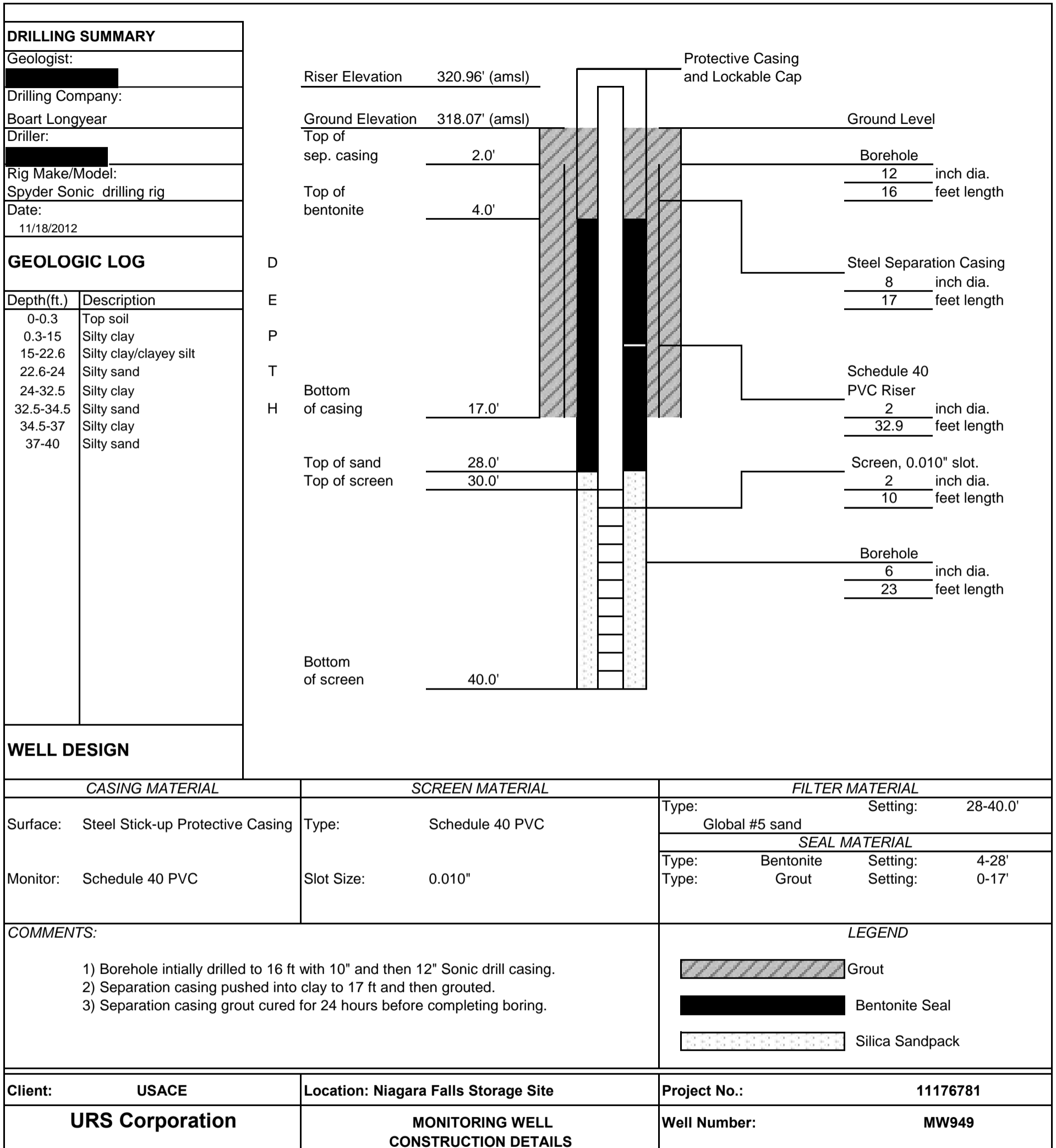





Appendix F
Well Construction Logs



DRILLING SUMMARY Geologist: [REDACTED] Drilling Company: Boart Longyear Driller: [REDACTED] Rig Make/Model: Spyder Sonic drilling rig Date: 11/18/2012		Riser Elevation 318.64' (amsl) Ground Elevation 316.04' (amsl) Protective Casing and Lockable Cap Ground Level Borehole 6 inch dia. 17 feet length Top of bentonite 4.0' Top of sand 5.5' Top of screen 7.5' Bottom of screen 12.5' Bottom of borehole 17.0'																			
GEOLOGIC LOG <table border="1"> <thead> <tr> <th>Depth(ft.)</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>0-1</td><td>Fill</td></tr> <tr><td>1-3</td><td>Silty sand</td></tr> <tr><td>3-5</td><td>Clayey silt</td></tr> <tr><td>5-10</td><td>Silt</td></tr> <tr><td>10-11.5</td><td>Sand</td></tr> <tr><td>11.5-14.3</td><td>Silty clay</td></tr> <tr><td>14.3- 16</td><td>Silty fine sand</td></tr> <tr><td>16-17</td><td>Silty clay</td></tr> </tbody> </table>		Depth(ft.)	Description	0-1	Fill	1-3	Silty sand	3-5	Clayey silt	5-10	Silt	10-11.5	Sand	11.5-14.3	Silty clay	14.3- 16	Silty fine sand	16-17	Silty clay	D E P T H Schedule 40 PVC Riser 2 inch dia. 10.1 feet length Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 5 feet length	
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WELL DESIGN																					
CASING MATERIAL Surface: Steel Stick-up Protective Casing Monitor: Schedule 40 PVC		SCREEN MATERIAL Type: Schedule 40 PVC Slot Size: 0.010"																			
		FILTER MATERIAL Type: Global #5 sand Setting: 5.5-17.0 SEAL MATERIAL Type: Bentonite chips Setting: 4-5.5' Type: Concrete Setting: 0-4'																			
COMMENTS: 1) Cave-in and sand in bottom of borehole		LEGEND  Concrete  Bentonite Seal  Silica Sandpack																			
