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April 13, 2004

Norman Shopay **Project Manager** California Department of Toxic Substances Control Geology and Corrective Action Branch 700 Heinz Avenue Berkeley, California 94710

Subject: Sampling Plan Supplement Interim Measures Drilling Program PG&E Topock Compressor Station, Needles, California

Dear Mr. Shopay:

Enclosed is a technical memorandum entitled Sampling Plan Supplement – Interim Measures Drilling Program for the Topock project. This Sampling Plan Supplement was prepared at the request of the Department of Toxic Substances Control (DTSC) to describe additional data to be collected to further evaluate site characteristics and remedial technologies for the Topock Site. Please contact me at (805) 546-5243 if you have any questions or if you need additional information.

Sincerely,

Teri Herson for Vronne Meeks

Enclosure

cc: CWG Members

# Sampling Plan Supplement PG&E Topock Interim Measures Drilling Program

Date: April 13, 2004

## Introduction

This sampling plan supplement describes the methods and procedures for drilling, core sampling, and well installation activities planned for the interim measures hydrogeologic investigations at the Pacific Gas and Electric Company (PG&E) Topock site. PG&E's *Draft Interim Measures Work Plan*, dated February 2004, identified the general locations where new field investigations and groundwater monitoring and test wells were proposed for the interim measures program. The activities described in PG&E's *Draft Interim Measures Work Plan* are collectively referred to as Interim Measure Number 1 (IM No. 1). The rationale, number, and locations for hydrogeologic investigations and wells for IM No. 1 were discussed, expanded, and agreed upon during meetings of the Topock Consultative Work Group (CWG) technical committee held on March 11 and 17, and April 2, 2004.

In addition, this sampling plan describes additional data to be collected to further evaluate site characteristics and evaluate remedial technologies for the Topock Site. While these additional data collection programs were not outlined in the Draft Interim Measures Work Plan, these additional data collection programs are being incorporated into the interim measures well drilling, field investigation, and sampling activities. The additional data collection activities are described in separate technical memorandum and include:

- 1. Geotechnical sampling and testing to support constructability evaluation of a soil/bentonite cutoff wall.
- 2. Aerobic zone core testing to evaluate the adsorption and desorption characteristics of the subsurface aquifer formation.
- 3. Reductive zone core testing to evaluate the reducing capacity of the subsurface aquifer formation.
- 4. Core testing to evaluate potential *in situ* remediation technologies for hexavalent chromium reduction.

### Purpose

The purposes of this sampling plan are to:

- Confirm the locations for the priority or "first stage" hydrogeologic investigations and well installations.
- Present the general plan, methods, and procedures for drilling, core sampling, and hydrogeologic logging.

• Outline the approach and plan for selecting well screen completions for the new groundwater monitoring and test wells.

## **Interim Measures Drilling Program**

Figure 1 shows the proposed well locations for the interim measures hydrogeologic investigations and drilling program. Figure 1 also shows additional locations for potential "step-out" monitoring/test wells that would be evaluated after initial sampling results from the first stage drilling program. The first stage and step-out well locations were discussed and agreed upon during the March 11 and 17, 2004 CWG technical committee meetings.

Table 1 identifies the sites planned for the first stage drilling activities and summarizes information on proposed drilling and sampling activities. The first stage drilling program is scheduled to commence during the week of March 22, 2004 and be completed by May 2004. The general methods and procedures for the drilling, core sampling, logging, and well installation activities are described below.

## **Drilling and Coring Methods**

The drilling and coring methods and equipment to be used for the interim measures drilling program are described below.

#### **Rotosonic Method**

The conventional groundwater monitoring wells will be drilled and installed using the rotosonic drilling method. This method produces a continuous core from surface to the target drill depths (ranging from 140 to 200 feet), generates minimal drilling wastes, and typically can drill through the gravel, cobble, and competent bedrock formations. The continuous core obtained from sonic drilling will facilitate the core logging, sampling, and core preservation requirements for the interim measures program.

