WELL COMPLETION DIAGRAM

PROJECT: ER-TCS Groundwater Investigation **PROJECT NO:** 417981.ER.02.FW WELL NO: MW-68-180

MW-68-240

LOCATION: Site 3

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey) **DRILLING START:** 5/13/2011

DRILLING METHOD: Rotosonic DRILLING END: 5/16/2011

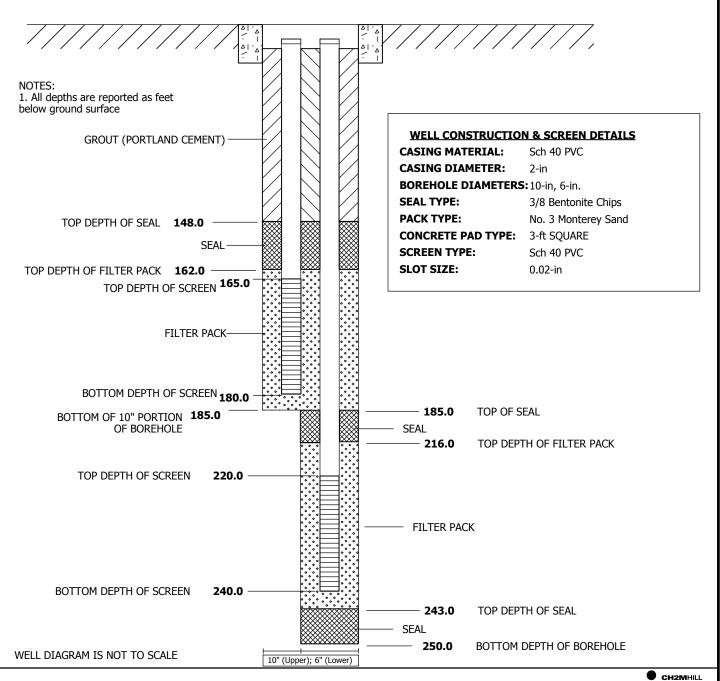
LOGGER: A. Brewster (Northstar) **WELL COMPLETION DATE: 5/18/2011**

GENERAL REMARKS: Centralizers at 10, 25, 40, 55, 70, 85, 100, 115, 130, 145, 160, and 215 ft bgs. GROUND SURFACE ELEVATION (NAVD 88): 621.6 ft AMSL

NORTHING (CCS NAD 83 Z 5): EASTING (CCS NAD 83 Z 5):

2100773.64 7615453.36

12-in DIAMETER WELL VAULT (FLUSH WITH GRADE)





WATER LEVELS: Approx. 164 ft BGS

RECOVERY (in)

COMPLETE

LAB SAMPLE

10301

10302

10303 50009

10304

10305

10306

DEPTH BELOW EXISTING GRADE (ft)

INTERVAL (ft)

0.0

1.0

2.0

3.0

5.0

6.0

9.0

10.0

14.0

15.0

19.0

20.0

5

10

15

20

PROJECT NUMBER: 417981.ER.02.FW

START: 5/13/2011

SOIL DESCRIPTION

BORING NUMBER: BH-68

SHEET 1 OF 15

ORIENTATION: Vertical

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION: Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

Poorly Graded Sand (SP)

Silty Sand (SM)

predominantly quartz.

17.0-35.0' - brown, (10YR 5/3), dry, loose to partially consolidated, 10% gravel, 60% sand, 30% fines,

subangular to subrounded, poorly graded,

DRILLING EQUIPMENT AND METHOD: RS-350, Rotosonic drill head and tools

USCS CODE/ LITHOLOGY

SP

SM

END: 5/16/2011 LOGGER: R. Tweidt (Northstar) COMMENTS LOG SYMBOLIC SOIL NAME, USCS GROUP SYMBOL, COLOR, DEPTH OF CASING, DRILLING RATE, MOISTURE CONTENT, RELATIVE DENSITY OR DRILLING FLUID LOSS, TESTS, AND CONSISTENCY, SOIL STRUCTURE, MINERALOGY INSTRUMENTATION Soil sample collected between 0.0 and 1.0 ft 0.0-17.0' - dark yellowish brown, (10YR 4/4), dry, loose, 5% gravel, 90% sand, 5% fines, angular to bgs. subangular, poorly graded, predominantly quartz. Soil sample collected between 3.0 and 4.0 ft bgs. Soil sample collected between 5.0 and 6.0 ft Soil sample collected between 9.0 and 10.0 ft bgs. 14' - Color change to yellowish brown, (10YR 5/4) Soil sample collected between 14.0 and 15.0 ft bgs.

