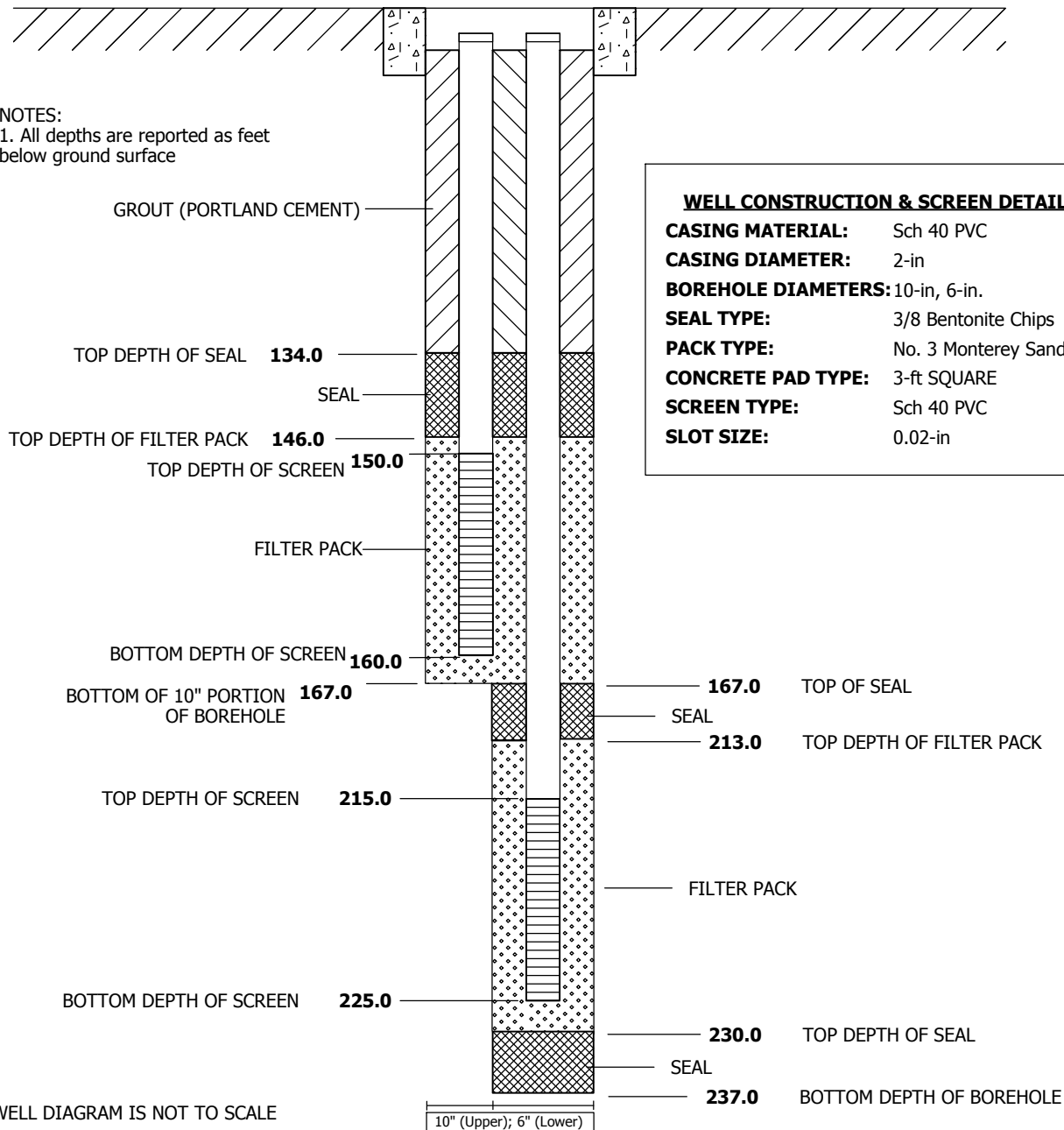


# WELL COMPLETION DIAGRAM

<b>PROJECT NO:</b> 417981.ER.02.FW	<b>PROJECT:</b> ER-TCS Groundwater Investigation	<b>WELL NO:</b> <i><b>MW-65-160</b></i> <i><b>MW-65-225</b></i>
<b>LOCATION:</b> Site 5		
<b>DRILLING CONTRACTOR:</b> Boart Longyear (R. Sawrey)	<b>DRILLING START:</b> 3/17/2011	
<b>DRILLING METHOD:</b> Rotosonic	<b>DRILLING END:</b> 4/4/2011	
<b>LOGGER:</b> A. Brewster (Northstar)	<b>WELL COMPLETION DATE:</b> 4/7/2011	
<b>GROUND SURFACE ELEVATION (NAVD 88):</b> 597.0 ft AMSL	<b>GENERAL REMARKS:</b> Centralizers at 5, 20, 35, 50, 65, 80, 95, 110, 125, 140, 165, 180, 195, and 210 ft bgs.	
<b>NORTHING (CCS NAD 83 Z 5):</b> 2100547.44		