#### Mud Rotary Method

The groundwater extraction/test well(s) to be installed under IM No. 1 will be drilled and constructed using the mud rotary drilling method. Mud rotary method is the preferred method for drilling and installing long-screen, larger-diameter (5-inch or greater) wells needed for aquifer testing groundwater extraction. Additionally, wireline geophysical logs can be collected from the mud rotary pilot boring for aquifer characterization. As was used during prior Topock drilling for pilot test well TW-1, the 94-mm wireline coring system will be used during mud rotary drilling for core logging and characterization.

#### All-terrain Rig with Rotosonic Method

The monitoring wells planned for the floodplain area will require use of track-mounted or balloon-tire all-terrain drilling equipment. The last set of monitoring wells constructed on the floodplain in March and June 2003 were drilled and installed using a compact all-terrain rotosonic rig. An all-terrain rotosonic rig, with continuous coring capability, is planned for the three monitoring wells to be installed on the floodplain (Table 1). If an all-terrain sonic rig is not available to meet the IM No. 1 schedule, an all-terrain hollow-stem auger rig may be used.

The provisions and procedures for drilling site access, permitting, and management of investigation-derived waste associated with the first stage drilling will follow the *Draft Interim Measures Work Plan*.

## **Core Logging and Preservation**

Drilling record and soil boring/core logs will be prepared for all borings drilled for the IM No. 1 program under the supervision of California registered geologists. The recovered continuous cores from the rotosonic drilling, as well as the wireline core and drill cuttings from mud rotary drilling, will be logged in accordance with the visual-manual procedures (Unified Soil Classification System). As recommended by the CWG technical committee, a subset of core material from the saturated Alluvial Aquifer and Red Fanglomerate unit will be preserved in the field (Table 1). Selected core samples will be collected at approximately 10-foot intervals, stored in sealed aluminum bags, and preserved and archived for potential future testing or analysis.

## **Core Sampling**

As listed in Table 1, a subset of core samples from all borings will be collected from the saturated Alluvial/Fluvial Aquifer and in selected Red Fanglomerate locations and submitted for the following analyses:

- Grain-size analyses
- Hexavalent chromium analyses using United States Environmental Protection Agency (USEPA) Method SW 7199

In all borings, selected saturated zone core samples will be sealed and preserved during drilling operations. Selected preserved core sections will be used for leachability testing, chromium reductive capacity testing, and bench testing of *in-situ* treatment technologies, as indicated on Table 1. The specific core testing, methods, and analyses are described in separate sample testing technical memoranda.

As recommended by the CWG technical committee, field chemical screening of porewater from saturated zone cores is proposed for one boring in the first stage drilling program. At location MW-31D, extract from selected core pieces will be obtained by in-field core squeezing and then screened for hexavalent chromium and specific conductance using a field test kit and field meter, respectively.

## **Geotechnical Sampling and Testing**

Supplementary geotechnical sampling and testing is planned at interim measures drilling locations MW-28D and MW-36 (Figure 1, Table 1) to support the evaluation of constructability of a soil/bentonite cutoff wall in the floodplain area of the site. Additional composited grain-size samples will be collected in selected floodplain borings to evaluate the suitability of site soils for mixing with bentonite to construct a slurry wall. Standard penetration testing (SPT) will be conducted in these borings to evaluate the stability and excavatability of the soils. Samples collected in the SPT tool will be analyzed for moisture content and Atterberg limits. Procedures for analyses of the geotechnical samples are provided in a separate technical memorandum. The formations to be sampled and tested

include shallow dredged fluvial sediments (unsaturated and saturated), the Fluvial/Alluvial Aquifer, and the consolidated Red Fanglomerate unit.

## Well Construction and Well Screen Selection

Table 2 summarizes the general plan for well construction and installation for the first stage interim measures field investigations. The monitoring wells and TW-2 test well will be constructed, developed, and completed under the supervision of California-registered geologists in accordance with the following PG&E work plans submitted for the Topock project:

- *RCRA Facility Investigation Work Plan Amendment No. 5,* dated September 12, 2002, prepared by Ecology and Environment, Inc.
- *Field Activities Work Plan for Groundwater Extraction Pilot System*, dated October 2003, prepared by CH2M HILL, Inc.
- Draft Interim Measures Work Plan, dated February 2004, prepared by CH2M HILL, Inc.