Soil sample collected between 19.0 and 20.0

ft bgs.



BORING NUMBER: BH-68

SHEET 2 OF 15

ORIENTATION: Vertical

SOIL BORING LOG

PROJECT: PG&E Topock, ER-TCS Investigation LOCATION: Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD : RS-350, Rotosonic drill head and tools

WATER LEVELS : Approx. 164 ft BGS	3	START : 5/13/2011	END: 5/16/2011	LOGGER : R. Tweidt (Northstar)
DEPTH BELOW EXISTING GRADE (ft)		SOIL DESCRIPTION	g	COMMENTS
INTERVAL (ft) RECOVERY (in) LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, CO MOISTURE CONTENT, RELATIVE DENSI CONSISTENCY, SOIL STRUCTURE, MINER	ΓY OR ΙΩΙ	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
29.0 30.0 35	SM	Silty Sand (SM) 17.0-35.0' - brown, (10YR 5/3), dry, loose to consolidated, 10% gravel, 60% sand, 30% fi subangular to subrounded, poorly graded, predominantly quartz. Well Graded Sand With Gravel (SW) 35.0-62.0' - brown, (10YR 5/3), dry, loose to consolidated, 25% gravel, 75% sand, subrous ubangular, predominantly quartz.	partially nes,	Soil sample collected between 29.0 and 30.0 ft bgs.
39.0	SW	outengular, processimality quarte.		Soil sample collected between 39.0 and 40.0 ft bgs.
40 40.0			0,000	



BORING NUMBER: BH-68

SHEET 3 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350. Rotosonic drill head and tools

ORIENTATION: Vertical

	ILINI AND MET	10D . 110-330, 110	tosonic drill head and tools		ORIENTATION : Vertical
VATER LEVELS :	Approx. 164 ft BO	3S	START: 5/13/2011	END : 5/16/2011	LOGGER : R. Tweidt (Northstar)
EPTH BELOW EXIS			SOIL DESCRIPTION		COMMENTS
INTERVAL	RECOVERY (in) LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, (MOISTURE CONTENT, RELATIVE DEN CONSISTENCY, SOIL STRUCTURE, MINI	SITY OR 📗 🦼 📗	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
45	10309 10310	SW	Well Graded Sand With Gravel (SW) 35.0-62.0' - brown, (10YR 5/3), dry, loose consolidated, 25% gravel, 75% sand, subr subangular, predominantly quartz.	*.*.	Soil sample collected between 49.0 and 50. ft bgs.



BORING NUMBER: **BH-68**

SHEET 4 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLIN	IG EQUIP	MENT A	ND METH	IOD : RS-350, Ro	tosonic drill head and tools	`	ORIENTATION : Vertical
WATER	LEVELS	: Approx	. 164 ft BC	GS	START : 5/13/2011 END : 5/	16/2011	LOGGER : R. Tweidt (Northstar)
DEPTH I	BELOW EX	ISTING G	RADE (ft)		SOIL DESCRIPTION	(h	COMMENTS
	INTERVA	AL (ft) RECOVE	ERY (in) LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
65		-COMPLETE		SW	Well Graded Sand With Gravel (SW) 35.0-62.0' - brown, (10YR 5/3), dry, loose to partially consolidated, 25% gravel, 75% sand, subrounded to subangular, predominantly quartz. Well Graded Gravel (GW) 62.0-243.0' - greyish brown, (10YR 5/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, no dominant mineralogy.	- 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-
70	69.0		10311	GW	69' - color change to light yellow brown, (2.5Y 6/3) 70.0-71.0' - Rock flour		Soil sample collected between 69.0 and 70.0 ft bgs.
80_	79.0 80.0		10312			_	Soil sample collected between 79.0 and 80.0 ft bgs.



