Well Condition Observations and Video Log Inspection of Groundwater Monitoring Well MW-44-125

PG&E Topock Compressor Station, Needles, California

Date: April 14, 2006

Introduction

This technical memorandum describes the well construction, current well conditions, and results of field observations and inspection of groundwater monitoring well MW-44-125, recently installed at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station. Well MW-44-125 is deepest well in a cluster of three groundwater monitoring wells installed in the floodplain area of the Topock site as part of PG&E's 2006 Interim Measures (IM) performance monitoring drilling program (see Figure 1 for the MW-44 cluster location). The California Department of Toxic Substance Control (DTSC) is the lead regulatory agency overseeing the IM drilling and performance monitoring program.

This purpose of this memorandum is to document the current conditions and results for the video log inspection of MW-44-125 and to present recommendations for ongoing monitoring, evaluation, and maintenance of this well.

Current Well Conditions and Field Observations

Well Installation and Development

Well MW-44-125 is a 2-inch diameter PVC monitoring well that was initially installed on February 26, 2006 in a "nested" well completion (two wells in a single borehole). During well construction, the shallow portion of the deeper well was damaged. On March 6-7, MW-44-125 and paired shallower nested well screen (MW-44-70) were successfully re-installed. Figure 2 presents a well construction details for MW-44-125 and the shallower well installed in the MW-44 nested well completion.

Well MW-44-125 was developed initially on March 8 by bailing, surging, and pumping. During development, it was noted that the well's 10-foot blank casing section (sump) below the well screen had filled-in with material, believed to be a mixture of filter-pack sand and formation sediment. The sediment in the bottom of the well was bailed and air-lifted out. Upon completion of development, sand/sediment had filled the sump interval to approximately 2 feet below the well screen (see Figure 2). On March 16, crews re-developed well MW-44-125 by bailing, surging, and pumping. Well soundings during re-development confirmed soft-bottom well depths ranging from 125.1 to 128.9 feet below top of casing. Table 1 summarizes the MW-44-125 well development activities and the field measurements.

Well Purging and Sampling Observations

Well MW-44-125 was initially purged and sampled on March 9. This well has been subsequently sampled on March 23 and April 4 (bi-weekly sampling schedule) in accordance with DTSC direction. Table 1 summarizes the well conditions, purging details, and characteristics of the groundwater samples collected during the first three sampling events at MW-44-125. The well depth measurements shallower than construction depth suggested that a breach in the well casing is allowing filter-pack sand and/or formation sediment to enter the well casing.

It should be noted that, although the purge rate for this well is lower than comparable depth monitoring wells (0.5 gallons per minute [gpm] versus typical 1-2 gpm purging rates), the field parameter readings for turbidity and specific conductance are representative and consistent with groundwater samples collected from equivalent wells in the floodplain area (see PG&E's groundwater monitoring reports). In addition to measuring static water level and field parameters, well bottom depths were sounded March 22 and will continue to be measured during ongoing groundwater sampling.

Video Log Inspection

To better assess the condition of the well, a video log inspection of MW-44-125 was performed on March 28, 2006 by Welenco, Inc. A 1-5/8 inch diameter color video camera was lowered into the well to inspect the condition of the PVC casing and screen. Kate Burger of DTSC was on site to observe the well video survey. The video output was viewed going into and out of the well.

The video showed that all of the threaded joints in the blank casing and screen were intact. No breaks or other damage to the blank casing or well screen were visible. The well screen slots, from 115 to 125 feet below ground surface, were intact. The top of the sediment in the well sump was visible at 128 feet, approximately 3 feet below the lowest screen slots. The well video log report and images from the inspection are attached to this memorandum.

Conclusions and Recommendations

Based on the results of the video log survey, it appears that a casing breach or parting occurred most likely at the bottom cap of the well casing during well construction, and that filter-pack sand and/or formation sediment has filled the bottom approximate 7 feet of the well sump. This cannot be confirmed or refuted by video or geophysical methods. The video log does indicate the well screen and blank casing above the screen have not been damaged or cracked. The most recent field purging measurements (April 4 sampling) indicate that MW-44-125, in its current condition is a functioning well, is capable of providing low turbidity groundwater samples that are representative of water quality in the aquifer zone monitored at this location.

PG&E recommends the following course of action regarding well MW-44-125:

- Continue routine sampling of the well in its current condition. The well bottom depth will be measured before and after purging to assess if the column of sediment in the well sump remains stable or increases with purging and over time.

