

GEOSCIENCE

Project: RBF/MPWSP
Monitoring Well
Project No.: 13027-14

LOG OF BORING

SHEET 1 OF 12

Location	MW-7D	Date(s) Drilled	6-27-2015	Drilling Contractor	CASCADE	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 3/4 → 9 1/8 → 8"	Total Depth (ft) 350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

Depth (ft)	Notes	Penetration (Graphic)	Type and No.	Blows per 6-in.	Penetration (in)	Recovery (in)	Geologic Unit	SOIL COLOR
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

Hand Auger
0'-5' EGS

G/27

6/28

15'-5' CORE

27' - 15' CONCRETE
(LONGER RUN)

37'-27'

7'

9'

19'

GEOSCIENCE

Project: RBF/MPWSP
Exploratory Boreholes
Project No.: 13017-13

LOG OF BORING

SHEET 2 OF 12

Location	MW - 7D	Date(s) Drilled	6-28-15	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHANLAMI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 3/4 → 9 7/8 → 8"	Total Depth (ft) 350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

Depth (ft)	Notes	Penetration (Graphic)	Type and No.	Penetration (in)	Recovery (in)	Geologic Unit	
30							SAME AS ABOVE
31							11
32							30.5
33			SM				SILTY SAND; 85% SAND + 15% SILT; VF-F SAND; POORLY GRADED; NONE-Low Plasticity; UNCONSOLIDATED; QFMA; MOIST.
34							BROWN
35			SP				
36							10YR 4/3
37							YELLOWISH BROWN
38			SP				
39							
40							
41			SP				
42							
43							10YR 5/4
44							PALISH BROWN
45							
46							
47			SP				
48							
49							
50							
51			SP				10YR 6/3
52							PALISH BROWN
53							
54			SP				
55							
56			SP				10YR 6/2
57							LIGHT BROWNISH GRAY
58							
59			SP				54.5'
60							

10YR 4/4
DARK YELLOWISH BROWN

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Exploratory Boreholes
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LOG OF BORING