Client: USACE URS Corporation		Location: Niagara Falls Storage Site MONITORING WELL CONSTRUCTION DETAILS																			
		Project No.: 11176781 Well Number: MW944																			

DRILLING SUMMARY Geologist: [REDACTED] Drilling Company: Boart Longyear Driller: [REDACTED] Rig Make/Model: Spyder Sonic drilling rig Date: 11/18/2012		Riser Elevation 320.24' (amsl) Ground Elevation 317.55' (amsl) Protective Casing and Lockable Cap Ground Level Borehole 6 inch dia. 20 feet length Schedule 40 PVC Riser 2 inch dia. 8.7 feet length Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 10 feet length																																																	
GEOLOGIC LOG <table border="1"> <thead> <tr> <th>Depth(ft.)</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>0-0.3</td><td>Top soil</td></tr> <tr><td>0.3-3</td><td>Sand</td></tr> <tr><td>3-5</td><td>Silty clay</td></tr> <tr><td>5-8.7</td><td>Silt</td></tr> <tr><td>8.7-10.5</td><td>Clayey silt</td></tr> <tr><td>10.5-15.5</td><td>Silty clay/ clayey silt</td></tr> <tr><td>15.5-20</td><td>Silty clay</td></tr> </tbody> </table>		Depth(ft.)	Description	0-0.3	Top soil	0.3-3	Sand	3-5	Silty clay	5-8.7	Silt	8.7-10.5	Clayey silt	10.5-15.5	Silty clay/ clayey silt	15.5-20	Silty clay	<p>Top of bentonite 3.0'</p> <p>Top of sand 4.0'</p> <p>Top of screen 6.0'</p> <p>Bottom of screen 16.0'</p> <p>Bottom of borehole 20.0'</p> <p>D E P T H</p>																																	
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COMMENTS: 1) Cave-in and sand in bottom of borehole		LEGEND 																																																	
Client: USACE URS Corporation	Location: Niagara Falls Storage Site MONITORING WELL CONSTRUCTION DETAILS	Project No.: 11176781 Well Number: MW945																																																	