- The field sampling data sheet for well MW-44-125 (Table 1) will be maintained and updated with well depth and other field measurements during ongoing monitoring. The field sampling data sheet will be provided to DTSC monthly for review.
- If the column of sediment in the well sump remains stable during continued sampling and water quality parameters remain consistent with water quality data from nearby wells monitoring an equivalent aquifer interval, then no further action is recommended.
- If the column of sediment in the well sump increases with purging and over time or if unusual inconsistencies are observed in water quality parameters, abandonment, repair and replacement options will be further evaluated, in consultation with DTSC. One available option is lining the well with a 1.5-inch diameter well screen and casing. The re-lined well screen interval would be equivalent to MW-44-125 but a smaller slot size (e.g., 0.010-inch) would be considered. The smaller diameter well can be purged and sampled with a Whale-brand (or equivalent) 12-volt submersible pump. If required, a dedicated Whale-pump would be installed in MW-44-125.

PG&E will update DTSC on a routine basis of the results of field measurements and observations from the continued sampling of MW-44-125. Crews will be prepared to implement the above actions as part of the site groundwater monitoring well maintenance program.

Certification

This technical memorandum was prepared by CH2M HILL under the supervision of the professional whose seal and signature appears hereon, in accordance with currently accepted professional practices; no warranty, expressed or implied, is made.