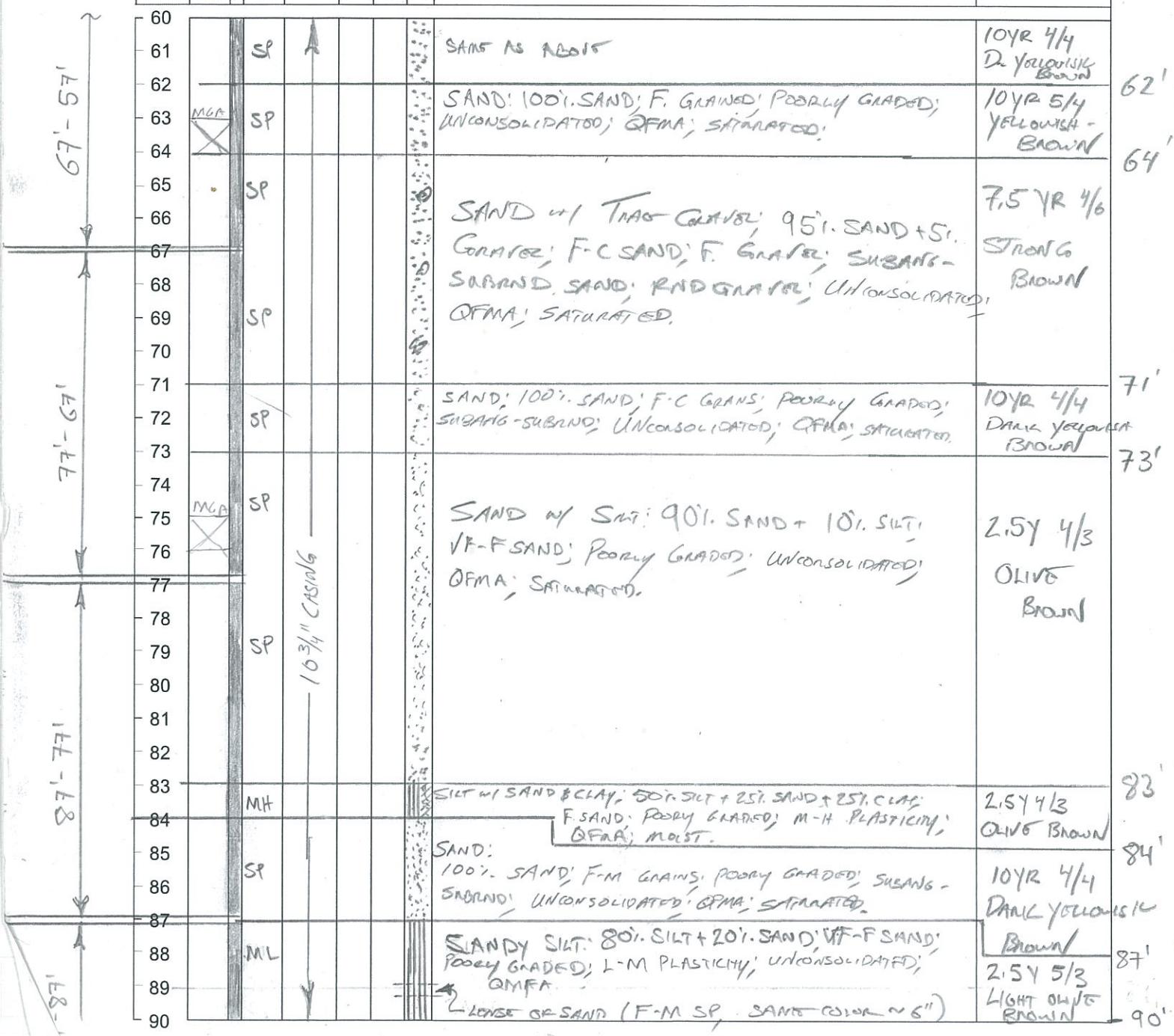
SHEET 3 OF 12

Location	MW-70	Date(s) Drilled	6-28-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 3/4" → 9 7/8" → 8	Total Depth (ft)
Depth (ft)	Notes	Sample Information				
	Penetration (Graphic)	Type and No.	Penetration (in)	Recovery (in)	Geologic Unit	SOIL COLOR
		Fast Core Blows per 6 in.				

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MATERIAL DESCRIPTION



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Exploratory Boreholes
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LOG OF BORING

SHEET 4 OF 12

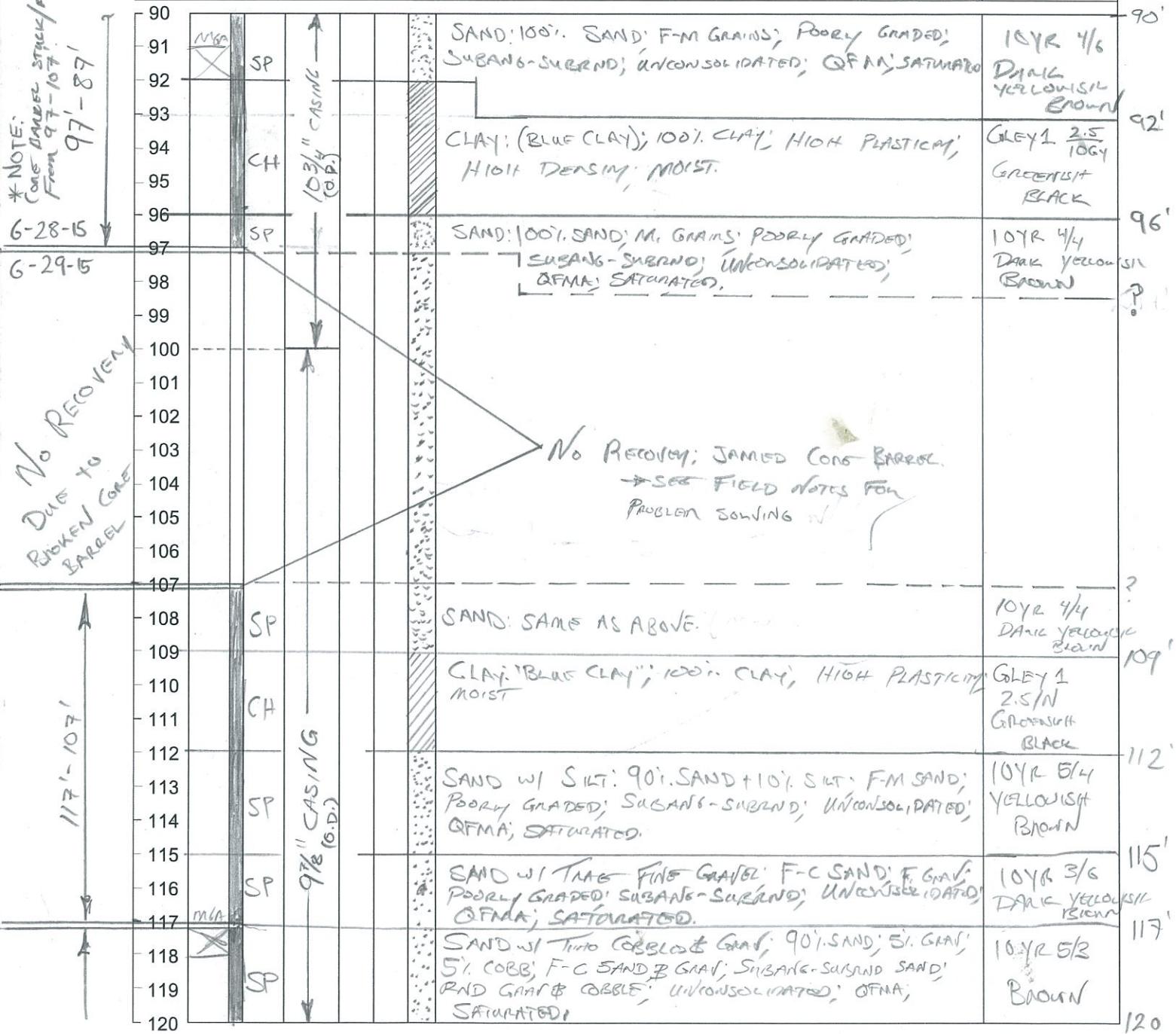
Location	MW-7D	Date(s) Drilled	6-28-15	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALISI	Drill Rig Type	Pro Sonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 1/4" → 9 7/8" → 8"	Total Depth (ft)