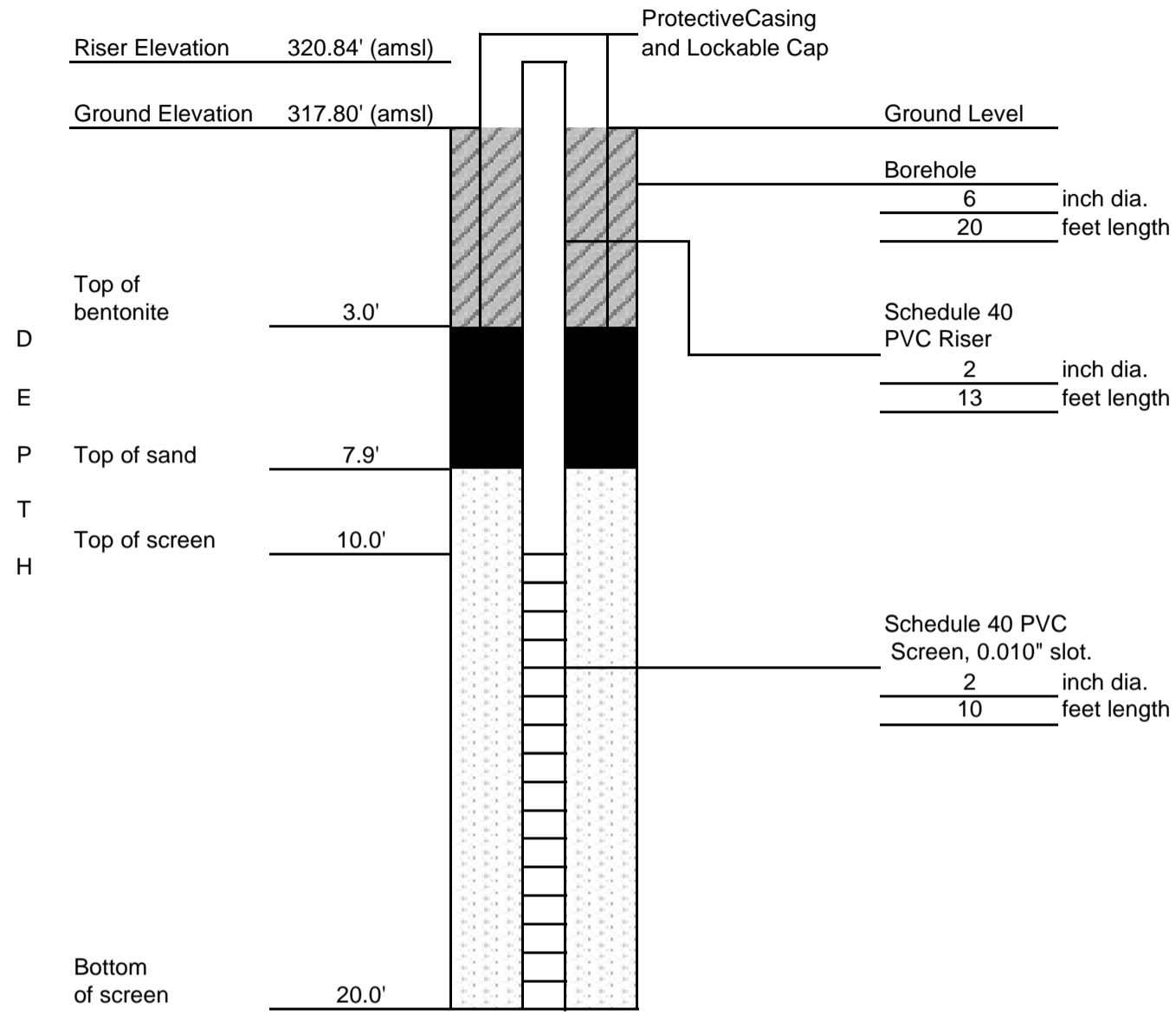
DRILLING SUMMARY Geologist: [REDACTED] Drilling Company: Boart Longyear Driller: [REDACTED] Rig Make/Model: Spyder Sonic drilling rig Date: 11/14/2012		Riser Elevation 319.65' (amsl) Ground Elevation 316.72' (amsl) Protective Casing and Lockable Cap Ground Level Borehole 6 inch dia. 15 feet length Schedule 40 PVC Riser 2 inch dia. 10.4 feet length Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 5 feet length															
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WELL DESIGN																	
CASING MATERIAL Surface: Steel Stick-up Protective Casing Monitor: Schedule 40 PVC		SCREEN MATERIAL Type: Schedule 40 PVC Slot Size: 0.010"															
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COMMENTS: 1) Cave-in and sand in bottom of borehole		LEGEND 															
Client: USACE URS Corporation	Location: Niagara Falls Storage Site MONITORING WELL CONSTRUCTION DETAILS	Project No.: 11176781 Well Number: MW946															

DRILLING SUMMARY Geologist: [REDACTED] Drilling Company: Boart Longyear Driller: [REDACTED] Rig Make/Model: Spyder Sonic drilling rig Date: 11/18/2012		Riser Elevation 322.53' (amsl) Ground Elevation 319.39' (amsl)		Protective Casing and Lockable Cap Ground Level Borehole 6 inch dia. 20 feet length Schedule 40 PVC Riser 2 inch dia. 11.6 feet length Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 10 feet length																					
GEOLOGIC LOG <table border="1"> <thead> <tr> <th>Depth(ft.)</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>0-0.5</td><td>Top soil</td></tr> <tr><td>0.5-2</td><td>Silty sand</td></tr> <tr><td>2-3.5</td><td>Silty clay</td></tr> <tr><td>3.5-5.5</td><td>Clayey silt</td></tr> <tr><td>5.5-6.3</td><td>Sand</td></tr> <tr><td>6.3-12</td><td>Silty clay/ clayey silt</td></tr> <tr><td>12-14.5</td><td>Silty sand</td></tr> <tr><td>14.5-15.5</td><td>Silt</td></tr> <tr><td>15.5-20</td><td>Silty clay</td></tr> </tbody> </table>		Depth(ft.)	Description	0-0.5	Top soil	0.5-2	Silty sand	2-3.5	Silty clay	3.5-5.5	Clayey silt	5.5-6.3	Sand	6.3-12	Silty clay/ clayey silt	12-14.5	Silty sand	14.5-15.5	Silt	15.5-20	Silty clay	D Top of bentonite 4.0' E Top of sand 6.5' P T Top of screen 8.5' H Bottom of screen 18.5' Bottom of borehole 20.0'			
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WELL DESIGN																									
CASING MATERIAL Surface: Steel Stick-up Protective Casing Monitor: Schedule 40 PVC		SCREEN MATERIAL Type: Schedule 40 PVC Slot Size: 0.010"		FILTER MATERIAL Type: Global #5 sand Setting: 6.5-20.0' SEAL MATERIAL Type: Bentonite chips Setting: 4-6.5' Type: Concrete Setting: 0-4'																					
COMMENTS: 1) Cave-in and sand in bottom of borehole				LEGEND 																					
Client: USACE URS Corporation		Location: Niagara Falls Storage Site MONITORING WELL CONSTRUCTION DETAILS		Project No.: 11176781 Well Number: MW947																					