## 12-in DIAMETER WELL VAULT (FLUSH WITH GRADE)

**NOTES:**  
1. All depths are reported as feet below ground surface





PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 1 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotasonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)							
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY							
5			COMPLETE		SW	<b>Well Graded Sand (SW)</b> 0.0-10.0' - dark yellowish brown, (10YR 4/4), dry, loose, 10% gravel, 85% sand, 5% fines, angular to subrounded, maximum clast diameter = 50mm.		Cleared to 10' bgs by hydro-vac rig (MPE)
10	9.0	10.0		10001				Soil sample collected between 9.0 and 10.0 ft bgs.
15	14.0	15.0		10002	SM	<b>Silty Sand (SM)</b> 10.0-87.0' - grayish brown, (2.5Y 5/2), dry, loose, 10% gravel, 60% sand, 30% fines, angular to subrounded, maximum clast diameter = 50mm.		Soil sample collected between 14.0 and 15.0 ft bgs.
20	19.0	20.0		10003		17.0-20.0' - Color change to brown (7.5YR 4/3), change to 5% gravel, 65% sand, 30% fines, change to subrounded.		Soil sample collected between 19.0 and 20.0 ft bgs.



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 2 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotasonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
							DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
25		COMPLETE			<b>Silty Sand (SM)</b> 10.0-87.0' - grayish brown, (2.5Y 5/2), dry, loose, 10% gravel, 60% sand, 30% fines, angular to subrounded, maximum clast diameter = 50mm.  34' - Change to 15% gravel, 55% sand, 30% fines, angularity change to subangular to subrounded.  35' - Change from loose to partially consolidated.		
30	29.0 30.0		10004	SM		Soil sample collected between 29.0 and 30.0 ft bgs.	
40	39.0 40.0		10005			Soil sample collected between 39.0 and 40.0 ft bgs.	



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 3 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
INTERVAL (ft)							
		COMPLETE			<b>Silty Sand (SM)</b> 10.0-87.0' - grayish brown, (2.5Y 5/2), dry, loose, 10% gravel, 60% sand, 30% fines, angular to subrounded, maximum clast diameter = 50mm. Metadiorite boulder.		
45							
	49.0						
50	50.0		10006	SM			Soil sample collected between 49.0 and 50.0 ft bgs.
55					55.0-57.0' - Presence of > 100mm sized fragments of metadiorite.		Drilling very difficult
	59.0						
60	60.0		10007				Soil sample collected between 59.0 and 60.0 ft bgs.



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 4 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)

ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical

WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
65	COMPLETE			SM	<b>Silty Sand (SM)</b> 10.0-87.0' - grayish brown, (2.5Y 5/2), dry, loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to subrounded, maximum clast diameter = 50mm. Gravel component is mixed metadiorite and conglomerate fragments. Metadiorite fragments show rusty red staining or mineral deposits on most surfaces (ie, weathered on all surfaces).	Stop at 64' at 3/17/2011, 1620. Resume 03/18/2011 at 0845.	
70	69.0 70.0	10008					Soil sample collected between 69.0 and 70.0 ft bgs.
80	79.0 80.0	10009, 50001					Soil sample collected between 79.0 and 80.0 ft bgs.



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 5 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION					
85	COMPLETE			SM	<b>Silty Sand (SM)</b> 10.0-87.0' - grayish brown, (2.5Y 5/2), dry, loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to subrounded, maximum clast diameter = 50mm, presence of highly weathered metadiorite fragments, red staining and/or deposits on gravel surfaces.		
90	89.0 90.0	10010		SW	<b>Well Graded Sand (SW)</b> 87.0-93.5' - dark yellowish brown, (10YR 4/4), dry, loose, angular to subangular, predominantly fine- to medium-grained quartz sand and metadiorite gravel, maximum clast size = 30mm.		Soil sample collected between 89.0 and 90.0 ft bgs.
95				SM	<b>Silty Sand (SM)</b> 93.5-168.0' - grayish brown, (2.5Y 5/2), dry to slightly moist, loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to angular, presence of highly weathered metadiorite, maximum clast size = 50mm.		
100	99.0 100.0	10011					Soil sample collected between 99.0 and 100.0 ft bgs.