BORING NUMBER: BH-68

SHEET 5 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350, Rotosonic drill head and tools

ORIENTATION: Vertical

ATER LEVE	S: Appr	ox. 164 ft BC	<u> </u>	START : 5/13/2011 END	: 5/16/201°	1 LOGGER : R. Tweidt (Northstar)
PTH BELOW				SOIL DESCRIPTION		COMMENTS
INTE	RVAL (ft)	. ,				
"""		OVERY (in)	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COLOR,		DEPTH OF CASING, DRILLING RATE,
	1,7500		LITHOLOGY	MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	DRILLING FLUID LÓSS, TESTS, AND INSTRUMENTATION
		LAB SAMPLE		SOMOIOTEMOT, SOIL STRUCTURE, WIINERALUGT	SYN	HOTTONIENTATION
				Well Graded Gravel (GW)	:::	
-	COMPLETE			62.0-243.0' - light yellow brown, (2.5Y 6/3), dry, loos to partially consolidated, 40% gravel, 40% sand, 20	se -	
-	MPL			fines, angular to subangular, no dominant mineralog	70 IV.	
4	Ş				" -	
4					-	
4					-[::]	
4					-	
4					-	
4						
				84' - Change to unconsolidated		
5_]						
7						
1						
1					1	
-					1	
-					-	
4					-	
4					- ::	
89.0	\dashv \vdash				-	Soil sample collected between 89.0 and 9
4		10313			4	ft bgs.
090.0			GW		;;	· ·
7						
7						
1						
1						
1						
_					1:3	
5					-	
+					-	
4					-	
4					4	
4					4	
4					4	
_						
1						
99.0		10314,			7:::	Soil sample collected between 99.0 and 100.0 ft bgs.
	i 1	50010	1		-10 0 €	I IIIIII TT DOS



BORING NUMBER: BH-68

SHEET 6 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350, Rotosonic drill head and tools

ORIENTATION: Vertical

MATERIAL PRICES - Accord. 16s th BGS START - 54132011 END - 54182011 LOGGER - R. Tweldt (Northstar)	DRILLING EQUIPMENT AND METH	10D : RS-350, Ro	otosonic drill head and tools		ORIENTATION : Vertical
DEPTH ACTION VESTING GRADE (9) NTERVAL (17) NTERVAL (17) RECOVERY (17) LAS SOUTH AND LUSCS GOODE SYMBOL COLOR MOSTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOLIS TRUCTURE, MINERALOGY Well Graded Gravel (GW) C2 C2 C3 C3 Light yellow borrow (2.5 Y 8/3), dry losos fines, angular to subangular, no dominant mineralogy. 105 - Color change to light yellow brown (2.5 Y 8/3) 107 - Rock flour 110 - 11	WATER LEVELS : Approx. 164 ft BC	GS	START : 5/13/2011	END: 5/16/2011	LOGGER : R. Tweidt (Northstar)
105			SOIL DESCRIPTION		
105	RECOVERY (in)	USCS CODE/ LITHOLOGY	MOISTURE CONTENT, RELATIVE DENS	COLOR, SITY OR ERALOGY	DRILLING FLUID LOSS, TESTS, AND
- 10316	105	GW	62.0-243.0' - light yellow brown, (2.5Y 6/3) to partially consolidated, 40% gravel, 40% fines, angular to subangular, no dominant 102' - Change to partially consolidated 105' - Color change to light yellow brown (3) 109.0-110.0' - Rock flour	, dry, loose sand, 20% mineralogy.	Soil sample collected between 109.0 and 110.0 ft bgs.
120 120.0	- 10316				Soil sample collected between 119.0 and 120.0 ft bgs.