DRILLING SUMMARY		<p style="text-align: center;">Riser Elevation 321.04' (amsl) Ground Elevation 318.04' (amsl) Ground Level</p> <p style="text-align: center;">Borehole 6 inch dia. 15 feet length</p> <p style="text-align: center;">Schedule 40 PVC Riser 2 inch dia. 8.0 feet length</p> <p style="text-align: center;">Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 10 feet length</p> <p style="text-align: center;">Protective Casing and Lockable Cap</p> <p style="text-align: center;">Top of bentonite 3.0' Top of sand 4.0' Top of screen 5.0' Bottom of screen 15.0'</p> <p style="text-align: center;">DEPTH</p>			
Geologist: [REDACTED]					
Drilling Company: Boart Longyear					
Driller: [REDACTED]					
Rig Make/Model: Spyder Sonic drilling rig					
Date: 11/16/2012					
GEOLOGIC LOG					
Depth(ft.)	Description				
0-0.3	Top soil				
0.3-15	Silty clay				
WELL DESIGN					
<i>CASING MATERIAL</i>		<i>SCREEN MATERIAL</i>		<i>FILTER MATERIAL</i>	
Surface: Steel Stick-up Protective Casing		Type: Schedule 40 PVC		Type: Global #5 sand Setting: 4-15.0'	
Monitor: Schedule 40 PVC		Slot Size: 0.010"		<i>SEAL MATERIAL</i>	
				Type: Bentonite chips Setting: 3-4'	
				Type: Concrete Setting: 0-3'	
<i>COMMENTS:</i>				<i>LEGEND</i>	
				<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 30px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black;"></div> Concrete </div>	
				<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 30px; height: 10px; background-color: black; border: 1px solid black;"></div> Bentonite Seal </div>	
				<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 30px; height: 10px; background: radial-gradient(circle, black 1px, transparent 1px); background-size: 4px 4px; border: 1px solid black;"></div> Silica Sandpack </div>	
Client: USACE		Location: Niagara Falls Storage Site		Project No.: 11176781	
URS Corporation		MONITORING WELL CONSTRUCTION DETAILS		Well Number: MW948	

DRILLING SUMMARY		
Geologist: [REDACTED]		
Drilling Company: Boart Longyear		
Driller: [REDACTED]		
Rig Make/Model: Spyder Sonic drilling rig		
Date: 11/11/2012		
GEOLOGIC LOG		
Depth(ft.)	Description	
0-0.5	Top soil	
0.5-13.5	Silty clay/ clayey silt	
13.5-20.0	Silty clay	
<p>The diagram illustrates a monitoring well construction. At the top, the riser elevation is 322.03' (amsl) and the ground elevation is 319.12' (amsl). The well is capped with a protective casing and lockable cap. The borehole has a diameter of 6 inches and a length of 20 feet. A Schedule 40 PVC riser, 2 inches in diameter and 12.9 feet long, is installed. A Schedule 40 PVC screen, 2 inches in diameter and 10 feet long, is located between 7.8' and 20.0' depth. The screen is set in a silica sandpack. The well passes through several geological layers: top soil (0-0.5'), silty clay/clayey silt (0.5-13.5'), and silty clay (13.5-20.0'). A bentonite seal is located between 3.0' and 7.8' depth. The bottom of the screen is at 20.0' depth.</p>		
WELL DESIGN		
CASING MATERIAL	SCREEN MATERIAL	FILTER MATERIAL
Surface: Steel Stick-up Protective Casing	Type: Schedule 40 PVC	Type: Global #5 sand Setting: 7.8-20.0'
Monitor: Schedule 40 PVC	Slot Size: 0.010"	SEAL MATERIAL
		Type: Bentonite chips Setting: 3-7.8'
		Type: Concrete Setting: 0-3'
COMMENTS:		LEGEND
		Concrete
		Bentonite Seal
		Silica Sandpack
Client: USACE	Location: Niagara Falls Storage Site	Project No.: 11176781
URS Corporation	MONITORING WELL CONSTRUCTION DETAILS	Well Number: MW950