The types of wells, general specifications, and proposed plan for selecting the well screens are summarized below. The investigation approach, number of wells, and well screen plan presented in Table 2 were agreed to by the CWG technical committee in meetings held on March 17 and April 2, 2004. The specific screen depths and construction details are subject to the field and subsurface drilling conditions encountered.

### **Groundwater Monitoring Wells**

Single and/or paired groundwater monitoring wells are planned for installation at six locations (Table 1, Figure 1). Paired monitoring wells (shallow and deep completions) are planned for four locations (MW-35, MW-37, MW-38 and MW-40). At two locations (MW-31D, MW-28D), single-completion wells will be installed in the vicinity of existing monitoring wells MW-31 and MW-28 to monitor water conditions at the base of the Alluvial Aquifer at these locations. All IM No. 1 conventional monitoring wells will be constructed of 2-inch-diameter Schedule 40 PVC well screens and casing. The well screens will be 0.02-inch factory-slotted PVC casing with No. 3 sand (consistent with other monitoring wells completed in the Alluvial Aquifer).

Table 2 identifies the screen length and proposed monitoring zones for the paired and individual monitoring wells planned for the first stage drilling program. Pending the results of core analyses and initial well sampling, the IM No. 1 drilling program includes a contingency for installing an additional monitoring well in the middle of the Alluvial Aquifer. The need for and specifications for the contingent wells at the first stage well locations will be evaluated as part of the step-out drilling program.

## **Groundwater Extraction Test Well**

One new groundwater extraction test well (designated TW-2) will be installed on the MW-20 bench during the first stage drilling program. In accordance with the *Draft Interim Measures No. 1 Work Plan,* TW-2 was planned to be completed and screened as a fully-penetrating extraction well across the complete saturated Alluvial Aquifer. However,

in response to CWG input, PG&E evaluated the option of installing two separate test wells at this location (TW-2S and TW-2D; Table 2) to optimize extraction and treatment capability for the interim measures program. The CWG technical committee approved the recommendation for installing dual extraction wells at TW-2 at the April 2, 2004 meeting.

The TW-2 wells will be constructed using 6-inch-diameter, Schedule 80 PVC well screen and casing. Based on the MW-20-130 log, the total thickness of the saturated Alluvial Aquifer at the TW-2 location is approximately 85 feet. Based on the aquifer materials encountered at MW-20-130, the TW-2 well screens will be constructed of 0.04-inch factory-slotted PVC casing with Monterey medium aquarium sand.

### **Clustered Monitoring Wells in Floodplain Area**

Clustered (multiple well) monitoring installations are planned for two floodplain locations in the first stage drilling program (MW-36 and MW-39; Figure 1, Table 2). The purpose of the first stage clustered wells is to install discrete 10-foot screened monitoring wells across the complete thickness of the saturated zone on the floodplain to assess vertical water quality conditions and to allow for long-term groundwater monitoring (water level and sampling) at these locations.

The monitoring well clusters at MW-36 and MW-39 will consist of up to six individual 1 inch-diameter Schedule 40 PVC wells installed in a nested arrangement in two or three separate boreholes (Tables 1 and 2). The screens will be constructed with 0.02-inch factory-slotted PVC casing with No. 3 sand (consistent with other monitoring wells completed in the Alluvial Aquifer).

# **Groundwater Sampling**

All new conventional groundwater monitoring wells will be sampled within approximately 10 days after well development using temporary adjustable-rate submersible well pumps (following the well volume method). The new floodplain monitoring well clusters installed with 1-inch well casings (MW-36, MW-39) will be sampled using a peristaltic pump. The purge rates and volumes for sampling these small-diameter wells will be selected to obtain representative groundwater samples from the aquifer zone. Test well TW-2 will be sampled following spinner testing and sampling. Spinner testing and sampling will be conducted in accordance with the plan and procedures recently applied at the pilot test well TW-1.