BORING NUMBER: BH-68

SHEET 7 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350. Rotosonic drill head and tools

ORIENTATION: Vertical

MATERIAL PATES Agrons 16th BIGS START START	DRILLING EQUIPM	MENT AN	ID METH	<u>IOD : RS-350, Ro</u>	tosonic drill head and tools		ORIENTATION : Vertical
PEPTH BELOW EXISTING GRADE (ft) INTERVAL (ft) RECOVERY (m) SAMPLE SOLIL NAME LUSCS GROUP SYMBOL, COLOR MOISTURE CONTENT, RELATIVE GRISHTY OR CONSISTENCY, SOLI STRUCTURE, IMMERALOGY Well Graded Gravel (CW) SC2 243 0f - high yellow tryon, (25 Y 63), dry, 40%; ro-dominant mineralogy, partially consolidated from 102.0 ft 125 126 137 138 139 139 139 130 130 130 130 130	NATER LEVELS :	Approx.	164 ft BC	SS	START : 5/13/2011	END : 5/16/201	1 LOGGER : R. Tweidt (Northstar)
125							
125		RECOVE		USCS CODE/ LITHOLOGY	MOISTURE CONTENT, RELATIVE DEN	COLOR, JSITY OR JERALOGY	DRILLING FLUID LOSS, TESTS, AND
139.0 Soil sample collected between 139.0 and 140.0 ft bgs.	129.0			GW	62.0-243.0' - light yellow brown, (2.5Y 6/3 gravel, 40% sand, 20% fines, angular to so dominant mineralogy, partially consolid), dry, 40%	Soil sample collected between 129.0 and 130.0 ft bgs.
- 10318 140.0 ft bgs.	-						Stop 05/13/2011 at 1700 at 137 ft bgs. Resume 05/14/2011 at 0730
	-		10318			- - - - - -	Soil sample collected between 139.0 and 140.0 ft bgs.
	140 140.0						



BORING NUMBER: **BH-68**

SHEET 8 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION: Site 3 (2100773.6 N, 7615453.4 E)

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey) ELEVATION: 621.6 ft

VILLING EQUIT MENT AND ME	HOD : RS-350, RC	otosonic drill head and tools		ORIENTATION : Vertical
ATER LEVELS : Approx. 164 ft I		START : 5/13/2011	END: 5/16/2011	LOGGER : R. Tweidt (Northstar)
EPTH BELOW EXISTING GRADE (ft	듸	SOIL DESCRIPTION		COMMENTS
INTERVAL (ft) RECOVERY (in) LAB SAMPL	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COL MOISTURE CONTENT, RELATIVE DENSIT' CONSISTENCY, SOIL STRUCTURE, MINERA	Y OR ALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
145	- GW	Well Graded Gravel (GW) 62.0-243.0' - light yellow brown, (2.5Y 6/3), dr gravel, 40% sand, 20% fines, angular to suba no dominant mineralogy, partially consolidate 102.0 ft	y, 40% -	Soil sample collected between 149.0 and 150.0 ft bgs. Soil sample collected between 159.0 and 160.0 ft bgs.



BORING NUMBER: BH-68

SHEET 9 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350, Rotosonic drill head and tools

ORIENTATION: Vertical

WATER LEVE				tosonic drill head and tools START: 5/13/2011 END: 5/10	8/2011	LOGGER: R. Tweidt (Northstar)
DEPTH BELOV				SOIL DESCRIPTION	П	COMMENTS
	ERVAL (ft)	VAL (ft)			SYMBOLIC LOG	
"""	RECOVI	FRY (in)	USCS CODE/	SOIL NAME, USCS GROUP SYMBOL, COLOR,	임	DEPTH OF CASING, DRILLING RATE,
	1120011		CODE/ LITHOLOGY	MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	MBO	DRILLING FLUID LÓSS, TESTS, AND INSTRUMENTATION
		LAB SAMPLE			S.	
165	-COMPLETE			Well Graded Gravel (GW) 62.0-243.0' - greyish brown, (10YR 5/2), dry, loose to partially consolidated, 40% gravel, 40% sand, 20% fines, angular to subangular, no dominant mineralogy. 163' - Increase in metadiorite fraction of gravel; increase in average gravel size to coarse; change to subangular. 164' - Saturated		163 ft bgs: Drill rate (~10 FPM to ~0.1 FPM)
170			GW	170.0-172.0' - Decrease in average gravel size (fine), increase in average sand size (coarse).		170 ft bgs: Drill rate ~10 FPM 172 ft bgs: Drill rate ~0.1 FPM
-				173.0-177.0' - Change to highly angular		
175 <u> </u>				175' - light yellow brown, (2.5Y 6/3)		
177 - - - -	7.0			177' - Color change to strong brown (7.5YR 4/6)		
180						



