

# WELL COMPLETION DIAGRAM

PROJECT NO: 315024.IM.02

PROJECT: PG&E Topock Interim Measures

WELL NO: TW-2S

LOCATION: MW-20 Bench

DRILLING CONTRACTOR: WDC Exploration and Wells, Montclair, CA

DRILLING START DATE: 04/05/2004

DRILLING METHOD: Mud Rotary

DRILLING END DATE: 04/05/2004

LOGGER: J. Sarabia

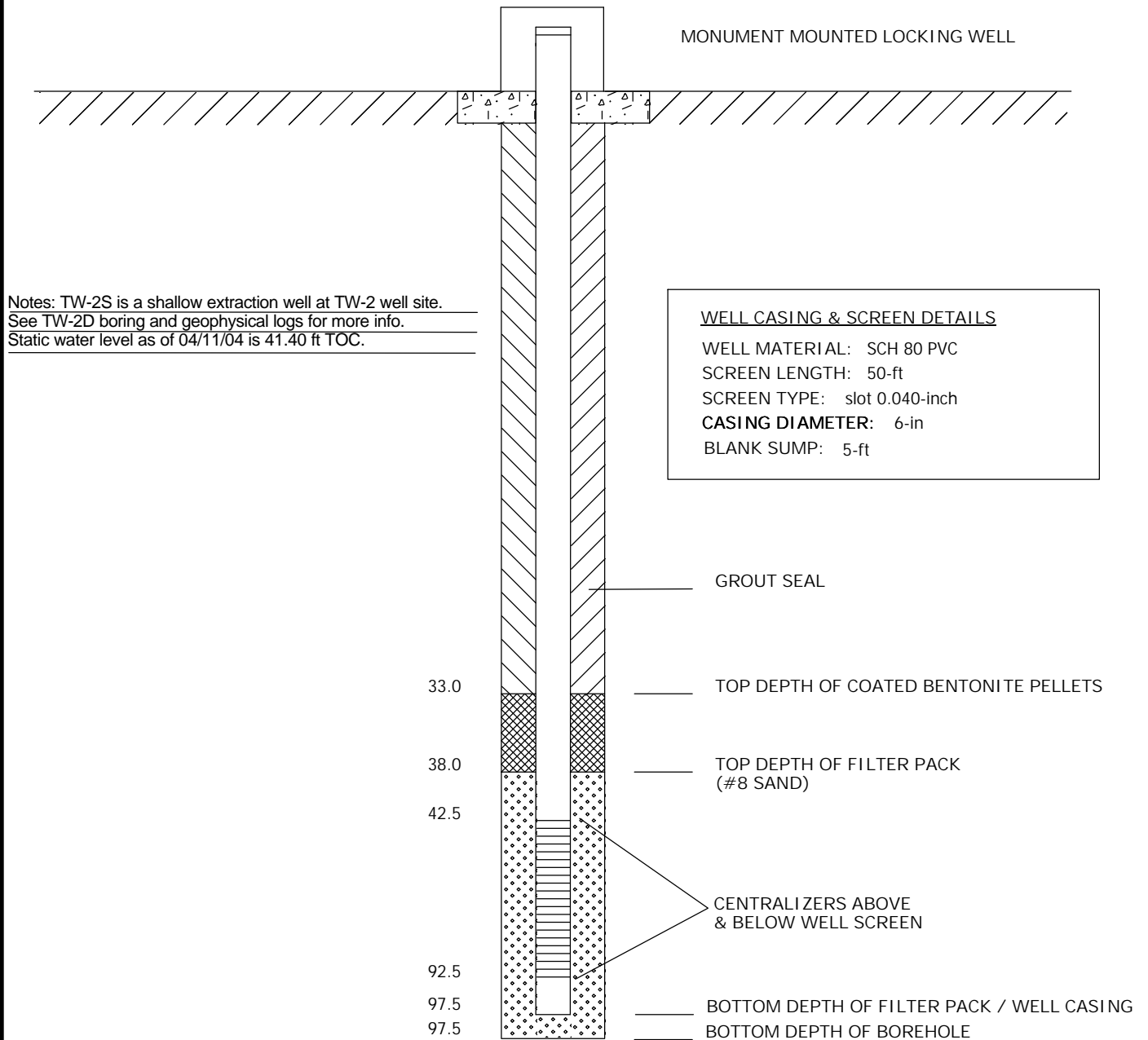
WELL COMPLETION DATE: 04/06/2004

TOP OF WELL CASING (NGVD 29): 499.05

NORTHING COORDINATE (CCS DAND 27, ZONE 5): 2102641.02

GROUND SURFACE ELEVATION (NGVD 29): 496.70

EASTING COORDINATE (CCS NAD 27 ZONE 5): 7615869.56



ALL DEPTHS ARE FEET BELOW GROUND SURFACE (NOT TO SCALE)