The following parameters will be analyzed during the initial groundwater sampling:

- Hexavalent chromium by USEPA Method SW 7199
- Total dissolved chromium by USEPA Method SW 6010B
- Total dissolved solids by USEPA Method 160.1
- Specific conductance by USEPA Method 120.1

Water level data, well purging characteristics, and field water quality parameters will be measured during the initial groundwater sampling following the existing Topock groundwater monitoring plan and procedures. General chemistry and other parameters will be included in subsequent sampling from all newly installed interim measures monitoring wells as part of the routine groundwater monitoring program.

# Reporting

The results of the drilling, core logging and sampling, and initial groundwater sampling from the first stage hydrogeologic investigations will be presented in IM No. 1 progress reports as applicable.



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# Table 1Proposed Drilling, Logging and Core Sampling - First Stage Hydrogeologic InvestigationsTopock IM No.1, March-May 2004

Location Property Owner	Drill Site ID	Well Type	Drilling Method Planned Drilling Depth <sup>1</sup>	Samples Collected for Cr(VI) Analysis <sup>2</sup>	Grain-Size Samples for Correlation with Chromium Concentration	Composited Grain Size Samples for Slurry Wall Evaluation	SPT Testing for Slurry Wall Evaluation <sup>3</sup>	Core Sealing and Preservation	Additional Core Samples for Reductive Capacity and/or Leachability Testing	Additional Preserved Core Samples for In-Situ Bench Testing
MW-20 Bench BLM	MW-31D	Deep monitoring well	Rotosonic 145'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone			10 ft. intervals through saturated zone	20 ft. intervals	
MW-20 Bench BLM	TW-2	Extraction well pair	Mud Rotary 160'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone			20 ft. intervals through saturated zone		
Floodplain BLM	MW-35	Monitoring well pair	Rotosonic 160'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone			20 ft. intervals through saturated zone		
Bat Cave Wash BLM	MW-37	Monitoring well pair	Rotosonic 200'	5 ft. intervals through sat. zone	2 unsat. zone samples 5 discrete samples through saturated zone			20 ft. intervals through saturated zone		
Floodplain BLM	MW-28D	Deep monitoring well	AT-Rotosonic 120'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone	10 ft. intervals surface to bottom of boring	10 ft. intervals surface to bottom of boring	10 ft. intervals through saturated zone	5 ft. below water table, then 20 ft. intervals	
Floodplain BLM	MW-36	Monitoring well cluster 1st hole (2 wells) 2nd hole (2 wells) 3rd hole (2 wells)	AT-Rotosonic 100' 80' 60'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone	10 ft. intervals surface to bottom of boring	10 ft. intervals surface to bottom of boring in both 80' and 100' borings	10 ft. intervals through saturated zone	5 ft. below water table, then 20 ft. intervals	
Floodplain BLM	MW-39	Monitoring well cluster 1st hole (2 wells) 2nd hole (2 wells) 3rd hole (2 wells)	AT-Rotosonic 100' 80' 60'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone			10 ft. intervals through saturated zone	5 ft. below water table, then 20 ft. intervals	approximate 20 ft. intervals with range of soil types
Bat Cave Wash PG&E	MW-38	Monitoring well pair	Rotosonic 180'	5 ft. intervals through sat. zone	2 unsat. zone samples 5 discrete samples through saturated zone			20 ft. intervals through saturated zone		approximate 20 ft intervals with range of soil types
I-40 Median Caltrans	MW-40	Monitoring well pair	Rotosonic 200'	5 ft. intervals through sat. zone	5 discrete samples through saturated zone			20 ft. intervals through saturated zone		

#### NOTES:

1. All depths are approximate in feet below ground surface.

 Soil samples submitted to laboratory will be analyzed for hexavalent chromium [Cr(VI)] in two stages: first, at 10-foot intervals (representing all soil types), and secondly, additional Cr(VI) analyses would be performed on selected remaining samples based on initial results and characterization needs.

