TECHNICAL MEMORANDUM

DATE June 28, 2022 **Project No.** 152030402

TO Mr. Alan Noell
Washington State Department of Ecology (Ecology)

FROM Gary Zimmerman and Joseph Xi, PE

REMEDIAL INVESTIGATION BOREHOLE DRILLING AND MONITORING WELL INSTALLATION
RESERVE SILICA RECLAMATION SITE
FACILITY ID NO.: 2041; CLEANUP SITE NO.: 4728

1.0 BOREHOLE DRILLING AND GROUNDWATER MONITORING WELL INSTALLATION

A Remedial Investigation (RI) and Feasibility Study (FS) Work Plan (Work Plan) was prepared for the Reserve Silica Reclamation Site (Site) under Agreed Order No. DE 16052. The Work Plan was submitted to Ecology in July 2021. Section 6 of the Work Plan describes borehole drilling and monitoring well installation tasks to support the RI/FS and to provide additional data to further refine the conceptual site model. This technical memorandum summarizes the following borehole drilling and monitoring well installation tasks completed in September 2021:

- P-15 - Installed groundwater monitoring well P-15 within the Lower Disposal Area (LDA) at a location immediately east of the Lower Haul Road and immediately east of existing well P-11. The location of P-15 is within the area where the geophysics indicated high pH groundwater is present. Groundwater samples collected from P-15 provide data on chemical composition of water just before the groundwater flows under the Lower Haul Road to daylight as seeps west of the LDA. During drilling, the P-15 borehole was extended to the bottom of the LDA fill material and top of the underlying bedrock, to further define the depth of the LDA.
- G-AB-1 - Drilled borehole G-AB-1 in the center of the Lower Haul Road at a location between P-15 and P-11 to characterize the composition of the fill material in the Lower Haul Road and determine the depth to bedrock at that location.
- P-16 - Installed groundwater monitoring well P-16 in the area where geophysics indicated high pH groundwater is present west of the seepage collection ditch, between the seepage collection ditch and the South Pond.
- P-17 - Installed groundwater monitoring well P-17 on the southwest side of the LDA[1]. This well is intended to delineate the extent of contamination and assess potential impacts southwest of the LDA landfill.

[1] Ecology requested the installation of this monitoring well during their site visit on September 21, 2021 during the borehole drilling and monitoring well installation.

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- MW-9A and MW-10A - Installed groundwater monitoring wells MW-9A and MW-10A west and northwest of the South Pond; respectively. The addition of these two wells creates a line of wells downgradient of the LDA and seepage area prior to the western property boundary running from the upgradient well MW-4A to MW-3A.
- MW-7A and MW-8A - Installed groundwater monitoring wells MW-7A and MW-8A west and southwest of the Infiltration Ponds; respectively, to evaluate groundwater gradients and delineate the extent of groundwater impacts hydraulically downgradient of the Infiltration Ponds.

Borehole drilling and installation of monitoring wells were completed from September 22 to September 24, 2021, by Cascade Drilling, Inc., a Washington State-licensed driller, using roto-sonic drilling methods. The roto-sonic drilling method collected continuous cores, which permitted detailed evaluation of the soils and materials encountered during drilling. Soils were logged by a Golder geologist in accordance with Unified Soil Classification System (USCS) standards and Golder technical guidelines. The work was completed in accordance with the Work Plan, the Sampling and Analysis Plan (SAP; Appendix D of the Work Plan), and the Quality Assurance Project Plan (QAPP; Appendix E of the Work Plan).

Borehole and monitoring well locations are shown on Figure 1. Monitoring well installation details are summarized in Table 1, and borehole and monitoring well construction logs are provided in Attachment 1.