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Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR



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LOG OF BORING

SHEET 5 OF 12

Location	MN-7D	Date(s) Drilled	6-30-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 1/4" - 9 1/8" - 8"	Total Depth (ft) 350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

Depth (ft)	Notes	Penetration (Graphic)	Sample Information	Geologic Unit	MATERIAL DESCRIPTION	SOIL COLOR
120						120'
121		SM			SILTY SAND; 70% SAND + 20% SILT; F SAND; NO-HIGH PLASTICITY; UNCONSOLIDATED; DENSE; QFM; MOIST-WET.	10YR 5/4 Yellowish Brown
122		SM			SILTY SAND; 85% SAND + 15% SILT; F MEAND; POORLY GRADED; SABANG-SUBRD; NON-LOW PLASTICITY; UNCONSOLIDATED; QFM; MOIST TO DRY.	10YR 5/3 Brown
123		SP				122'
124		SP				127'
125		SP				
126		SP				
127		SP				
128		SP				
129		SP				
130		SP				
131		SP				
132		SP				
133	X	SP			SAND; 100% SAND; VFF GRAINED; PEARY GRADED; UNCONSOLIDATED; QFM;	10YR 5/3 Brown
134	X	SP			"FINE BROWN SAND"	
135		SP				
136		SP				
137		SP				
138		SP				
139		SP				
140		SP				
141		SP			SAND; 100% SAND; (PULVERIZED SANDSTONE?) VF SANDW/ BITS OF M.C. SAND; PEARY GRADED; UNCONSOLIDATED; Dry.	10YR 4/3 Brown
142		SP				
143		SP				
144		SP			SAND; 100% SAND; FIRM GRAINS; PEARY GRADED; SUBANG-SUBRD; UNCONSOLIDATED; QFM; SATURATED.	10YR 6/8 Brownish-Yellow
145		SP				
146	X	SP				
147		CL			CLAY; 100% CLAY; HIGH PLASTICITY; MOIST.	GLAY 1 6/10GY GREENISH GLEY
148		CL				
149		CL				
150		CL				150'

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LOG OF BORING

SHEET 6 OF 12

Location	MW-7D	Date(s) Drilled	6-30-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)	12
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	ProSonix 600T	Plunge (Degrees)	Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 3/4 -> 9 7/8 -> 8	Total Depth (ft)	350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