BORING NUMBER: BH-68

SHEET 10 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350. Rotosonic drill head and tools

ORIENTATION: Vertical

ATTER LEVELS : Agrow. 16th Bigs. EPH BELOW RETRING GROUP (II) INTERVAL (8) ECOVERY (III) LAB LAB LAB LAB LAB LAB LAB LAB LAB LA	SOIL DESCRIPTION NTERVAL (II) SIGN SOIL NAME, USCS GROUP SYMBOL, COLOR, MOSTURE CONTROL RELATIVE DESCRIPTION SIGN STRUCTURE, MINERALOGY SIGN SIG	RILLING EQUIF	PMENT AND N	METHOD: RS-350,	Rotosonic drill head and tools		ORIENTATION : Vertical
INTERVAL (II) RECOVERY (III) LAB LAB LAB LAB LAB LAB LAB LAB LAB LA	INTERVAL (IT) RECOVERY (III) IAB JOSE THICK OF STRUCTURE IN RELATIVE DENSITY OR STRUCTURE IN INTERVAL OR STRUCTURE IN I	VATER LEVELS	: Approx. 164	ft BGS	START : 5/13/2011	END: 5/16/2011	LOGGER : R. Tweidt (Northstar)
Well Grade Gravel (GV) G2-0243.0" light vellow brown, (2.5Y 6/3), 40% gravel, 40% sand, 20% fines, highy angular from 173.0 th bgs, perdominantly metaldride gravel from 163.0 th bgs, perdominantly metaldride gravel from 163.0 th bgs, perdominantly metaldride gravel from 163.0 th bgs, perdominantly metaldride gravel from 164.0 th bgs. Grab groundwater sample collected from borehole between 187.0 and 197.0 th bgs. Grab groundwater sample collected from borehole between 187.0 and 197.0 th bgs. 190 190 190 190 190 197 197 197	Well Grade Gravel (GW) 26.0-24.3.0" light plub brown, (2.57 6/3), 40% gravel, 40% sand, 20% fines, highy angular from 173.0 t bgs, perdominantly metaldorite gravel from 163.0 t bgs, perdominantly metaldorite gravel from 162.0 th bgs. Grab groundwater sample collected from borehole between 187.0 and 197.0 th bgs. Grab groundwater sample collected from borehole between 187.0 and 197.0 th bgs. 190 195 197 197 198.0" - Metadiorite boulder	EPTH BELOW EX	KISTING GRADI	E (ft)	SOIL DESCRIPTION	, o	COMMENTS
Well Grade Graval (20) 243.0" light yellow brown, (2.57 6/3), 40% gravel, 40% sand, 20% fines, highly angular from 173.0 ft bgs, predominary metadorite gravel from 163.0 th gravel, 40% sand, 20% fines, highly angular from 173.0 ft bgs, performancy metadorite gravel from 162.0 ft bgs. 187.0	Well Grade Gravel (10% sand, 20% fines, highy angular from 173.0 ft bgs, predominary metadorite gravel from 163.0 tt bgs, parally consolidated from 162.0 ft bgs. 185 187.0 189. GW Grab groundwater sample collected from borehole between 187.0 and 197.0 ft bgs. Grab groundwater sample collected from borehole between 187.0 and 197.0 ft bgs.	INTERV	RECOVERY ((in) CODE/ LITHOLOGY	MOISTURE CONTENT, RELATIVE DE	, COLOR, ENSITY OR INERALOGY	DRILLING FLUID LOSS, TESTS, AND
		190	PLETE—	BH-68-20301	62.0-243.0' - light yellow brown, (2.5Y 6, gravel, 40% sand, 20% fines, higly anguent by the predominantly metadiorite gravel by the partially consolidated from 102.0 ft matrix-supported, saturated from 164.0	/3), 40% - • • • • • • • • • • • • • • • • • •	Grab groundwater sample collected from borehole between 187.0 and 197.0 ft bgs.