2.0 GROUNDWATER MONITORING PROGRAM

Depth to water measurements were collected from all monitoring wells (including the newly installed monitoring wells P-15, P-16, P-17, MW-7A, MW-8A, MW-9A, MW-10A) at the Site on October 29, 2021. Groundwater elevation contour maps are provided in Figures 2A-D. Installed groundwater monitoring wells are incorporated into the existing Site groundwater monitoring well network and sampling program defined in the Work Plan. Groundwater analytical results are provided in quarterly groundwater monitoring reports and will be compiled with the RI/FS report.

Golder Associates USA Inc.

Joseph Xi, PE
Lead Consultant

Gary Zimmerman
Vice President

GZ/JX/tp

Attachments: Table 1 Remedial Investigation Boreholes and Monitoring Wells Construction Details
Figure 1 Completed RI Boreholes and Monitoring Wells (Overlying 2010 and 2019 Geophysics Surveys)
Figure 2A Groundwater Monitoring Locations
Figure 2B DSP Groundwater Elevations
Figure 2C LDA Groundwater Elevations
Figure 2D Alluvial/Shallow Groundwater Elevations
Attachment 1 Borehole and Monitoring Well Construction Logs

152030402-tm-rev0-2022-ri- 4728-062822.docx

Table

Table 1: New Remedial Investigation Boreholes and Monitoring Wells Construction Details

Area	Location ID	Northing	Easting	Date Constructed	Total Well Depth (feet bgs)	Screened Interval (feet bgs)	Bentonite Seal (feet bgs)	Casing Diameter (inches)	TOC Elevation (feet NAVD88)
LHR - Borehole	G-AB-1	127080	1352892	9/22/2021	N/A	N/A	N/A	6	739.87*
LDA - Shallow/Alluvial Groundwater Monitoring Wells	MW-7A	128439	1352283	9/22/2021	20	10-20	2-7	2	592.69
	MW-8A	128206	1352128	9/22/2021	26	16-26	2-13	2	601.49
	MW-9A	127023	1352544	9/24/2021	13	8-13	2-5	2	697.29
	MW-10A	127301	1352538	9/21/2021	29	9-29	2-6	2	698.02
Within LDA - Groundwater	P-14	126771	1353075	11/20/2020	52	40-50	3-38	2	773.32
	P-15	127061	1352958	9/23/2021	34	24-34	2-20	2	756.55
LDA - Shallow/Alluvial Piezometers	P-16	127121	1352776	9/21/2021	10	5-10	1-3	2	702.87
	P-17	126190	1353036	9/24/2021	13	8-13	2-5	2	720.32

Notes:
Northing and Easting Coordinates provided in Washington State Plane North (NAD 83)