Depth (ft)	Notes	Penetration (Graphic)	Type and No.	Blows per 6 in.	Penetration (in)	Recovery (in)	Geologic Unit		
150									150'
151	ML							SILT w/ SAND; 90% SILT + (0%) SAND; VF GRAINS; LOW PLASTICITY; MOIST.	GRAY 1 6/10 GREENISH-GRAY
152								CLAY w/ SAND & TRAC CLAY; 85% CLAY; 10% SAND; 5% CLAY; LOW PLASTICITY; VF SAND; MOIST.	GRAY 1 G/10 GREENISH-GRAY
153	CL								152'
154								SILTY SAND w/ TRAC CLAY; 75% SAND + 20% SILT + 5% CLAY; VF SAND; POORLY GRADED; NON-PLASTIC; UNCONSOLIDATED; QFMA; MOIST-WET	GRAY 1 4/10 DARK GREENISH-GRAY
155	SM								154'
156								SILTY SAND w/ TRAC CLAY; 70% SAND + 20% SILT + 5% CLAY; VF SAND; POORLY GRADED; SUBANG-SUBAND; UNCONSOLIDATED; NON-PLASTIC; QFMA; MOIST-WET	157'
157									
158	SM							SILTY SAND w/ TRAC CLAY & GRAV; 70% SAND + 20% SILT + 5% GRAV + 5% CLAY; F-C SAND & GRAV; POORLY GRADED; SUBANG-SUBAND; UNCONSOLIDATED; NON-PLASTIC; QFMA; MOIST-WET	11
159									160'
160	SP							SAND w/ CLAMPS OF CLAY (BT TRAC GRAVE); 90% SAND + 5% CLAY + 5% GRAV; F-C SAND & GRAV; POORLY GRADED; SUBANG-SUBAND SAND; BND GRAV; QFMA; SAT.	11
161									162'
162	SC							CLAYEY SAND w/ TRAC SILT; 75% SAND + 20% CLAY + 5% SILT; F-C SAND; POORLY GRADED; SUBANG-SUBAND; HIGH PLASTICITY; UNCONSOLIDATED; QFMA; MOIST	2.5Y 6/3 LIGHT YELLOWISH-BROWN
163									165'
164	SC								
165								CLAYEY SAND w/ GRAVEL & COBBLES; 65% SAND; 20% CLAY; 15% GRAVEL; F-C SAND & GRAV; POORLY GRADED; SUBANG-SUBAND; LOW PLASTICITY; QFMA; MOIST	2.5Y 5/2 GRAY/WT BROWN
166	SC								167'
167								SAND; 100% SAND; F-C GRAINS; POORLY GRADED; UNCONSOLIDATED; QFMA; WET.	
168									10YR 3/4
169	SP							"Brown Sand"	DARK YELLOWISH-BROWN
170	X								
171	SP								
172									
173								6" LAYER OF SANDY CLAY (173'-178.5')	173'
174									
175	SP							SAND; 100% SAND; F-C GRAINS; POORLY GRADED; SUBANG-SUBAND; UNCONSOLIDATED; QFMA; WET.	10YR 4/6 DARK YELLOWISH-BROWN
176									
177									
178									
179	SP								
180								Same as Above	

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LOG OF BORING

SHEET 7 OF 12

Location		Date(s) Drilled	Drilling Contractor	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	Drill Rig Type	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by	Borehole Diameter (in)	Total Depth (ft)
Depth (ft)	Notes	Sample Information		
		Penetration (Graphic)	Type and No.	Blows per 6 in.
			Penetration (in)	Recovery (in)
			Geologic Unit	

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

180						
181	X MGA	SP			SAME AS ABOVE	"
182						
183						
184					SAND: 100% SAND; M. GRAINS: SUBANG-SUBANG; UNCONSOLIDATED; QFMA; POORLY GRADED; WET.	2.5YR 6/4 LIGHT YELLOW-BRN
185		SP				7.5YR 4/6 STRONG BRN
186						7.5YR 3/4 DARKE BROWN
187						
188					SANDY GRAVEL WI TRAC COBBLES; 60% GRAVEL 135. SAND + 5% COBBLES; FC SAND & GRAY	7.5YR 3/2
189		GP			Poorly Graded; UNCONSOLIDATED; OFMA;	DARKE BROWN
190	X MGA	SP			ROUNDED GRAVEL & COBBS; SUBANG-SUBANG SAND; WET.	
191						
192					GRAVELLY SAND WI TRAC COBBLES; 75% SAND; 20% GRAVEL; 5% COBBLES; SAME AS ABOVE (187-191).	10YR 5/3 Brown
193		SP-GP				
194						
195		SP				
196						
197					SAND: (00% SAND): "BROWN SAND"	
198					VF-F GRAINS; POORLY GRADED; UNCONSOLIDATING, QFMA; SATURATED.	10YR 3/3
199						DARKE BROWN
200						
201						
202	X MGA	SP				
203						
204						
205						
206					From 193.5ft TO 208ft. "Brown SAND" INCLUDES GRAVEL & COBBLE SIZED SANDSTONE CLASTS, UP THE SAND "Brown SAND". w/ TRACE SIL.	
207						
208						
209		SP				
210						