DRILLING SUMMARY	
Geologist:	[REDACTED]
Drilling Company:	Boart Longyear
Driller:	[REDACTED]
Rig Make/Model:	Spyder Sonic drilling rig
Date:	11/11/2012
GEOLOGIC LOG	
Depth(ft.)	Description
0-0.5	Top soil
0.5-5.0	Silty clay/ clayey silt
5.0-7.0	Silty sand
7.0-10.0	Silty clay
10.0-10.5	Silty sand
10.5-14.0	Clay
14.0-16.5	Clayey silt
16.5-20.0	Clay



WELL DESIGN




CASING MATERIAL		SCREEN MATERIAL		FILTER MATERIAL	
Surface:	Steel Stick-up Protective Casing	Type:	Schedule 40 PVC	Type:	Global #5 sand
Monitor:	Schedule 40 PVC	Slot Size:	0.010"	Setting:	7.9-20.0'
				SEAL MATERIAL	
				Type:	Bentonite chips
				Type:	Concrete
				Setting:	3-7.8'
				Setting:	0-3'

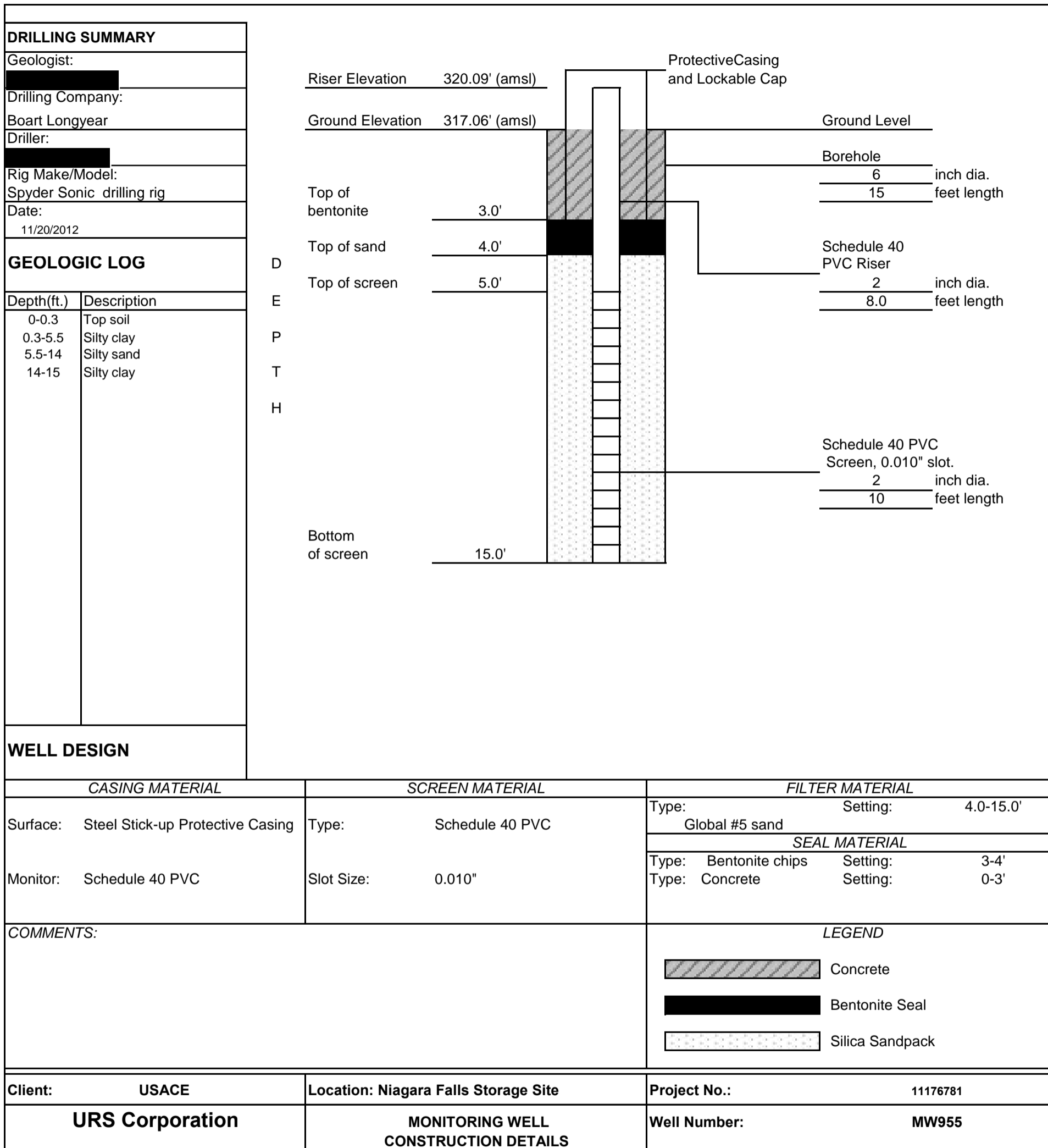
COMMENTS:	LEGEND
	Concrete
	Bentonite Seal
	Silica Sandpack