Paul Bertucci, Certified Engineering Geologist #1977

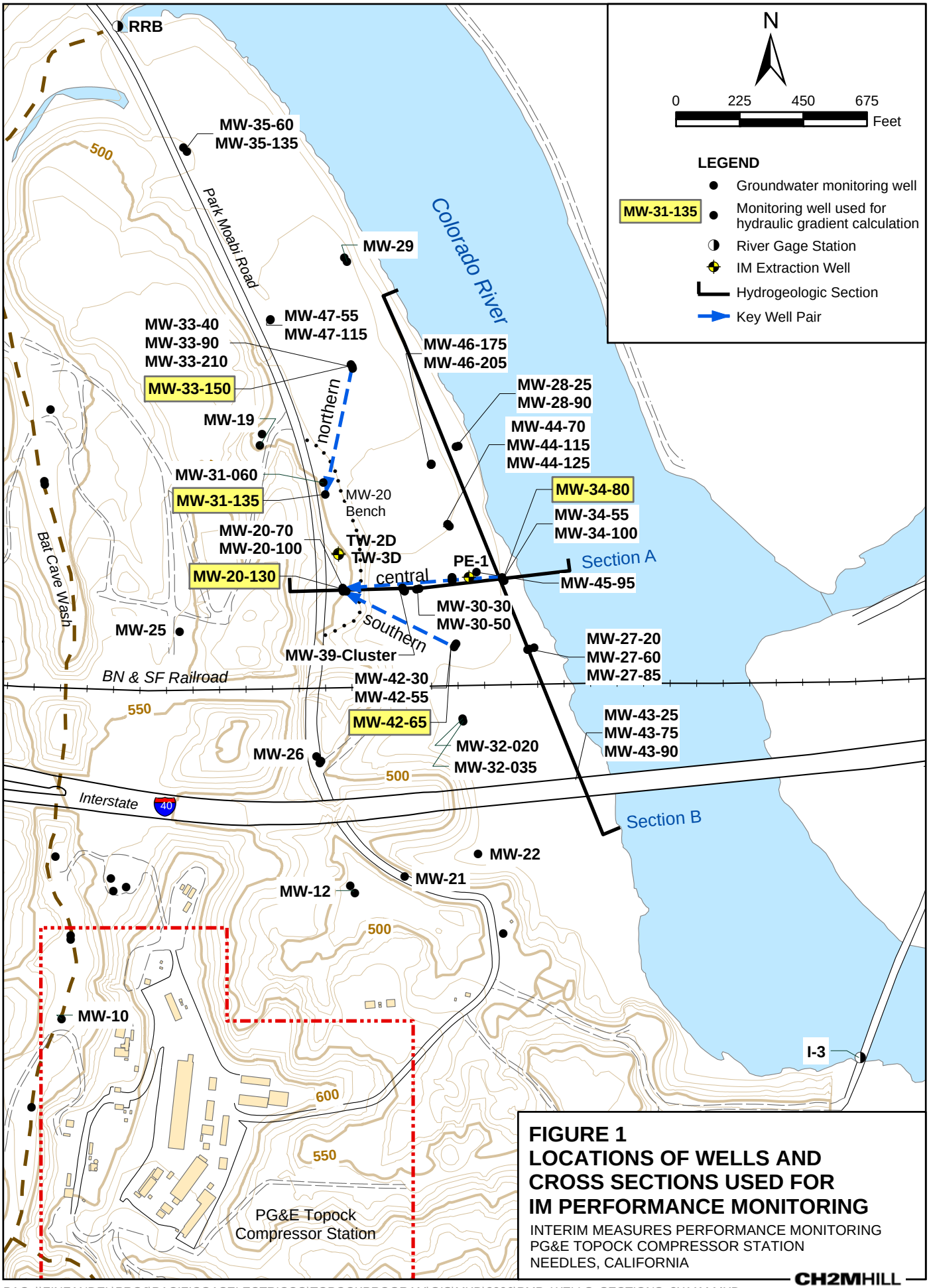

FIGURE 1
LOCATIONS OF WELLS AND CROSS SECTIONS USED FOR IM PERFORMANCE MONITORING

INTERIM MEASURES PERFORMANCE MONITORING
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

CH2MHILL

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FIGURE 2

PROJECT NUMBER	WELL NUMBER	
340934.AA.01.00	MW-44-70 MW-44-125	SHEET 1 of 1

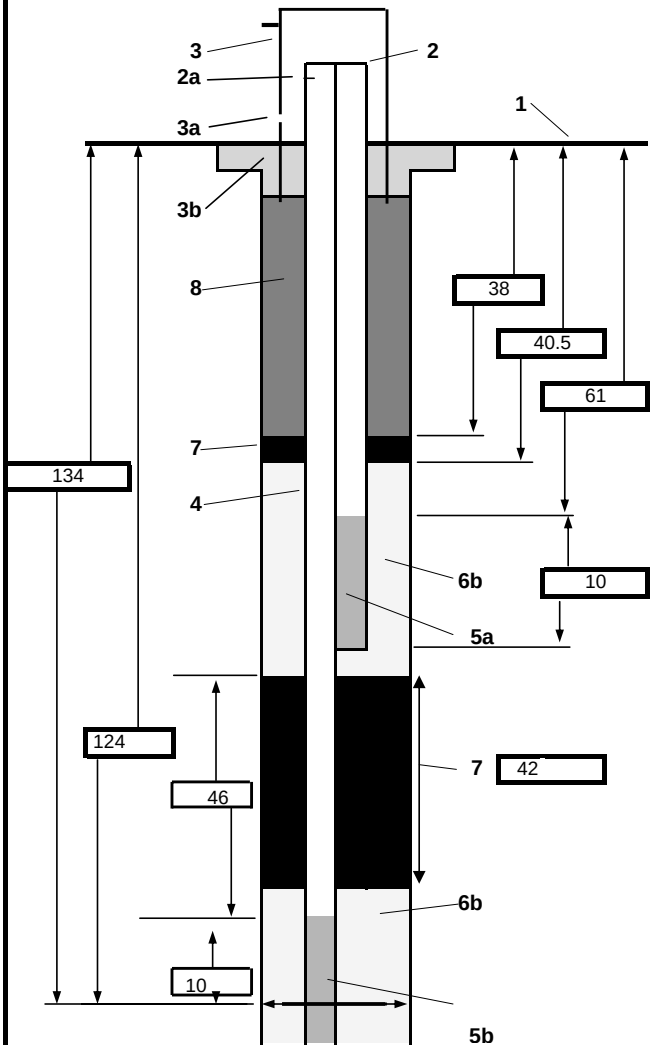
NESTED WELL COMPLETION DIAGRAM

PROJECT : **Topock 2006 IM Performance Monitoring Drilling Pr** LOCATION : **PG&E Topock Compressor Station, floodplain area**

DRILLING CONTRACTOR : Prosonic

DRILLING METHOD AND EQUIPMENT USED : Track-mounted Rotosonic drilling rig

WATER LEVELS : approx 18 ft below TOC START : 3/6/2006 END : 3/7/2006 LOGGER : Rob Tweidt - Northstar



1-	Ground elevation at well	Estimated 467 feet MSL. Survey pending.
2-	Top of casing elevation	Pending. Casing stickup 1.5 ft above ground
	a) vent hole?	No
3-	Wellhead protection cover type	stove-pipe monument
	a) weep hole?	No
	b) concrete pad dimensions	
4-	Dia./type of well casing	2-inch Sch. 40 PVC
5a	Type/slot size of screen	2-inch Sch. 40 PVC, 0.020 slot
5b	Type/slot size of screen	2-inch Sch. 40 PVC, 0.020 slot
6a	Type screen filter/Quantity	#3 Monterey Sand
6b	Type screen filter/Quantity	#3 Monterey Sand
7-	Type of seal	Bentonite chips (medium)
	a) Quantity used	10 bags or 500 pounds
8-	Grout	
	a) Grout mix used	Bentonite slurry grout
	b) Method of placement	Tremmie pipe
	c) Vol. of well casing grout	165 gallons
	Development method	Surge, bail, and pump - 1st devel. 3/8/06
	Development note	Surge, bail, and pump - 2nd devel. 3/16/06
	Estimated purge volume	

Comments Nested well pair initially installed 2/26/06 (casing damaged) Removed casings and completed re-drill on same borehole for well installation. Nested wells labeled as follows:
MW-44-125 (screen 114-124) with 10-foot blank casing sump.