**SOIL BORING LOG**

<b>PROJECT NAME:</b> PG&E Topock IM Investigation (Phase 1 2004)		<b>HOLE DEPTH (ft):</b> 180.0	<b>DRILLING CONTRACTOR:</b> WDC Exploration and Wells, Montclair, CA	
<b>SURFACE ELEVATION:</b> 497.0 ft. MSL	<b>NORTHING (CCS NAD 27 Z 5):</b> 2,102,633.34	<b>EASTING (CCS NAD 27 Z 5):</b> 7,615,861.57	<b>DATE AND TIME STARTED:</b> 03/30/2004	<b>DATE AND TIME COMPLETED:</b> 04/01/2004
<b>DRILLING METHOD:</b> Mud Rotary		<b>WATER LEVEL (ft):</b> ---	<b>DRILLING EQUIPMENT:</b> Speedstar 30K Rig with 94-mm Punch Core	
<b>LOCATION:</b> MW-20 Bench			<b>LOGGED BY:</b> J. Sarabia	

DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION  SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS  DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.
	INTERVAL	TYPE/ NUMBER	RECOVERY (ft)			
5					No core	AM activities: rig-up, set conductor casing to 17' bgs with air rotary. P.M. activities: set up mud circulation system, drill direct 17'-40' bgs. 15:30 begin first core run
10						
15						
20						
25						
30						
35						

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	INTERVAL	TYPE/NUMBER	RECOVERY (ft)			
40					No core	
45		CC124	0.75	SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 10YR4/3, well graded sand, c silt, f gravel up to 3/4, subang to ang. <b>SILT WITH GRAVEL (ML)</b> - brn 10YR4/3, sand fraction nearly absent. <b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 10YR4/3, 80% well graded c silt to f gravel, m gravel up to 2, ang.	very slow coring very slow - rig maxed out hard coring
		CC125	0.5	ML		
		CC126	3.5	SW		
		CC127	0.5	SW		
		CC128	2	SW		
		CC129	0.5	SW		
50		CC130	2.25	SM	<b>SILTY SAND WITH GRAVEL (SM)</b> - brn 10YR4/3, well graded c silt to 0.75 gravel, subang to ang, slight plasticity.	
		CC131	0.75	SM		
55		CC132	3.5	SM	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 10YR4/3, c silt, gravel up to 1, subang to subrnd.	moderate to hard coring, core is less dense/consolidated-remains intact after extraction from core barrel  very hard coring
		CC133	0.5	SM		
		CC134	1.5	SM		
		CC135	0	SM		
60		CC136	1.5	SM	- 1/8 to 1 ang gravel, subrnd cobbles to 2.5	very hard coring, obstruction at 57' - will try to drill through with bit drill ahead to try to get through obstruction attempt to core- no recovery hard coring cannot core, will drill ahead and attempt to core at 62' bgs attempted to core at 62'bgs - too many rocks, will drill to 65' bgs
65						attempted to core at 65'bgs - too many rocks, will drill ahead to 67' bgs and attempt to core attempted to core at 67'bgs - too many rocks, will drill ahead to 70' bgs and attempt to core
70						

**SOIL BORING LOG**

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<b>LOCATION:</b> MW-20 Bench			<b>LOGGED BY:</b> J. Sarabia	

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	INTERVAL	TYPE/NUMBER	RECOVERY (ft)			
75				SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - brn 10YR4/3, c silt, gravel up to 1, subang to subrnd.	attempted to core at 70'bgs - refusal, will drill ahead  rig chatter significant in this zone, becomes progressively harder to drill with depth, and impossible to core (possible basal conglomerate)
80						at ~79.5 bgs, rig chatter subsides (possible lith, contact), will attempt to core at 80'bgs attempted to core at 80' bgs, could not advance the core barrel - will continue to attempt to get core.
85						attempted to core - could not advance core, will drill forward and attempt to core when lithology changes or 90' bgs (which ever comes first)
90						
95					<b>SILTY SAND WITH GRAVEL (SM)</b> - brn 10YR4/3, silt.	core barrel cannot be advanced (too many rocks/ cobbles. Will continue to drill direct with tricone bit and attempt to core every 3-5 feet.  continued strong rig chatter. Still unable to advance core barrel
100				GM		
105						

