




SHEET 1 of 10				PROJECT NUMBER: 315024.IM.02		BORING NUMBER: TW-1	
SOIL BORING LOG							
PROJECT NAME: PG&E Topock IM Investigation (Phase 5 2004)				HOLE DEPTH (ft): 312.0		DRILLING CONTRACTOR: WDC Exploration and Wells, Montclair, CA	
SURFACE ELEVATION: 621.0 ft. MSL		NORTHING (CCS NAD 27 Z 5): 2,101,173.17		EASTING (CCS NAD 27 Z 5): 7,615,150.78		DATE AND TIME STARTED: 11/11/2003 10:15:00 AM	
						DATE AND TIME COMPLETED: 11/13/2003 5:00:00 PM	
DRILLING METHOD: Mud Rotary				WATER LEVEL (ft): ---		DRILLING EQUIPMENT: Speedstar 30K Rig with 94-mm Punch Core	
LOCATION: PG & E Topock Facility						LOGGED BY: D. Thomas / R. Edwards	
DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION  SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS	
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5				SM	SILTY SAND WITH GRAVEL (SM) - light brown, 40% well-graded gravel, 40% m-f sand, 20% silt, loose, dry, some broken from drilling.	10 1/2 surface casing installed to a depth of 20' using Air Rotary Casing Hammer (ARCH). Soil logging imprecise in this interval due to mixing of cuttings.  Much drill chatter in this interval.  Exterior of casing sealed with hydrated bentonite at surface. Interior of casing sealed at bottom prior to advancement of 6 5/8 bit.  Pilot boring drilled with mud rotary; soil descriptions to 160' from drill cuttings.	
10							
15							
20							
25				GP	POORLY GRADED GRAVEL (GP) - m ang sand up to 1/4, trace fine sand and silt, freshly broken.  - c. ang sand up to 3/8 gravel	Drill chatter.	
30							
35				SC	CLAYEY SAND (SC) 70-75% m-c ang sand, 15-20% lt brn clay, 10% f ang gravel to 1/4, some fine sand.		



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40				SW-SC	WELL GRADED SAND WITH CLAY (SW-SC) - 85% m-c ang sand, 10% clay, 5% vf ang gravel, overall decreasing particle size and clay content.				
45					WELL-GRADED SAND (SW) m-c ang sand, trace vf ang gravel.				
50									
55									
60									
65									
70									
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75				SW	WELL-GRADED SAND (SW) m-c ang sand, trace vf ang gravel.				
80					- orange streaking				
85									
90					- orange streaking				
95					- orange streaking				
100					- orange streaking				
105					- orange and white streaking				


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110				SW	WELL-GRADED SAND (SW) m-c ang sand, trace vf ang gravel.						
					- orange and white streaking						
115					- orange and white streaking						
120					- red, orange, and white streaks in cuttings, mostly m-c ang sand, some fines, trace gravel up to 1/4						
125											
130				- trace of silt							
135											
140				- orange and white streaking							


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	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)				
145					WELL-GRADED SAND (SW) m-c ang sand, trace vf ang gravel.		
150					- orange and white streaking		
155					- m-c ang sand with some fine sands and silt	Mud Properties (155' during borehole ream) viscosity = 37 seconds density = 9.2 lbs/gallon half press filter test = 3.4 mL in 7.5 min with firm 1-mm cake	
160					- trace vf ang gravel	Mud properties at 155' during borehole ream	
165					- brown, 80% angular sand, 20% subangular to angular gravel up to 2, medium dense, wet	Start 94 mm coring at 10' intervals. First core met refusal after 8.	
170							
175				SM	SILTY SAND (SM) - brown matrix with red, orange, white, dk and lt green clasts, 70% well-graded ang sand, 30% silt, medium dense, wet.	First attempted SimulProbe groundwater sample (no recovery). Continue with 94 mm coring.	


