



Linda S. Adams  
Secretary for  
Environmental Protection



## Department of Toxic Substances Control

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



Arnold Schwarzenegger  
Governor

Sent Via Email

April 2, 2007

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

**CONDITIONAL APPROVAL OF WORK PLAN FOR HYDRAULIC TESTING IN  
BEDROCK WELLS, 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 reviewed the Work Plan for Hydraulic Testing in Bedrock Wells dated November 10, 2006, and the Technical Addendum dated December 19, 2006. DTSC considers the combined document as the final PG&E proposal and workplan for the hydraulic testing in bedrock wells (here after referred to as the Workplan). Based on our review, DTSC Geological Services Unit (GSU) has compiled a memorandum, dated March 31, 2007, with specific recommendations. The memorandum with its recommendations is enclosed and it is incorporated as a condition of approval by reference. In addition, DTSC considered comments received from the United States Geological Survey and the Fort Mojave Indian Tribe regarding this Workplan. DTSC determined that the following clarification and conditions are necessary to supplement the enclosed memorandum from DTSC GSU.

1. In respect and awareness of the landscape considered sacred to the Fort Mojave Indian Tribe and other tribes with similar views, PG&E shall use established access routes for transportation of personnel and equipment for the hydraulic testing activities. PG&E shall instruct and refresh all workers at the site to respect the sacred landscape through, at a minimum, work orientations and kick-off meetings.
2. PG&E shall implement proper management controls consistent with standard practices to address the following:
  - a. Incidental trash from site operations will be collected at the end of each shift, and hauled off for proper disposal.

Ms. Yvonne Meeks  
April 2, 2007  
Page 2 of 2

- b. Storage tanks, piping and all connections associated with this project shall either be double-walled or placed over secondary containment to prevent spills and to contain leaks. All incidental spills shall be immediately controlled. PG&E shall provide timely notification of such spills to DTSC and the landowner. All spills or releases associated with hydraulic testing shall be recorded and documented in the bedrock wells hydraulic test report.
  - c. Water generated from pump tests shall be characterized for proper management in accordance with applicable State, Federal and local laws and regulations. PG&E may transfer test water to the Interim Measures No. 3 facility for management unless otherwise limited by existing permits and/or restrictions associated with the design of the Interim Measures facility for safe operation.
3. In consideration of the United States Geological Survey (USGS) comments submitted on December 21, 2006, DTSC agrees that if production exceeds five gallons per minute while pumping PGE-7 or PGE-8, PG&E should evaluate the permeability of potential fault zones with a numerical model. Within 15 days of this letter PG&E should provide a technical response to the December 21, 2006 USGS comment regarding assessment of potential fault zones.
  4. PG&E shall work with interested tribes and make a good faith effort to establish a tribal monitor to be present during all site clearance and disturbance work.
  5. In conformance with requirements established by the United States Department of the Interior, PG&E shall work with the Native American Indian Tribes, the landowner, and the Bureau of Land Management on the development of any applicable site restoration plan.

If you have any questions or comments regarding this Workplan approval letter or its conditions, please contact me at (714) 484-5439.

Sincerely,



Aaron Yue  
Project Manager  
Geology, Permitting and Corrective Action Branch

Enclosure

aky:040702B

cc: PG&E Topock Consultative Workgroup Members – Via e-mail  
Tribal Representatives in PG&E Contact List – Via e-mail



## Department of Toxic Substances Control




Linda S. Adams  
Secretary for  
Environmental Protection

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



Arnold Schwarzenegger  
Governor

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

FROM: Chris Guerre, CHG  
Senior Engineering Geologist  
Geological Services Unit 

DATE: March 31, 2007

SUBJECT: Aquifer Testing Work Plan for Bedrock Wells  
PG&E Topock Compressor Station, Needles, California  
Project No. 22120/540015-48/36-HWMP Tracking No. 640293

---

### DOCUMENTS REVIEWED

*Work Plan for Hydraulic Testing in Bedrock Wells, PG&E Topock Compressor Station, Needles, California (Work Plan).* The Work Plan is dated November 10, 2006 and was prepared for Pacific Gas and Electric Company (PG&E) by CH2M Hill.