3. Atterberg limits and moisture content to be run on soil samples from standard penetration test (SPT) tool.

# Table 2Proposed Monitoring and Test Well InstallationFirst Stage Topock IM Investigations, March-May 2004

Location	Site ID	Drilling Method	Preliminary Well ID	Proposed Monitored Zone (equivalent well)	Casing Type	Proposed Well Screen
MW-20 Bench	MW-31D	Rotosonic	MW-31D	Base of Alluvial Aquifer (equiv. to MW-20-130)	2" PVC	20-foot
MW-20 Bench	TW-2	Mud Rotary	TW-2D	<b>FW-2D</b> Lower Alluvial Aquifer (MW-20-130)		40-foot
			TW-2S	Upper & Middle Alluvial Aquifer (MW-20-70 & -100)	6" PVC	50-foot
Floodplain	MW-35	Rotosonic	MW-35D	Lower part Alluvial Aquifer (equiv. to MW-31D)	2" PVC	20-foot
			MW-35S	Upper part Alluvial Aquifer (equiv. to MW-31)	2" PVC	20-foot
Bat Cave Wash	MW-37	Rotosonic	MW-37D	Base of Alluvial Aquifer (equiv. to MW-20-130)	2" PVC	20-foot
			MW-37S	Upper part Alluvial Aquifer (equiv. to MW-13)	2" PVC	20-foot
Floodplain	MW-28D	AT-Sonic	MW-28D	Lower part (or Base) of Alluvial Aquifer	2" PVC	20-foot
Floodplain	MW-36	AT-Sonic	MW-36-F	Base of Alluvial Aquifer (equiv. to MW-20-130)	1" PVC	10-foot
			MW-36-E	Lower part Alluvial Aquifer	1" PVC	10-foot
			MW-36-D	Middle part Alluvial Aquifer	1" PVC	10-foot
			MW-36-C	Upper part Alluvial Aquifer	1" PVC	10-foot
			MW-36-B	Floodplain Aquifer sediments (equiv. to MW-30-30)	1" PVC	10-foot
			MW-36-A	Top of Floodplain Aquifer (equiv. to MW-27)	1" PVC	10-foot
Floodplain	MW-39	AT-Sonic	MW-39-F	Base of Alluvial Aquifer (equiv. to MW-20-130)	1" PVC	10-foot
			MW-39-E	Lower part Alluvial Aquifer	1" PVC	10-foot
			MW-39-D	Middle part Alluvial Aquifer	1" PVC	10-foot
			MW-39-C	Upper part Alluvial Aquifer	1" PVC	10-foot
			MW-39-B	Floodplain Aquifer sediments (equiv. to MW-30-30)	1" PVC	10-foot
			MW-39-A	Top of Floodplain Aquifer (equiv. to MW-27)	1" PVC	10-foot
Bat Cave Wash	MW-38	Rotosonic	MW-38D	Base of Alluvial Aquifer (equiv. to MW-24B)	2" PVC	20-foot
			MW-38S	Upper part Alluvial Aquifer (equiv. to MW-24A)	2" PVC	20-foot
I-40 Median	MW-40	Rotosonic	MW-40D	Base of Alluvial Aquifer (equiv. to MW-24B)	2" PVC	20-foot
			MW-40S	Upper part Alluvial Aquifer (equiv. to MW-25)	2" PVC	20-foot

#### NOTES:

- 1. Pending core & initial well sampling results, IM program includes contingency for installing additional wells in the middle zone of the Alluvial Aquifer at the following locations: MW-31, MW-35, MW-37, MW-28, MW-40
- The specific screen depths and construction details will be based on the field and drilling conditions encountered. Well screen lengths of may vary from 20 to 10 feet depending on core logging results at specific drilling sites.

3.	Selected Existing Well Data:	<u>screen length</u>		
	MW-13	20-foot		
	MW-20-70	20-foot		
	MW-20-100	10-foot		
	MW-20-130	10-foot		
	MW-24A	20-foot		
	MW-24B	20-foot		
	MW-25	20-foot		
	MW-27	10-foot		
	MW-31	20-foot		