BORING NUMBER: **BH-68**

SHEET 11 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION: Site 3 (2100773.6 N, 7615453.4 E)

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey) ELEVATION: 621.6 ft

DRILLING EQUIPMENT AND METH	IOD : RS-350, Ro	otosonic drill head and tools		ORIENTATION : Vertical
WATER LEVELS : Approx. 164 ft BO	SS	START : 5/13/2011 END : 5/	16/2011	LOGGER: R. Tweidt (Northstar)
DEPTH BELOW EXISTING GRADE (ft)		SOIL DESCRIPTION	o	COMMENTS
INTERVAL (ft) RECOVERY (in) LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
205	GW	Well Graded Gravel (GW) 62.0-243.0' - light yellow brown, (2.5Y 6/3), 40% gravel, 40% sand, 20% fines, higly angular from 173.0 ft bgs, predominantly metadiorite gravel from 163.0 ft bgs, partially consolidated from 102.0 ft bgs, matrix-supported, saturated from 164.0 ft bgs.		Grab groundwater sample collected from borehole between 207.0 and 217.0 ft bgs.



BORING NUMBER: BH-68

SHEET 12 OF 15

ORIENTATION : Vertical

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD: RS-350, Rotosonic drill head and tools

WATER	LEVELS	: Approx	. 164 ft BC	SS	START : 5/13/2011 END) : 5/16/2011	LOGGER : R. Tweidt (Northstar)
DEPTH B	ELOW EX	ISTING G	RADE (ft)		SOIL DESCRIPTION	_O	COMMENTS
1	INTERVA	AL (ft)		USCS		SYMBOLIC LOG	
		RECOV	ERY (in)	CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR	OLIC	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND
			LAB	LITIOLOGI	CONSISTENCY, SOIL STRUCTURE, MINERALOGY	, AMB	INSTRUMENTATION
-	<u> </u>		SAMPLE		Well Graded Gravel (GW)	<i>σ</i>	
- - - -		COMPLETE		CN.	62.0-243.0' - olive grey, (5Y 5/2), 40% gravel, 40% sand, 20% fines, higly angular from 173.0 ft bgs, predominantly metadiorite gravel from 163.0 ft bgs, partially consolidated from 102.0 ft bgs, matrix-supported, saturated from 164.0 ft bgs.	- - - - - - - - - - - - - - - - - - -	- - - - -
225_ - - -				GW		-0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- - - - - -
l _				CL	Clay With Silt (CL)		_
230	235.0			GW	fines, color change to black 238.5-239.0' - Color change to black 239' - Color change to brown (10YR 5/3)		Grab groundwater sample collected from borehole between 235.0 and 245.0 ft bgs.
1							
	1						



BORING NUMBER: **BH-68**

SHEET 13 OF 15

SOIL BORING LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

DRILLING CONTRACTOR: Boart Longyear (R. Sawrey) ELEVATION: 621.6 ft

DRILLING EQUIPME	NT AND METH	ORIENTATION : Vertical		
WATER LEVELS : Ap	pprox. 164 ft BG	SS	START : 5/13/2011 END : 5/16/20	11 LOGGER : R. Tweidt (Northstar)
DEPTH BELOW EXISTI	ING GRADE (ft)		SOIL DESCRIPTION	COMMENTS
INTERVAL (f	ECOVERY (in) LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	
-	—сомРLЕТЕ— ВН-68-20303	GW	Well Graded Gravel (GW) 227.0-243.0' - brown, (10YR 5/3), saturated, 40% gravel, 40% sand, 20% fines, angular to subangular, poorly graded, predominantly metadiorite gravel, dense, matrix-supported,	
245 245.0	<u> </u>		Conglomerate (Tmc) 243.0-257.0' - massive, red (2.5YR 4/8)	Stop 05/15/2011 at 1620 at 245 ft box
250		Tmc		Stop 05/15/2011 at 1630 at 245 ft bgs. Resume 05/16/2011 at 1000 -
255			Begin rock coring from 257.0 ft bgs See the next page for the rock core log.	Initiate rock core drilling at 1115 on 8/10/2011