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 6 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	SOIL DESCRIPTION			SYMBOLIC LOG	COMMENTS
	INTERVAL (ft)	RECOVERY (in)	USCS CODE/ LITHOLOGY		
	SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY				
105	COMPLETE		SM	<p><b>Silty Sand (SM)</b>            93.5-168.0' - grayish brown, (2.5Y 5/2), dry to slightly moist, loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to angular, presence of highly weathered metadiorite, maximum clast size = 50mm.</p>	<p>Soil sample collected between 109.0 and 110.0 ft bgs.</p>
109.0 110.0		10012			
115					
119.0 120.0			10013		<p>Soil sample collected between 119.0 and 120.0 ft bgs.</p>



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 7 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)		RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	DEPTH	DEPTH						
			COMPLETE			<b>Silty Sand (SM)</b> 93.5-168.0' - grayish brown, (2.5Y 5/2), dry to slightly moist, loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to angular, presence of highly weathered metadiorite, maximum clast size = 50mm.		
125								
	129.0							Stop 3/18/2011 at 1530. Resume 3/19/2011 at 930.
130	130.0			10014	SM			Soil sample collected between 129.0 and 130.0 ft bgs.
						138' - Light green silt on surface fractures.		
	139.0					139' - Color change to brown (10YR 4/3), moist.		
140	140.0			10015				Soil sample collected between 139.0 and 140.0 ft bgs.





PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 8 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
							DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
145		COMPLETE			<b>Silty Sand (SM)</b> 93.5-168.0' - brown, (10YR 4/3), moist to saturated at 141', loose to partially consolidated, 15% gravel, 55% sand, 30% fines, subangular to angular, presence of highly weathered metadiorite, maximum clast size = 50mm.		
150			SM				
155							
157.0							Grab groundwater sample collected from borehole between 157.0 and 167.0 ft bgs.  Sustained pump rate of 2 gpm.
160							





PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 10 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)

ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)

DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotasonic      ORIENTATION : Vertical

WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
	RECOVERY (in)	LAB SAMPLE					
185	COMPLETE			GW	<b>Well Graded Gravel (GW)</b> 168.0-228.0' - dark greyish brown, (2.5Y 5/2), saturated, loose to partially consolidated, 60% gravel, 30% sand, 10% fines, angular, presence of highly weathered metadiorite fragments (gravel), clast-supported, maximum clast size = 50 mm. Fragments display red staining/mineralization on most surfaces.  193.0-194.0' - Metadiorite boulder.		Stop 03/20/2011 at 1700. Resume 03/21/2011 at 0845.  Grab groundwater sample collected from borehole between 187.0 and 197.0 ft bgs.  Drill rate slows to <1 in/min.  Sustained pump rate of 8 gpm.  Stop 03/21/2011 at 1615. Resume 03/22/2011 at 0800.
187.0							
190							
195							
197.0			ISOFLOW #20002 at 1510				
200							



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 11 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
205					<b>Well Graded Gravel (GW)</b> 168.0-228.0' - brown, (7.5YR 4/3), saturated, loose to partially consolidated, 60% gravel, 30% sand, 10% fines, angular, presence of highly weathered metadiorite fragments (gravel), clast-supported, maximum clast size = 50 mm. Fragments display red staining/mineralization on most surfaces.  213' - Color change to dark greyish brown (2.5Y 5/2) and change to 60% gravel, 30% sand, and 10% fines.  216' - Color change to very dark brown (10YR 3/2).	Grab groundwater sample collected from borehole between 217.0 and 227.0 ft bgs.	
210			GW				
215							
217.0							
220							



PROJECT NUMBER: <b>417981.ER.02.FW</b>	BORING NUMBER: <b>BH-65</b>	SHEET 12 OF 12
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock, ER-TCS Groundwater Investigation      LOCATION : Lower Bench of TCS (2100547.4 N, 7614934.7 E)  
 ELEVATION : 597.0 ft      DRILLING CONTRACTOR : Boart Longyear (R. Sawrey)  
 DRILLING EQUIPMENT AND METHOD : RS-350 with 6 barrels., Rotosonic      ORIENTATION : Vertical  
 WATER LEVELS : Approx. 139 ft BGS      START : 3/17/2011      END : 3/23/2011      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
225		COMPLETE	ISOFLOW #20003 at 1518	GW	<b>Well Graded Gravel (GW)</b> 168.0-228.0' - very dark brown, (10YR 3/2), saturated, loose to partially consolidated, 60% gravel, 30% sand, 10% fines, angular, presence of highly weathered metadiorite fragments (gravel), clast-supported, maximum clast size = 50 mm. Fragments display red staining/mineralization on most surfaces. Metadiorite boulders to 213 ft bgs. 222.0-224.5' - Metadiorite boulder.  224.5' - Color change to dark greyish brown (2.5Y 5/2).	•••••	Drill rate <1 in/min from 228.0-237.0'
230				pTbr	<b>Metadiorite Bedrock (pTbr)</b> 228.0-237.0'  229.0-230.0' - Rock fragments covered with iron staining on all surfaces.  232.0-236.5' - Core difficult to recover, clasts in recovered core disintegrate into rock flour (ie, no gravel).  233.5' - Presence of calcite infill on rock surfaces.  236.5' - Interlocking metadiorite fragments.	~::~~::~~::~	Stop 03/22/2011 at 1645. Resume 03/23/2011 at 0830.
235					End Drilling on 3/23/2011 Total Borehole Depth: 237.0 ft bgs		This borehole was converted into the following monitoring well(s): MW-65-160 and MW-65-225
240							