*Technical Addendum: Work Plan for Hydraulic Testing in Bedrock Wells, PG&E Topock Compressor Station, Needles, California (Addendum).* The Addendum is dated December 19, 2006 and was prepared for PG&E by CH2M Hill.

### INTRODUCTION

The Geological Services Unit (GSU) of the Department of Toxic Substances Control (DTSC) has reviewed the above-referenced documents regarding aquifer testing of three existing bedrock wells (wells PGE-7, PGE-8, and MW-48). The Work Plan was prepared in response to a DTSC letter (DTSC, 2006a) requesting additional bedrock investigation related to hydraulic characterization and potential hexavalent chromium transport in bedrock. The Work Plan also incorporates recommendations contained in a PG&E technical memorandum for well PGE-7 (CH2M Hill, 2006) related to flow logging and retrofitting the well.

The objectives of the hydraulic testing stated in the Work Plan include the following:

- Conduct a long term pumping test in well PGE-8 to evaluate the hydraulic properties of bedrock and the degree of hydraulic communication with other bedrock wells and Alluvial aquifer wells.
- Evaluate the distribution of chromium in bedrock through collection of groundwater samples at periodic intervals during the PGE-8 aquifer test.
- Conduct pumping tests in PGE-7 and MW-48 to characterize bedrock hydraulic properties and evaluate vertical gradients.
- Conduct camera surveys of wells PGE-7 and PGE-8 to verify whether the wells are screened in conglomerate or crystalline rock.
- Retrofitting of well PGE-7 to seal off the portion of the well screened across the Alluvial Aquifer.

## **RECOMMENDATIONS**

The GSU finds the Work Plan generally acceptable, but has listed the following recommendations for PG&E to address as part of work plan implementation.

1. PG&E should notify DTSC one to two weeks prior to the implementation of the Work Plan.
2. Page 1-2, Section 1.2, First Paragraph, Line 3: The following additional objectives should be added to the list proposed in the Work Plan:
  - Conduct flow meter surveys within wells PGE-7 and PGE-8 to evaluate vertical hydraulic gradients within the bedrock units.
  - Obtain representative water quality samples from discrete portions of the bedrock formation within well PGE-7 to characterize bedrock chemistry and ensure it is not impacted.

The first bullet was previously requested in Dr. Kate Burger's July 20, 2006 memorandum attached to DTSC's November 3, 2006 letter (DTSC, 2006a). The GSU acknowledges that the injection packer assembly left within well PGE-8 may limit the type of devices that can be employed within this well or prevent measurement.

3. Page 2-1, Section 2.1.1, First Paragraph, Line 3: Several geophysical logging techniques are being conducted on well PGE-7. The GSU requests that a cement bond log be run on well PGE-7 as recently done on well PGE-8 to determine the

relative quality of the bond between the grout and casing (if grout is present). The log may assist in determining if the 7-inch steel casing is sealed inside the old 14-inch well or against the borehole below approximately 182 feet below ground surface (bgs). The data should assist with establishing the existing condition of the well and aid in plans for its eventual decommissioning. Conducting this cement bond log survey in conjunction with the other geophysical techniques will minimize the number of excursions to the site and not trigger another separate permitting event.