BORING NUMBER:

BH-68

SHEET 14 OF 15

ROCK CORE LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

CORING EQUIPMENT AND METHOD : RS-350, Wire-Line Rotary

ORIENTATION : Vertical

				HOD : RS-350, Wife-Life Rolary			ON . Vertical
WATER	LEVELS : Ap	prox.	164 ft				R. Tweidt (Northstar)
<u>چ</u>	(%			DISCONTINUITIES	၂ဗ္ဂ	LITHOLOGY	COMMENTS
(£)	A ANI	~	RES	DESCRIPTION	SYMBOLIC LOG	ROCK TYPE, COLOR, MINERALOGY, TEXTURE,	SIZE AND DEPTH OF CASING,
FAC	BATE OVE	Q D (%)	E S	DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND	BOL	HARDNESS, WEATHERING,	FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD
DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	S O	FRACTURES PER FOOT	THICKNESS, SURFACE STAINING, AND TIGHTNESS	SYM	AND ROCK MASS CHARACTERISTICS	DROPS, TEST RESULTS, ETC.
	257.0				0.0	Miocene Conglomerate (Tmc)	Run 1 (257 ft - 260 ft), Drill
-			NR	-		- 257.0-257.8' - moderate brown, (5YR 4/4)	rate = 0.55 ft/min -
-	R1	28		258.0-258.5' - abundant joints, no dominant orientation, not healed, rough, dry - 258.5-263.5' - fracture zone, no dominant orientation, presence of moderately to totally healed fractures, some 60 degree dip angles between 262 and 263 ft bgs.	$\stackrel{\wedge}{\sim}$	Metadiorite (pTbr)	1
-	3 ft 70%		8		$\overset{\sim}{\sim}$	257.8-280.5' - palé yellowish brown (10YR 8/6), non-foliated, uniform,	1
-	1070				$\overset{\circ}{\boxtimes}$	slightly to moderately decomposed,	1
260	260.0		>10		\bowtie	 slightly disintegrated, slightly to moderately fractured 	-
200	200.0					_ moderately fractured	Run 2 (260 ft - 264.5 ft),
-			>10	-	$\stackrel{\sim}{\sim}$	_	Drill rate = 0.28 ft/min -
_				-	$\stackrel{\sim}{\sim}$	_	1
_	R2	44	3	-	1		
	4.5 ft		>10		$\stackrel{\wedge}{\sim}$		
	75%		-10		$\stackrel{\sim}{\sim}$		
_			>10	263.0-264.5' - shear zone, dry, rough	\sim	_	
_			- 10	_	\sim	_	
_	264.5		>10		\swarrow	-	
265_		93		264.5-269.5' - undulating, few joints observed, narrow presence of totally healed —	\swarrow	_	Run 3 (264.5 ft - 269.5 ft), Drill rate = 0.41 ft/min —
-			2	fractures, mineralization, dry	\swarrow	205 51. Color shange to duals wellow	-
-				-	$\stackrel{\sim}{\sim}$	265.5' - Color change to dusky yellow green (5GY 5/2)	-
-	R3		1	-	$\stackrel{\sim}{\sim}$	-	-
-	5 ft			-	$\stackrel{\text{\top}}{\sim}$	-	-
-	80%		1	-	₩	-	-
-				-	$\overset{\circ}{\otimes}$	-	1
-			1	-	$\overset{\sim}{\sim}$	-	1
-	269.5			-	\bigotimes	-	1
270	R4	0	>10	269.5-273.5' - undulating, fracture zones, no	$\stackrel{\sim}{\sim}$	_	Run 4 (269.5 ft - 270.5 ft),
	1 ft 270.5 50%		>10	dominant orientation, not healed, dry —	\sim		Drill rate = 0.44 ft/min —
	·		-10		$\stackrel{\wedge}{\sim}$		Run 5 (270.5 ft - 275.5 ft), Drill rate = 0.45 ft/min
_		15	>10	_	$\stackrel{\sim}{\mathbb{M}}$	_	Dini rate - 0.43 (vitili)
_			- 10	_	\swarrow	-	
_			>10	<u>-</u>	$\stackrel{\sim}{\sim}$	_	
_	R5 5 ft 70%			-	$\cancel{\mathbb{M}}$	_	-
_			3	<u>-</u>	$\stackrel{\sim}{\sim}$	_	
-					\swarrow	-	-
	275.5		5	-	$\stackrel{\sim}{\sim}$	-	-
275				_	$\downarrow \!\!\! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \! \!$	_	-
-			>10	-	₩	_	Run 6 (275.5 ft - 280.5 ft),
-			H	276.0-280.5' - undulating, fracture zone, no	1	-	Drill rate = 0.3 ft/min -
-			>10	dominant orientation, not healed, surface staining	\bowtie	-	1
							1