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	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)				
180				SW	WELL GRADED SAND (SW) - m-c ang sand, some vf ang gravel.	3 attempts for a total of 6' core.	
185				SM	SILTY SAND WITH GRAVEL (SM) - color varies widely, 60% well graded ang sand, 15-20% silt, 10-15% angular gravel to 1, soft to medium firm, wet.		
190				SW	WELL GRADED SAND (SW) - m-c ang sand, trace vf ang gravel.		
195				SW-SC	WELL GRADED SAND WITH CLAY (SW-SC) - 80% well-graded ang sand, 20% clay in layers.		
200				SM	SILTY SAND WITH GRAVEL (SM) - color varies widely with minerals present, 60% well graded ang sand, 15-20% silt, 10-15% angular gravel to 1, soft to medium firm, wet.		
205					WELL GRADED SAND (SW) - orange streaks in cuttings, m-c ang sand, trace ang gravel to 3/16.		
210							


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	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)				
215				SW	WELL GRADED SAND (SW) - orange streaks in cuttings, m-c ang sand, trace ang gravel to 3/16.  - red-orange clay	Loss of circulation briefly.    - 41% gravel in core sample based on grain size analysis	
220				GW	WELL GRADED GRAVEL WITH SAND (GW) - 65-70% well-graded, angular sand, 15-20% silt, 15% f ang gravel to 1/4, trace orange clay, loose to medium firm, wet.		
225							
230							
235				SW	WELL GRADED SAND (SW) - some ang gravel to 3/16.		
240				SC	CLAYEY SAND (SC) - medium brn, 65% well-graded ang sand, 35% medium plasticity fines, trace of ang gravel to 3/16, soft, wet. - becoming reddish		
245							


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	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)				
250				SW	WELL GRADED SAND (SW) - slight red color, trace gravel to 3/16.	<p>Large rock in shoe blocked collection of core.</p> <p>- C09 core contains dense, stiff clayey sand, red in color, not consolidated</p> <p><u>Mud Properties at (270' during borehole ream)</u>  Viscosity = 38 seconds  Density = 9.3 lbs/gallon  Half press filter test = 4.0 mL in 7.5 min with firm 1.5-mm firm cake  Sand content = 0.5%  Viscosity = 38 seconds  Density = 9.3 lbs/gallon</p> <p>Contact with consolidated bedrock interpreted from core, geophysical logs, and change in drilling fluid color at 275'  Sand content = 0.5%  Drill cuttings and mud return changed to red in color (notes at 275'); bedrock contact suspected between 270' and 275'</p>	
255					- 15% fines, ang gravel		
260					- 25% f ang gravel to 1/8		
265				CL	SANDY CLAY (CL) - (10YR 4/4), 60% fines, 40% well-graded ang sand, soft, medium plasticity, wet.		
270				SC	CLAYEY SAND (SC) wet, loose, 70% well-graded, angular sand, 30% fines. Becoming red, stiff to friable.		
275					SANDY MUDSTONE - reddish (2.5YR 4/6), 70% fines, 30% f-m ang sand, consolidated.		
280							


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285				BR	SANDY MUDSTONE - reddish (2.5YR 4/6), 70% fines, 30% f-m ang sand, consolidated.  - consolidated, sandy to silty	<u>Mud Properties at (during borehole ream)</u> Viscosity = 43 seconds Density = 9.1 lbs/gallon Full press filter test = 5.7 mL in 7.5 min with firm 2/32-inch firm cake Sand content = 0.6% Core collected at 281' is consolidated bedrock (I.e., Red Fanglomerate).	
290					CLAYEY SANDSTONE - medium brown, 70% well-graded ang sand, 30% fines.		
295							
300				BR			
305							
310				BR	SANDY MUDSTONE - medium brown with white calcareous streaks, firm.	Pilot boring terminated at 312' bgs.	
					Boring Terminated at 312 ft		
					ABBREVIATIONS cc = continuous core run		

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## SOIL BORING LOG

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					brn = brown lt = light dk = dark vf = very fine-grained f = fine-grained m = medium-grained c = coarse-grained vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz	



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