4. Page 2-1, Section 2.1.1, First Paragraph, Lines 3 and 4: The Work Plan indicates that “one or more” depth specific flow logging techniques will be conducted to identify conductive fractures in well PGE-7. However, the FLUTE™ liner technique proposed is not a depth specific monitoring device. It will average flow over a constantly changing borehole interval as the liner is deployed. Therefore, employment of a downhole flow meter and/or high-resolution temperature logging is required as a condition of DTSC’s approval. A flow meter is also necessary to evaluate natural vertical hydraulic gradients within the bedrock units. PG&E recommended using an electromagnetic (EM) flow meter for both static and pumping conditions (CH2M Hill, 2006) in well PGE-7. The GSU concurs with this PG&E proposal and recommends that it be implemented. The FLUTE™ liner technique for hydraulic conductivity profiling may not be necessary if adequate information is obtained from flow meter and other surveys.
5. Page 2-1, Section 2.1.1, Second Paragraph: One of the objectives identified in the Work Plan includes verifying bedrock lithologies in wells PGE-7 and PGE-8 using camera surveys. The GSU recommends that, if needed, open boreholes be cleaned in some manner to expose the geology in the borehole wall and enhance the ability of the camera surveys to identify the bedrock type.
6. Page 2-1, Section 2.1.1, Middle Paragraph, Last Sentence: This section mentions that metadiorite was logged in well PGE-8, yet a boring log or geologic description is not provided or referenced in the Work Plan. For completeness, this information should be included in the report described in section 10.2 of the Work Plan. Additionally, PG&E records should be further searched to determine if any additional documentation regarding well installation/construction details and hydrogeologic conditions exist for well PGE-7 and PGE-8. Historic information regarding wells PGE-7 and PGE-8 should be summarized and appropriately referenced in the pending report.
7. Page 2-1, Section 2.1.1, Last Paragraph: See Recommendation 2, 4, and 9 regarding the need to utilize flow meters.

8. Page 3-1, Section 3.2, First Paragraph: This section discusses retrofitting well PGE-7 and recommends utilizing the FLUTE™ liner system to temporarily seal PGE-7 until it is decommissioned. The GSU concurs with this general approach. However, see Recommendation 10 and Specific Comment 2 below.
9. Page 3-3, Section 3.2.1, First Paragraph: The GSU is unfamiliar with deploying the FLUTE™ system to assess borehole transmissivity (hydraulic conductivity profiling). The technique as described appears qualitative. The GSU requests that more detailed information and description regarding this technique be included in the pending report if it is utilized in well PGE-7. The GSU notes that PGE-7 aquifer transmissivity will be assessed by the proposed aquifer testing and conductive zones will be identified by flow meter surveys.
10. Page 3-3, Section 3.2.1, Second Paragraph: This section discusses modifying the PGE-7 FLUTE™ system at some future date to allow collection of water samples using a Water FLUTE™ system. Obtaining water quality samples from the bedrock portion of PGE-7 is required to confirm that hexavalent chromium has not impacted bedrock within this well. PG&E's Technical Memorandum (CH2MHill, 2006) indicates that the elevated hexavalent chromium groundwater concentrations detected in well PGE-7 are similar to those from well MW-24B completed near the base of the Alluvial Aquifer. The memo concludes that the detected hexavalent chromium in well PGE-7 likely originates from the portion of the PGE-7 borehole exposing the base of the Alluvial Aquifer and not the bedrock. PG&E must collect and evaluate data to support this statement including collection of discrete, representative samples from within the bedrock portion of the aquifer within the PGE-7 borehole. The proposed Water FLUTE™ with sampling ports would appear to accomplish this objective. Therefore, the Water FLUTE™ system must be installed as part of Work Plan activities and documented in the pending report described in section 10.2. PG&E shall seek DTSC approval regarding the number and locations of sampling port horizons to be included in the Water FLUTE™ system design soon after geophysical logging and aquifer testing are completed.
11. Page 3-4, Section 3.3, First Paragraph: This section discusses packer placement for the aquifer test to be conducted on well PGE-7. The inflatable packer will be installed near the top of bedrock to eliminate or minimize the influence of the Alluvial Aquifer on the bedrock aquifer test. In addition to the hydraulic monitoring to be conducted within the bedrock unit for the PGE-7 test, it is requested that water levels be monitored in the Alluvial Aquifer above the PGE-7 packer to monitor the packer's sealing capability and/or bedrock interconnection with the Alluvial Aquifer.
12. Page 4-1, Section 4.1, Last Paragraph: As the section indicates which wells may be instrumented with pressure transducers during the PGE-7 aquifer test, there is some uncertainty as to which wells will eventually be used as observation wells for the