BORING NUMBER: BH-68

SHEET 15 OF 15

ORIENTATION : Vertical

ROCK CORE LOG

PROJECT : PG&E Topock, ER-TCS Investigation LOCATION : Site 3 (2100773.6 N, 7615453.4 E)

ELEVATION: 621.6 ft DRILLING CONTRACTOR: Boart Longyear (R. Sawrey)

CORING EQUIPMENT AND METHOD : RS-350, Wire-Line Rotary

				HOD : RS-330, WITE-LITTE ROLATY		ORIENTATI	
WATER	LEVELS : Ap	prox.	164 ft				R. Tweidt (Northstar)
>	(%)			DISCONTINUITIES	၂ ဗွ	LITHOLOGY	COMMENTS
DEPTH BELOW SURFACE (ft)	CORE RUN, LENGTH, AND RECOVERY (%)		FRACTURES PER FOOT	DESCRIPTION	SYMBOLIC LOG	ROCK TYPE, COLOR,	SIZE AND DEPTH OF CASING,
H BE	S.F.A	(%)	TI SO	DEPTH, TYPE, ORIENTATION, ROUGHNESS,	OLI	MINERALOGY, TEXTURE, HARDNESS, WEATHERING,	FLUID LOSS, CORING RATE AND
PT.	S S S S S S S S S S S S S S S S S S S	Q D (%)	RAC ER F	PLANARITY, INFILLING MATERIAL AND	MΒ	AND ROCK MASS	SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
S	228	2	표표	THICKNESS, SURFACE STAINING, AND TIGHTNESS	S	CHARACTERISTICS	5.16. 6, 120. 1.202. 6, 2.16.
			>10		\bowtie	Metadiorite (pTbr) – 257.8-280.5' - pale yellowish brown	
	R6		/10		\bowtie	(10YR 8/6), non-foliated, uniform,	
	5 ft 70%	15			1	slightly to moderately decomposed,	_
_			>10		₩	 slightly disintegrated, slightly to moderately fractured 	-
-	-				₩	_ moderatery fractured	-
-			>10		₩	-	-
280	-		>10	276.0-280.5' - undulating, fracture zone, no	₩	_	
-	280.5		>10	dominant orientation, not healed, surface	\sim	End Drilling on 5/16/2011	This borehole was
_				staining	4	- Total Borehole Depth: 280.5 ft bgs	converted into the following -
_						_	monitoring well(s):
						_	MW-68-180, MW-68-240, and MW-68BR-280
						_	and MIVI CODIC-200
]
					1	-	1
_					1	=	1
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285					1	-	-
285	-			_	1	_	-
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						_	_
290				_			
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-	1				1	-	-
-	1				1	-	
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295_				_	1	<u></u>	-
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