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LOG OF BORING

SHEET 8 OF 12

Location	MW-7D	Date(s) Drilled	6-30-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAO KHALIGHI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 ³ / ₁ → 9 ⁷ / ₈ → 8"	Total Depth (ft)
Depth (ft)	Notes	Sample Information				SOIL COLOR
		Type and No.	Blows per 6 in.	Penetration (in)	Recovery (in)	Geologic Unit

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

210						
211						
212						
213						
214						
215						
216						
217						
218						
219	NBA					
220	X					
221						
222						
223						
224						
225						
226						
227						
228						
229						
230						
231						
232						
233						
234						
235						
236						
237						
238						
239						
240						

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LOG OF BORING

SHEET 9 OF 12

Location	MW-7D	Date(s) Drilled	6-30-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AHMAD KHALIGHI	Drill Rig Type	Pro Sonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)		Total Depth (ft)
Depth (ft)	Notes	Sample Information				
		Type and No.	Blows per 6 in.	Penetration (in)	Recovery (in)	Geologic Unit

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Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

240		SP				SAND w/ TRAC Gravel; SAND AS ABSENT.	11
241		GP-SP				SANDY GRAVEL w/ CLAY & SILT & TRAC COBBLE; BO% GRAVEL + 25%; SAND + 10%; SILT + 10%; CLAY + 5%; COBBLES; F-C SAND & GRAVEL; POORLY GRADED; SUBANG-SUBIND; UNCONSOLIDATED; QFMIA; SATURATED-MOIST.	241'
242		SP				SAND w/ TRAC SILT & CLAY OR CUP; 90% SAND + 5% CLAY + 5% SILT; F-C SAND; POORLY GRADED; SUBANG-SUBIND; UNCONSOLIDATED; QFMIA	244.5'
243							11
244							
245							
246							
247							
248							
249							
250							
251							
252		SP				SAND w/ SILT & CLAY; 80% SAND + 10% SILT + 10% CLAY; F-C SAND; POORLY GRADED; SUBANG-SUBIND; LOW PLASTICITY; QFMIA; MOIST-NET.	7.5YR 4/4
253							
254							
255							
256							
257		SC				CLAYEY SAND w/ SILT; 65% SAND + 20% CLAY + 15% SILT; F-M SAND; POORLY GRADED; SUBANG-SUBIND; M-H PLASTICITY; QFMIA; MOIST.	2.5Y 6/2 GRAY/LIGHT BROWN
258							
259							
260							
261		SP				SAND; 100% SAND; F-M GRAINS; POORLY GRADED; SUBANG-SUBIND; UNCONSOLIDATED; QFMIA; SATURATED.	11
262							
263							
264							
265							
266		CH				SILTY CLAY; 70% CLAY + 30% SILT; M-H PLASTICITY; VERY PENSE; MOIST.	2.5Y 6/3 LIGHT YELLOWISH BROWN
267							
268		SP				SAND w/ TRAC SILT & CLAY; 95% SAND + 5% SILT + 5% CLAY; F-GRAINED; POORLY GRADED; UNCONSOLIDATED; QFMIA; SATURATED.	2.5Y 4/2 DARK YELLOWISH BROWN
269							
270							

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LOG OF BORING

SHEET 10 OF 12

Location	NW - 7D	Date(s) Drilled	7-1-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	PaoSonic 60T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 ³ / ₄ " - 9 ⁷ / ₈ " - 8"	Total Depth (ft) 350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