test. Therefore, the GSU recommends that PG&E submit an actual list of observation wells for the PGE-7 test to DTSC for review and approval prior to conducting the official test. The United States Geological Survey (DOI, 2006) has indicated that alluvial observation wells should also be included in the bedrock aquifer tests and specifically requested well MW-24A be added to the PGE-7 test. Similarly, some or all of the shallow and mid-depth wells at wells PT-7, PT-8, and PT-9 (all yet to be installed) should also be utilized as observation wells.

13. Page 4-3, Section 4.2.1, First Paragraph: The section indicates that pressure transducers will be used in all the wells listed in Table 4-2 of the Work Plan during the aquifer test for well PGE-8. Any new wells installed in Arizona by the time the aquifer test is conducted should also be included as observation wells. DTSC (2006a, 2006b) has previously recommended that observation wells should also include wells in the Arizona floodplain. PG&E should include wells MW-52 and MW-53 as observation wells, especially zones monitored at or near bedrock, as new Arizona wells will not likely be installed by the time the PGE-8 test is conducted.
14. Page 5-1, Section 5.1, First Paragraph: In addition to hexavalent chromium and total chromium laboratory analyses, general mineral analyses are recommended for the constant rate tests. At a minimum, laboratory analyses for general minerals and total chromium should be conducted three times a day to evaluate the potential fate and distribution of chromium in the crystalline bedrock. PG&E may request to modify the sampling approach as data are collected and as the longer aquifer tests progress. The frequency for water quality parameter collection is not specified in the Work Plan for the constant rate tests. These field parameters should be collected at a minimum of once every hour during the tests. Hexavalent chromium samples should also be collected every two hours and analyzed at the IM-3 lab (or equivalent). Sample and parameter collection should not be conducted at night to respect the desires of the Fort Mojave Indian Tribe (FMIT). PG&E should consult with FMIT if night sampling is desired.
15. December 19, 2006 Addendum, Page 2, Well Bore Videoing: This section of the Addendum indicates that conventional well bore video methods are not possible below the packer in well PGE-8 and that a smaller camera may also not work. The GSU has reviewed the November 17, 2006 well video taken within well PGE-8 and has observed the presumed packer pipe at 360 feet bgs. The GSU recommends that a smaller video camera be used to establish the condition of the well below 360 feet bgs. This may be completed after aquifer testing of PGE-8 to allay any concerns regarding the camera lodging and blocking the packer pipe. After the video is conducted and the condition of the screened interval is determined, the potential for flow logging and possibly depth sampling (DOI, 2006) should be evaluated again. At that time, DTSC should determine if PG&E should conduct surveys to accomplish the objective identified in Recommendation 2 above.

## **SPECIFIC COMMENTS**

The comments in this section are either subordinate in nature or not directly related to the aquifer testing project (e.g., potential decommissioning of well PGE-7).

1. Page 1-2, Section 1.3.1, Last Paragraph: According to the Work Plan, the contact between the Alluvial Aquifer and the Miocene conglomerate within well PGE-7 is estimated to occur at 220 feet below ground surface as based on review of a 1998 video log. The well log for well MW-24BR (CH2M Hill, 2006), located close to PGE-7 and at the same elevation, indicates that the contact occurs at 225 feet below ground surface where a red fanglomerate was identified below gravelly sands. The information contained in the well log for well MW-24BR should also be considered to ensure that a packer is located low enough in the open borehole to seal off the Alluvial Aquifer from bedrock during the aquifer test. It is doubtful that the 1998 video log alone could conclusively determine the Alluvial Aquifer/Miocene conglomerate contact.
2. The GSU is concerned with the substandard construction of well PGE-7. It is not constructed to California Wells Standards (California Department of Water Resources, 1991) or Cal EPA guidance (1995). It was installed in 1964 possibly in a manner similar, if not identical to, well PGE-6. As identified in the GSU memorandum dated October 13, 2006, the current condition of well PGE-6 warrants decommissioning by overdrilling-grouting or by perforating-grouting due to the lack of an annular seal. As the current condition of the original PGE-7 well is concealed and its construction details are undocumented, it is assumed the same decommissioning criteria for well PGE-6 would apply to well PGE-7. Well PGE-7 construction is further complicated by the poorly documented well retrofit that occurred in 1969 in which 195 feet of blank casing was installed (without a documented annular seal) above 135 feet of open borehole.