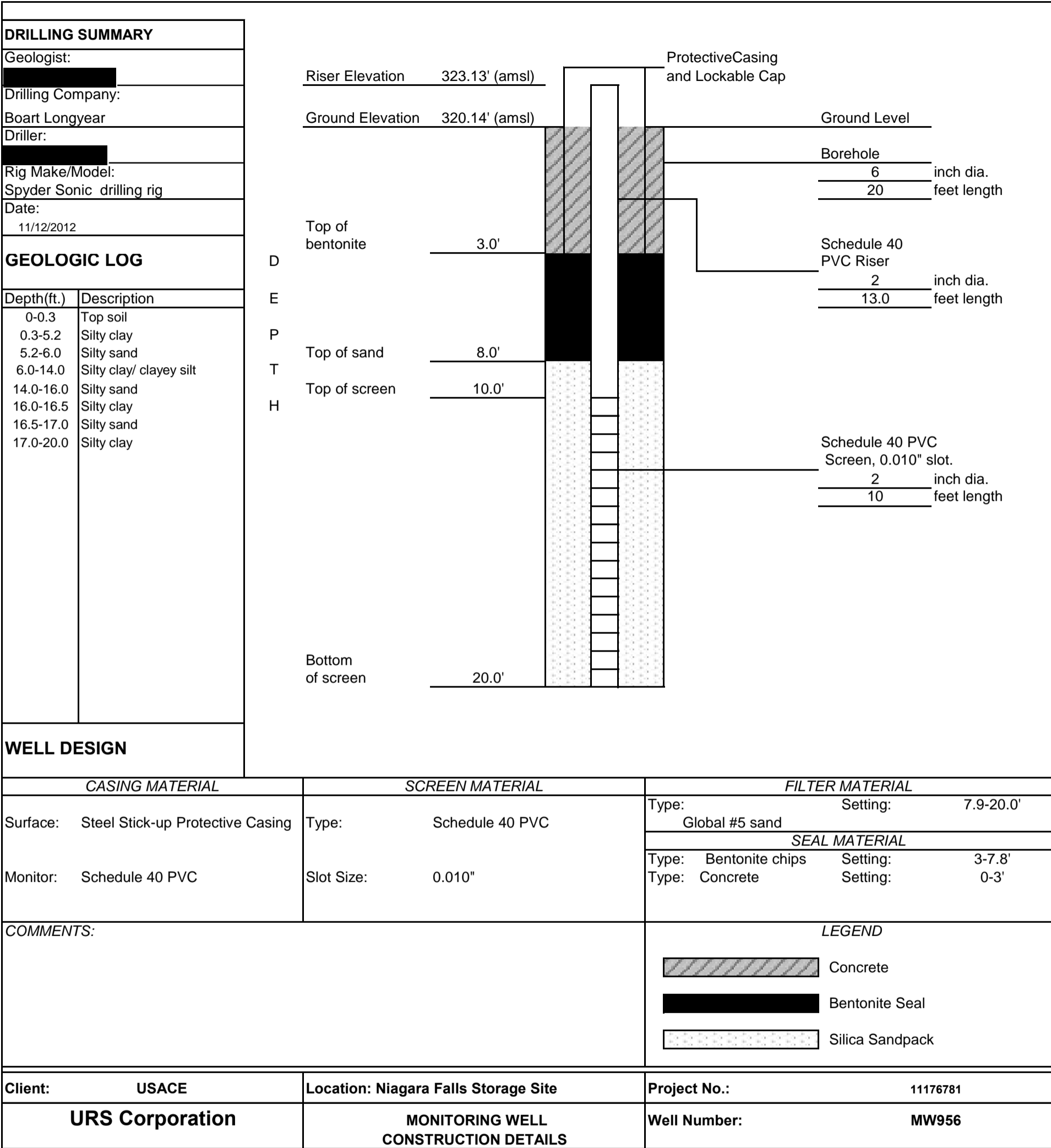
Client:	USACE	Location:	Niagara Falls Storage Site	Project No.:	11176781
	URS Corporation		MONITORING WELL CONSTRUCTION DETAILS	Well Number:	MW951

