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August 18, 2006

Mr. Chris Guerre
California Department of Toxic Substances Control
Southern California Region
5796 Corporate Avenue
Cypress, CA 90630

Subject: Groundwater Model Report, Section 4.4
PG&E Topock Compressor Station, Needles, California

Dear Mr. Guerre:

This letter transmits Section 4.4 (Initial Hydraulic Parameter Assignments) of the Groundwater Model Report for the PG&E Topock Compressor Station. This document has been prepared in conformance with DTSC's letter dated February 3, 2006; the submittal date for this section was approved by DTSC on July 17, 2006.

If you have any questions, please do not hesitate to call me.

Sincerely,

Julie Eakins for Yvonne Meeks

Enclosure

cc: Kate Burger/DTSC

Groundwater Model Report

Topock Compressor Station
Needles, California

Prepared for

Pacific Gas and Electric Company

Section 4.4: August 2006

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Groundwater Model Report

Topock Compressor Station
Needles, California

Prepared for

California Department of Toxic Substances Control

on behalf of

Pacific Gas and Electric Company

August 18, 2006

This report was prepared under supervision of a California Professional Geologist

Brian Schroth, Professional Geologist No. 7423
Senior Hydrogeologist

4.4 Initial Hydraulic Parameter Assignments

Hydraulic testing in site wells was described in Section 2 and summarized in Table 2-3. The higher priority was placed on data from long-term pumping/recovery tests over short-term tests. There are four areas at the site where hydraulic testing data have been collected: (1) the floodplain and adjacent area, (2) the IM3 injection well area, (3) TW-1 at the Topock Compressor Station, and (4) PT-1 at the New Ponds area.

Table 4-3 provides estimates of horizontal and vertical hydraulic conductivity (K_h and K_v, respectively), and storativity (S) for these areas, with parameters listed for each HSU screened by test wells. Data were analyzed using the MLU software (available at www.microfem.com), which uses a combination of numerical and analytical methods to estimate parameters from layered aquifer systems (Hemker 1999). With this tool, drawdown in multiple screened intervals may be interpreted quickly and simultaneously by assigning layers to different screened intervals. In these interpretations, the assigned layers corresponded to HSUs that correspond to the screened intervals of the observation wells. The program is used to estimate transmissivity (T) and storativity of each layer, along with the leakance between layers. Transmissivity is defined as the product of horizontal conductivity and thickness.

Because thickness of each HSU varies throughout the region, conductivity values are more useful for model input than transmissivity. Assigned HSU thickness at the test area was divided into the T value to obtain K_h, and vertical resistance was converted to a K_h/K_v ratio to determine an estimate for K_v. Assigned K_h and K_v values for HSUs are input to the model, which is then used with HSU thickness estimates to populate transmissivity values for the entire model domain. Storativity is a unitless parameter that represents the product of specific storage and thickness, and is entered as storativity to the model in the area of each test in order to later calibrate the model. When general estimates of storativity for each HSU are determined during calibration, then representative specific storage values will be calculated for all areas and reported in Section 5.

These parameters represent pre-calibration estimates for initial model input. Estimates in the four areas were input to the model and distributed based on assumptions of geologic extent of properties for each area. Estimated average property values for each HSU were assigned to all other areas of the model. For HSUs not present in the testing areas but present in other areas of the model (Tmc, Tb, and Qoa), hydraulic parameter estimates were assigned based on knowledge of geology and typical properties for these types of materials. Adjustments to properties were made during the calibration procedure, in which not only aquifer test data but other calibration targets were matched, including long term average heads and monthly average heads. The initial parameters included in Table 4-3 should therefore be considered as starting points for initial distribution of these parameters in the groundwater model. The calibration procedure and results are described in Section 5.

4.4.1 Floodplain Area

The highest quality hydraulic data are derived from the floodplain areas due to the large number of monitoring wells, transducer/datalogger systems, and relatively long duration of pumping tests conducted in this area. A number of aquifer tests have been conducted at

IM-3 extraction wells in the vicinity of the MW-20 cluster, as well as in the MW-20 cluster itself. In May 2006, testing was performed at two new test wells, TW-4 and TW-5 (see Figure 1-2). The area of influence of these tests strongly overlapped that of past tests, and allowed data to be collected from newly installed monitoring wells in the floodplain that were not present during the previous testing. For these reasons, the TW-4 and TW-5 tests are considered the best data currently available for use in assigning pre-calibration estimates for aquifer parameters in this area. The number of well screen intervals was so large in this area that multiple completions exist within the alluvial HSUs (Toa2, Toa1, and Toa0). Table 4-3 reflects these completions by splitting these HSUs into subunits. The model layering will enable splitting of these units in most areas of the floodplain, so that these property variations within HSUs are reflected in the model.

