this table.*

*PG&E RESPONSE: Available information for these decommissioned/abandoned industrial supply wells will be included in the revised Report.*

DTSC FOLLOWUP: Please ensure that these two wells are listed in the equivalent Table 9-1 in the revised Report.

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DTSC COMMENT (6/27/06 GSU Memo, Specific Comment 10)

*Table 9-2: This table should also summarize the groundwater data collected in the vicinity of the Old Evaporation Ponds.*

*PG&E RESPONSE: We feel it is appropriate to summarize the groundwater data that was collected for both the Old Evaporation and New Evaporation Ponds sites and cite the reports that presented these data. However, as indicated in the above response to Specific Comment 3, we feel the actual data from these historical studies should not be incorporated in the data set used for the RFI characterization due to the lack of analytical data documentation, QC review, and validation.*

DTSC FOLLOWUP: See the DTSC response regarding Specific Comment 3 above.

## PG&E RESPONSES TO DOI RFI COMMENTS

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**Comment 32:** PG&E did not respond to this comment. The response provided for Comment 32 actually responds to Comment 31. PG&E shall address the request contained within Comment 32 within the revised Report.

**Comment 47:** PG&E did not respond to a portion of this comment (third paragraph) regarding comparison to background conditions and “not solely potential standards”. PG&E shall address the third paragraph contained in Comment 47 within the revised Report.

**Comment 101, Page 11-1:** It should be noted that groundwater well installations are being discussed for the East Ravine area and within the fence line of the Compressor Station. Additionally, all soils data to be collected from upcoming investigations will be evaluated at each included AOC/SWMU to determine if additional groundwater pathways may exist.

**Comment 158:** The comment discusses the potential for radial flow from discharges into Bat Cave Wash due to reported mounding associated with the discharge. PG&E’s response indicated that the spreading associated with the mounding would not be excessive as based on model simulations. PG&E further states that the extent of plume spreading beneath Bat Cave Wash is not known, but is reasonably well defined.

The lateral extent of the plume near wells MW-9, MW-11, and MW-38S/D has not been fully assessed. To the west, only well cluster MW-40S/D is located west of Bat Cave Wash approximately 1,000 feet away from the discharge area. The presence of anthropogenic hexavalent chromium in well MW-40D is not easily explained. Perhaps radial flow did occur to the west at the discharge area causing the observed detection in well MW-40D. Density driven flow or anisotropic flow along alluvial channels might also explain the occurrence of contamination at well MW-40D. PG&E should provide greater discussion on the cause of the observed chromium detection at MW-40D in the revised Report. The GSU suggests that a groundwater well cluster to the west of Bat Cave Wash, in the vicinity of wells MW-9 and MW-10 would be valuable in monitoring the plume. This well cluster would be valuable remedial planning, plume delineation, and monitoring the effectiveness of remedial measures.

**Comment 166:** See Comment 101 regarding other potential sources of groundwater contamination. See also 6/27/06 GSU Memo, General Comments 3 and 4.

**Comment 167:** The comment discusses the need for a groundwater risk assessment, but does not appear to be addressed by PG&E’s response.

## REFERENCES

API, 2006. Downward Solute Plume Migration: Assessment, Significance, and Implications for Characterization and Monitoring of "Diving Plumes", Regulatory Analysis and Scientific Affairs, API Soil and Groundwater Technical Task Force, Bulletin 24.

CH2M Hill, August 10, 2007a. RCRA Facility Investigation/Remedial Investigation Report, PG&E Topock Compressor Station, Needles, California. Volume 1 - Site Background and History.

CH2M Hill, 2007b. Evaluation of Recent Anomalous Sampling Results at Well MW-23, TWG Meeting 8/2/07.

CH2M Hill, May 30, 2006a. Soil and Sediment Data Useability Assessment Technical Memorandum, PG&E Topock Compressor Station, Needles, California.

CH2M Hill, November 16, 2006b. RCRA Facility Investigation/Remedial Investigation Soil Investigation Work Plan, Part A, PG&E Topock Compressor Station, Needles, California.

Hunt, James R. and Flowers, Tracey C., May 10, 2007a. Perchlorate as an Example of Groundwater Contamination Arising from Dense Brines.

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Mittelhauser Corporation, 1990, Phases 1 and 2, Closure Certification Report, Hazardous Waste Management Facilities, Topock Compressor Station, Needles, California.