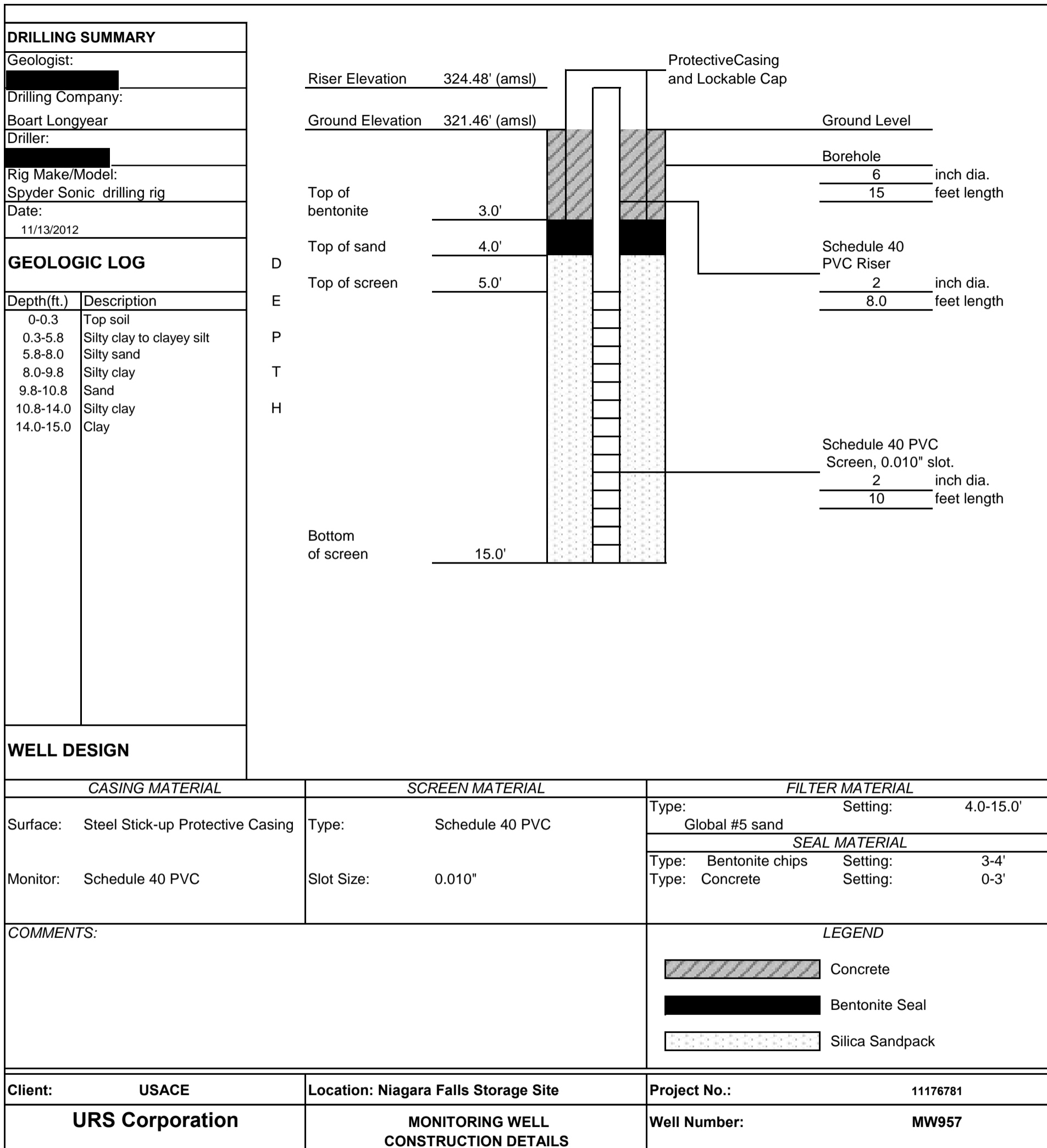
DRILLING SUMMARY		<p style="text-align: right;">Protective Casing and Lockable Cap</p> <p>Riser Elevation 320.16' (amsl)</p> <p>Ground Elevation 317.13' (amsl)</p> <p>Ground Level</p> <p>Top of bentonite 3.0'</p> <p>Top of sand 4.0'</p> <p>Top of screen 5.0'</p> <p>Bottom of screen 10.0'</p> <p>Borehole: 6 inch dia., 10 feet length</p> <p>Schedule 40 PVC Riser: 2 inch dia., 8.0 feet length</p> <p>Schedule 40 PVC Screen, 0.010" slot: 2 inch dia., 5 feet length</p>			
Geologist: ██████████					
Drilling Company: Boart Longyear					
Driller: ██████████					
Rig Make/Model: Spyder Sonic drilling rig					
Date: 11/19/2012					
GEOLOGIC LOG					
Depth(ft.)	Description				
0-0.3	Top soil				
0.3-10	Clayey silt to Silty clay				
WELL DESIGN					
<i>CASING MATERIAL</i>		<i>SCREEN MATERIAL</i>		<i>FILTER MATERIAL</i>	
Surface: Steel Stick-up Protective Casing		Type: Schedule 40 PVC		Type: Global #5 sand Setting: 4-10.0'	
Monitor: Schedule 40 PVC		Slot Size: 0.010"		<i>SEAL MATERIAL</i>	
				Type: Bentonite chips Setting: 3-4'	
				Type: Concrete Setting: 0-3'	
<i>COMMENTS:</i>				<i>LEGEND</i>	
				Concrete	
				Bentonite Seal	
				Silica Sandpack	
Client: USACE		Location: Niagara Falls Storage Site		Project No.: 11176781	
URS Corporation		MONITORING WELL CONSTRUCTION DETAILS		Well Number: MW952	