4.4.2 IM3 Injection Well Area

The December 2004 injection well testing (IW-2 and IW-3) provided data for estimates of hydraulic parameters for the alluvial HSUs Toa0, Toa1, and Toa2 in this area. The Toa0 HSU showed higher hydraulic conductivity than the shallower zones in this area, based on responses of the deep observation wells (OW-1D, OW-2D, OW-5D) and spinner (velocity) logging at the injection wells themselves.

4.4.3 Topock Compressor Station Area

A brief step-drawdown test was conducted at well TW-1 in December 2003, with responses observed in wells MW-24A, MW-24B, and MW-10. Given the short time span of the test, the relatively low pumping rate, and the large distances to observation wells, the parameter estimates derived from this test are considered to be somewhat lower in quality than estimates from the longer term pumping tests in the floodplain wells. The most accurate parameters from this test are likely for the Toa1/Toa0 zone, screened by both TW-1 and MW-24B.

4.4.4 New Ponds Area

A 48 hour pumping test was conducted in well PT-1 in January 1987 with several nearby New Ponds wells as observation wells. Parameter estimates using traditional aquifer test analysis methods, which assume a single, confined aquifer of constant T and S. Interpretations using these methods were documented in a previous report (PG&E 1995). Although several nearby wells were monitored during the test, the water level data from all wells except P-2 appear to have been lost. . Well P-2 is an observation well located approximately 30 feet away from PT-1. Estimated thicknesses of each HSU in this area were used to construct a multiple aquifer, MLU analysis of the test data. Water level in P-2 showed less than six feet of drawdown after two days of 345 gpm pumping from PT-1. Consequently, transmissivity estimates are relatively high for this test. Estimated thickness of each HSU in this area was used to calculate and assign K_h values, and a 10:1 ratio between K_h and K_v was assumed.

TABLE 4-3
Pre-Calibration Model Aquifer Parameters

Area of Model	HSU	K_h (ft/d)	K_v (ft/d)	S (unitless)	Source
Floodplain/Park Moabi Road	Qr3	22	2	9E-03	TW-4/TW-5 testing, May 2006
	Qr2	5	1	1E-06	
	Qr1	46	1	3E-05	
	Upper Toa2	22	2	9E-03	
	Middle Toa2	5	1	1E-06	
	Lower Toa2	46	1	3E-05	
	Upper Toa1	5	1	3E-05	
	Lower Toa1	46	1	3E-05	
	Upper Toa0	36	2	3E-04	
	Lower Toa0	6	0.4	6E-05	
IM3 Injection Area	Toa2	18	1.4	6E-03	IW-2/IW-3 testing, December 2004
	Toa1	34	1	1E-04	
	Toa0	240	1.7	3E-04	
Topock Compressor Station Area	Toa2	7	2.7	4E-03	TW-1 step-drawdown test, December 2003
	Toa1	52	4.9	1.5E-04	
	Toa0	11	0.6	1.5E-04	
New Ponds Area	Toa2	85	8	0.1	PT-1 test, January 1987
	Toa1	85	8	1E-07	
	Toa0	85	8	1E-07	
Remainder of Model Domain (default values)	Qr3	20	2	9E-03	
	Qr2	5	1	1E-06	
	Qr1	50	1	3E-05	
	Qr0	50	5	3E-05	
	Qoa	20	2	3E-05	
	Tb	1	0.1	3E-05	
	Toa2	35	3.5	5E-03	
	Toa1	25	2.5	1E-05	
	Toa0	20	2	1E-05	
	Tmc	0.03	0.03	1E-07	

7.0 References

(please note: this section will be expanded as additional report sections are submitted)

Hemker, C.J. 1999. Transient well flow in vertically heterogeneous aquifers. Journal of Hydrology 225:1-18.

Pacific Gas & Electric Co. (PG&E). 1995. Background geologic, hydrogeologic, and water quality information. PG&E Technical and Ecological Services. October.