TABLE 1
Well Development and Sampling Summary - Floodplain Well MW-44-125
PG&E Topock 2006 IM Performance Monitoring

Date	Activity	Static Water Level (ft BTOC)	Pre-Pumping Sounded Well Depth (ft BTOC)	Post-Pumping Final Well Depth (ft BTOC)	Remarks	Purge Rate (gpm)	Total Volume Purged (gallons)	Final Turbidity (NTU)	Field Specific Conductance (µS/cm)
8-Mar-06	Initial well development	17.96	128.67	--		1 to 2.3	198	9	12,100
9-Mar-06	Sampling event #1	19.10	--	--		0.2 to 1	24	293	13,500
16-Mar-06	Second well development	18.25	129.11	128.80	soft bottom	0.4	44	136	18,900
17-Mar-06	Well sounding	17.86	128.78	128.78		--	--	--	--
18-Mar-06	Well sounding	18.04	128.75	128.75		--	--	--	--
22-Mar-06	Sampling event #2	18.20	128.90	128.90		0.4	57	1	15,000
5-Apr-06	Sampling event #3	16.29	--	--		0.5	60	5	15,600
14-Apr-06	Well sounding	16.58	128.8	--		--	--	--	--

NOTES:
1. All water level and sounded well depths in feet below top of casing (ft BTOC).
2. MW-44-125 top of casing datum is 1.38 feet above ground surface. See Figure 2 for MW-44-125 well construction details.
3. Purge rates in gallons per minute (gpm) rounded off to 0.1 gpm. (--) denotes data not collected or available.

Vid-Pac

Wellbore Video Report

welenco

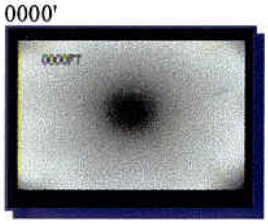
Company	CH2MHILL			**Job Ticket** 5894	**Run No.** 1
Address	2285 Corporate Circle #200			**Well No** 44-125	
City	Henderson	**State** NV	**Zip** 89074	**Survey Date**	March 28, 2006
Requested by	Jay Piper	**P.O.**		**Well Owner**	
Copy To				**Camera**	1 5/8" Rental Color Camera
Reason For Survey	Looking For Breaks			**Zero Datum**	Top of Casing
Operator	Mitch Tullis	**Well Depth**		**Video Vai**	P-03

Location Topock Site

Casing I.D. at Surface 2" **I.D. Reference** Well Records **Build-Up** None

SELECTED WELLBORE SNAPSHOTS

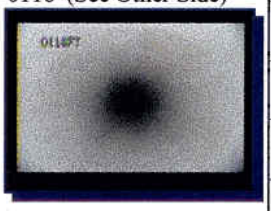
0000'



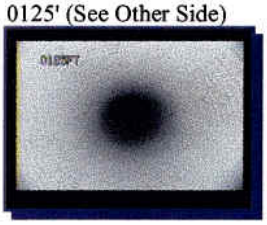
0016' (See Other Side)

0065'

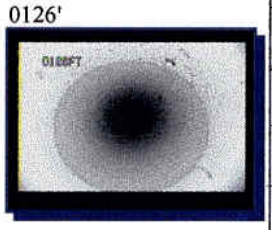
0116' (See Other Side)



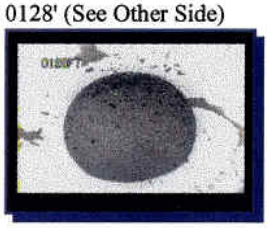
0125' (See Other Side)



0126'



0128' (See Other Side)



TRUE DEPTHS	WELLBORE/CASING INFORMATION
0'	Recordings Start - Zeroed at Top of Casing, 1' Above GL
16'	Static Water Level
65'	Joint
116'	Top of Perforations, Horizontal Slots, Screen
125'	Bottom of Perforations, Slots
126'	Joint
128'	Fill, Bottom of well
	end of survey

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Notes: Mobile System used in Floodplain