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	INTERVAL	TYPE/NUMBER	RECOVERY (ft)			
110					<b>SILTY SAND WITH GRAVEL (SM)</b> - brn 10YR4/3, silt.	
115		CC137	2.75	SW	<b>WELL GRADED SAND WITH GRAVEL (SW)</b> - reddish brn 2.5YR4/4, well graded c silt, gravel up to 2, subang to ang, massive.	lithology still causing rig chatter, but will attempt core run.
120		CC138	1.75			partial core recovery; core color implies geologic contact
125		CC139	1			poor core recovery, punch coring bit has been chewed up due to cobbles/rocks. Well put on another bit. Very hard coring
		CC140	1.75			hard to very hard coring
		CC141	2			very hard coring
130		CC142	0.5	SM	<b>SILTY SAND (SM)</b> - reddish brn 2.5YR4/4, increasing silts and clays, ang gravel clasts, variable mineralogy, massive.	very hard coring
		CC143	4			hard coring - good core recovery and competence (less very large stones/cobbles, more cohesion in lithology)
135		CC144	2.5			alternating moderate to hard coring
		CC145	2			stones/cobbles stuck on both ends of returned core preventing better recovery
140		CC146	2			moderate to easy coring
						moderate coring difficulty

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	INTERVAL	TYPE/NUMBER	RECOVERY (ft)			
145		CC147	3	SC	<b>CLAYEY GRAVEL WITH SAND (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand to 0.125, 20% gravel up to 2.	very easy coring  very hard coring
		CC148	3			
		CC149	3			
150		CC150	2	SC	<b>CLAYEY GRAVEL WITH SAND (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand to 0.125, 20% gravel up to 2.	very hard coring, probable geologic contact at 150' very dense/tough material
		CC151	0.5			
155		CC152	1.5	SC	<b>SILTY SAND WITH GRAVEL (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand, 20% gravel 0.125 up to 2.  - dark red, geologic contact, dense, lithified, stiff, rock-like	extremely hard coring extremely hard coring, will drill 2.5'  drill ahead due to difficult or impossible coring
		CC153	2			
160		CC154	0.4	SM	<b>SILTY SAND WITH GRAVEL (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand, 20% gravel 0.125 up to 2.  - dark red, geologic contact, dense, lithified, stiff, rock-like	extremely hard core refusal  drill ahead due to core refusal, will attempt to core again at 162' bgs
		CC155	0.3			
165				SM	<b>SILTY SAND WITH GRAVEL (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand, 20% gravel 0.125 up to 2.  - dark red, geologic contact, dense, lithified, stiff, rock-like	very slow drill with abundant rig chatter extremely hard core refusal at 6 drill ahead due to core refusal, will attempt to core again at 167' bgs
		CC156	0.5			
170				SM	<b>SILTY SAND WITH GRAVEL (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand, 20% gravel 0.125 up to 2.  - dark red, geologic contact, dense, lithified, stiff, rock-like	lots of rig chatter, very slow drilling extremely hard core, refusal at 6 drill ahead due to core refusal
		CC157	0.25			
175				SM	<b>SILTY SAND WITH GRAVEL (SC)</b> - dk reddish brn 2.5YR3/4, well graded vf sand, 20% gravel 0.125 up to 2.  - dark red, geologic contact, dense, lithified, stiff, rock-like	extremely slow drilling, abundant rig chatter, will attempt core run at 172'  attempted core run, refusal at 3, will drill ahead

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DEPTH BGS (feet)	SAMPLE			USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	TYPE/NUMBER	RECOVERY (ft)			
180					<p><b>SILT SAND WITH GRAVEL (SC)</b> - silts and clays, 25% to 34% graded, 20% gravel 0.125 up to 2.0 mm, variable mineralogy, massive.</p> <p style="text-align: center;">Boring Terminated at 180 ft</p> <p><b>ABBREVIATIONS</b>                      cc = continuous core run                      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</p>	extremely hard drilling to 180' bgs