DRILLING SUMMARY				
Geologist:				
Drilling Company:				
Boart Longyear				
Driller:				
Rig Make/Model:				
Spyder Sonic drilling rig				
Date:				
11/19/2012				
GEOLOGIC LOG				
Depth(ft.)	Description			
0-0.3	Top soil			
0.3-6.0	Silty clay			
6.0-6.5	Silt and Sand			
6.5-10.0	Silty clay			
WELL DESIGN				
<i>CASING MATERIAL</i>		<i>SCREEN MATERIAL</i>		<i>FILTER MATERIAL</i>
Surface:	Steel Stick-up Protective Casing	Type:	Schedule 40 PVC	Type: Global #5 sand Setting: 4-10.0'
Monitor:	Schedule 40 PVC	Slot Size:	0.010"	<i>SEAL MATERIAL</i>
				Type: Bentonite chips Setting: 3-4'
				Type: Concrete Setting: 0-3'
COMMENTS:		<i>LEGEND</i>		
Client:	USACE	Location:	Niagara Falls Storage Site	Project No.:
				11176781
URS Corporation		MONITORING WELL CONSTRUCTION DETAILS		Well Number:
				MW953

DRILLING SUMMARY Geologist: [REDACTED] Drilling Company: Boart Longyear Driller: [REDACTED] Rig Make/Model: Spyder Sonic drilling rig Date: 11/20/2012		Riser Elevation 319.85' (amsl) Ground Elevation 316.78' (amsl) Protective Casing and Lockable Cap Ground Level Borehole 6 inch dia. 10 feet length Top of bentonite 3.0' Top of sand 4.0' Top of screen 5.0' Schedule 40 PVC Riser 2 inch dia. 8.1 feet length Schedule 40 PVC Screen, 0.010" slot. 2 inch dia. 5 feet length Bottom of screen 10.0'																																					
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CASING MATERIAL		SCREEN MATERIAL		FILTER MATERIAL																																			
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		Type:	Concrete	Setting:	0-3'																																		
COMMENTS:		Client: USACE Location: Niagara Falls Storage Site Project No.: 11176781																																					
URS Corporation		MONITORING WELL CONSTRUCTION DETAILS Well Number: MW954																																					







DRILLING SUMMARY		<p style="text-align: right;">Protective Casing and Lockable Cap</p> <p>Riser Elevation 319.77' (amsl)</p> <p>Ground Elevation 316.71' (amsl)</p> <p>Ground Level</p> <p>Borehole</p> <p> 6 inch dia.</p> <p> 10 feet length</p> <p>Schedule 40 PVC Riser</p> <p> 2 inch dia.</p> <p> 8.1 feet length</p> <p>Schedule 40 PVC Screen, 0.010" slot.</p> <p> 2 inch dia.</p> <p> 5 feet length</p> <p>Top of bentonite 3.0'</p> <p>Top of sand 4.0'</p> <p>Top of screen 5.0'</p> <p>Bottom of screen 10.0'</p>					
Geologist:							
Drilling Company:							
Boart Longyear							
Driller:							
Rig Make/Model:							
Spyder Sonic drilling rig							
Date:							
11/130/2012							
GEOLOGIC LOG							
Depth(ft.)	Description	D	E	P	T	H	
0-0.3	Top soil						
0.3-3.0	Silty clay						
3.0-3.8	Sand						
3.8-5.0	Silty clay						
5.0-5.5	Silty sand						
5.5-10.0	Silty clay						
WELL DESIGN							
<i>CASING MATERIAL</i>		<i>SCREEN MATERIAL</i>		<i>FILTER MATERIAL</i>			
Surface:	Steel Stick-up Protective Casing	Type:	Schedule 40 PVC	Type:	Global #5 sand	Setting:	4-10.0'
Monitor:	Schedule 40 PVC	Slot Size:	0.010"	<i>SEAL MATERIAL</i>			
				Type:	Bentonite chips	Setting:	3-4'
				Type:	Concrete	Setting:	0-3'
COMMENTS:				<i>LEGEND</i>			
				Concrete			
				Bentonite Seal			
				Silica Sandpack			
Client:	USACE	Location:	Niagara Falls Storage Site	Project No.:	11176781		
URS Corporation		MONITORING WELL CONSTRUCTION DETAILS		Well Number:	MW958		