SOIL COLOR

Depth (ft)	Notes	Penetration (Graphic)	Sample Information	Geologic Unit		
270						
271						
272						
273	MGA	SP			SAND w/ TRACER SILT; SAND AS ABOVE, w/ NO CLAY. TRACER	2.5Y 4/2 DARK YELLOWISH BROWN
274	X				@ 274 ft BGS: TRACER F. GRAVEL; RIVERD.	
275						
276						
277						
278						
279						
280						
281	MGA	SP			SAND w/ GRAVEL; 90% SAND + 10% GRAVEL	2.5Y 4/3 OLIVE BROWN
282	X				F-C SAND & GRAVEL; SUBANG-SUBUND SAND; SUBUND-RND GRAVEL; POORLY GRADED; UNCONSOLIDATED; QFMIA (MUDY SHALE); SATURATED.	
283						
284						
285						
286						
287					SAND w/ GRAVEL; 90% SAND + 10% GRAV; M-C SAND; F-C GRAVEL SUBANG-SUBUND SAND; RHO GRAVEL; UNCONSOLIDATED QFMIA; SATURATED	2.87
288						
289						
290						
291	MGA	SP	8" O.D. CHAIN/G			
292	X					
293						
294						
295		CB			SILTY CLAY; 50% CLAY + 40% SILT; HIGH DENSITY; LOW PLASTICITY; MOIST	293.5'
296						
297						
298		SP			SAND; 100% SAND; F-M GRAINS; POORLY GRADED; SUBANG-SUBUND; UNCONSOLIDATED; SATURATED	2.5Y 5/2 GRAYISH BROWN
299						
300						

GEOSCIENCE

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Exploratory Boreholes
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LOG OF BORING

SHEET 12 OF 12

Location	MW-7D	Date(s) Drilled	7-1-2015	Drilling Contractor	Cascade Drilling	Bearing (Azimuth)
Ground Surface Elevation (ft)		Logged by	AZAD KHALIGHI	Drill Rig Type	ProSonic 600T	Plunge (Degrees) Vert
Horizontal/Vertical Datum		Reviewed by		Borehole Diameter (in)	10 $\frac{3}{4}$ - 9 $\frac{1}{2}$ - 7 $\frac{1}{2}$	Total Depth (ft) 350

CONFIDENTIAL DRAFT

Subject to Revision

MATERIAL DESCRIPTION

Depth (ft)	Notes	Penetration (Graphic)	Sample Information	Geologic Unit	MATERIAL DESCRIPTION	SOIL COLOR
330		SP			SAND: SAME AS ABOVE	"
331		GP-SP				331'
332						
333					SANDY GRAVEL w/ COBBLES & TRACE SILT; 50% GRAVEL + 35%. SAND + 10%. COBBLES + 5% SILT; F-C SAND & GRAVEL; POORLY GRADED; 5 ABUND-SURFACE SAND & GRAVEL; UNCONSOLIDATED; QFM; SATURATED - INLWS REYNOLD SECTORS OF MONTON SHALE.	2.5Y 4/8 OLIVE BROWN
334		GP-SP				
335						
336						
337						
338						338'
339	M6A	SP-GP			GRAVELY SAND w/ COBBLES & TRACE SILT; 50%. SAND + 35%. GRAVEL + 10%. COBBLES + 5%. SILT; SAME AS ABOVE, SATURATED.	"
340	X					
341					GRAVELY CLAY w/ COBBLES & TRACE SILT: 50%. CLAY; 30%. GRAVEL; 10%. COBBLES; 10%. SAND; F-C SAND & GRAVEL; SUBGRD-RND; HIGH PLASTICITY OF FM; MOIST.	
342	CH					
343	SP				SANDW/ SILT & TRACE GRAVEL; 85%. SAND + 10%. SILT + 5%. GRAVEL; FC SAND; F.GRAVEL; POORLY GRADED; QFM; SATURATED	"
344						
345					GRAVELY SAND w/ COBBLES & TRACE SILT:	2.5Y 5/3 LIGHT OLIVE BROWN
346		SP-COP			SAME AS 338'-331.5'	
347	CH				GRAVELY CLAY w/ COBBLES & SILT; SAME AS 341.5'	2.5Y 6/3
348					GRAVELY SAND w/ COBBLES & TRACE SILT	2.5Y 4/3
349	M6B	SP-GR			SAME AS 338'-331.5'	OLIVE BROWN
350	X					
351					T.D. = 350 ft BGS	
352						
353						
354						
355						
356						
357						
358						
359						
360						