If it is determined that long term monitoring of well PGE-7 will not provide useful data for the project, then the GSU recommends that it be properly decommissioned. PG&E should comment on potential future uses of well PGE-7 in the pending aquifer test report described in section 10.2 of the Work Plan. Information obtained from well PGE-6 decommissioning and upcoming tests on PGE-7 (e.g., geophysics) may provide salient information to support decommissioning of the well. It appears that a permanent, reconstructed well at PGE-7 would complicate decommissioning activities and is, therefore, not recommended by the GSU at his time. The GSU recommends that the Water FLUTE™ liner/sampling ports remain in the borehole until the well is decommissioned or data are generated conclusively indicating that contaminated water from the Alluvial Aquifer in PGE-7 cannot impact groundwater within bedrock.



3. Page 4-1, Section 4.1, Second Paragraph: The Work Plan indicates that bedrock well MW-24BR has a screen length similar to PGE-7. Table 1-1 of the Work Plan and well logs indicate that wells MW-24BR and PGE-7 are not screened with similar lengths or at similar horizons. The Work Plan also states that well MW-24BR is completed in “cemented sandstone and/or crystalline metamorphic bedrock”. Table 1-1 of the Work Plan and the well log for MW-24BR indicate that well MW-24BR is completed in red fanglomerate and sandstone and not crystalline bedrock. PG&E should clarify this apparent discrepancy in the report or in response to these comments.
4. Page 8-1, First Paragraph: The section indicates that investigative fieldwork will be conducted during daylight hours. The GSU interprets this to allow an emergency response to occur at night including, but not limited to, response activities due to a water line release.

If you have questions regarding the preceding comments, please contact Chris Guerre at (714) 484-5422 or by email at [cguerre@dtsc.ca.gov](mailto:cguerre@dtsc.ca.gov).

Peer Reviewed By: Alfredo Zanoia, CHG, CEG

## REFERENCES

California Department of Water Resources, June 1991. California Well Standards Bulletin 74-90 (Supplement to Bulletin 74-81).

Cal EPA - The California Environmental Protection Agency, July 1995. Monitoring Well Design and Construction for Hydrogeologic Characterization. Guidance Manual for Groundwater Investigations.

CH2M Hill, February 28, 2005. Draft RCRA Facility Investigation (RFI) Report, PG&E Topock Compressor Station, Needles, California.

CH2M Hill, February 23, 2006. Technical Memorandum: Well Disposition Evaluation for Inactive Supply Well PGE-7, PG&E Topock Compressor Station.

DTSC, 2006a. November 3, 2006. Additional Bedrock Investigation Based on Review of Bedrock Technical Memorandum at Pacific Gas and Electric Company (PG&E), Topock Compressor Station, Needles, California (EPA ID NO. CAT080011729).

DTSC, 2006b. November 3, 2006. Response to Arizona Department of Environmental Quality Comments on Bedrock Conditions Technical Memorandum at Pacific Gas and Electric Company (PG&E), Topock Compressor Station, Needles, California (EPA ID NO. CAT080011729).

DOI, 2006. December 21, 2006. United States Department of Interior, United States Geological Survey. Review – Work Plan and Addendum to Work Plan for Hydraulic Testing in Bedrock Wells, PG&E Topock Compressor Station, Needles, California.