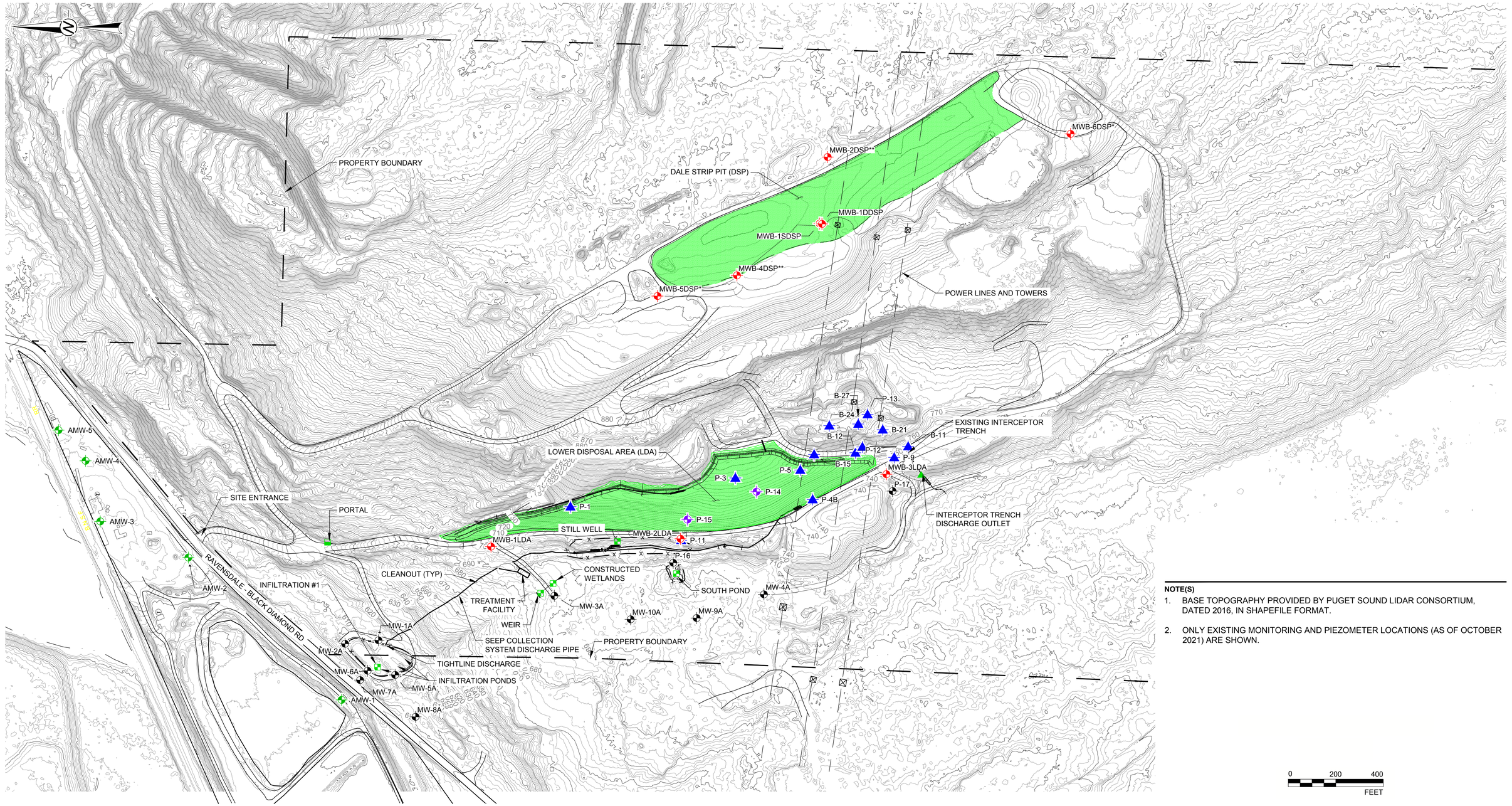
All wells constructed of 2-inch diameter PVC, with 2-inch diameter 0.020 slot screen, except for P-14, which was constructed with 0.010 slot screen.

-	Not measured or not available
feet bgs	Feet below ground surface
feet NAVD88	Elevation (feet) in NAVD88 Vertical Datum

* G-AB-1 is a borehole. The TOC Elevation is ground surface elevation.

LDA	Lower Disposal Area
TOC	Top of well casing.

Figures



NOTE(S)

1. BASE TOPOGRAPHY PROVIDED BY PUGET SOUND LIDAR CONSORTIUM, DATED 2016, IN SHAPEFILE FORMAT.
2. ONLY EXISTING MONITORING AND PIEZOMETER LOCATIONS (AS OF OCTOBER 2021) ARE SHOWN.

0 200 400
FEET

LEGEND

	COVER AREA	P-1	GOLDER PIEZOMETER
MW-1A	ALLUVIAL MONITORING WELL		LDA SURFACE WATER SAMPLING LOCATION
MWB-1DDSP	BEDROCK MONITORING WELL		DSP BEDROCK SAMPLING LOCATION (PORTAL)
P-14	LDA MONITORING WELL		INTERCEPTOR TRENCH SAMPLING LOCATION
AMW-1	PLANT SITE MONITORING WELLS	x x	FENCE LINE

CLIENT
HOLCIM

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-12-01
DESIGNED	JX
PREPARED	REDMOND
REVIEWED	JX
APPROVED	GZ

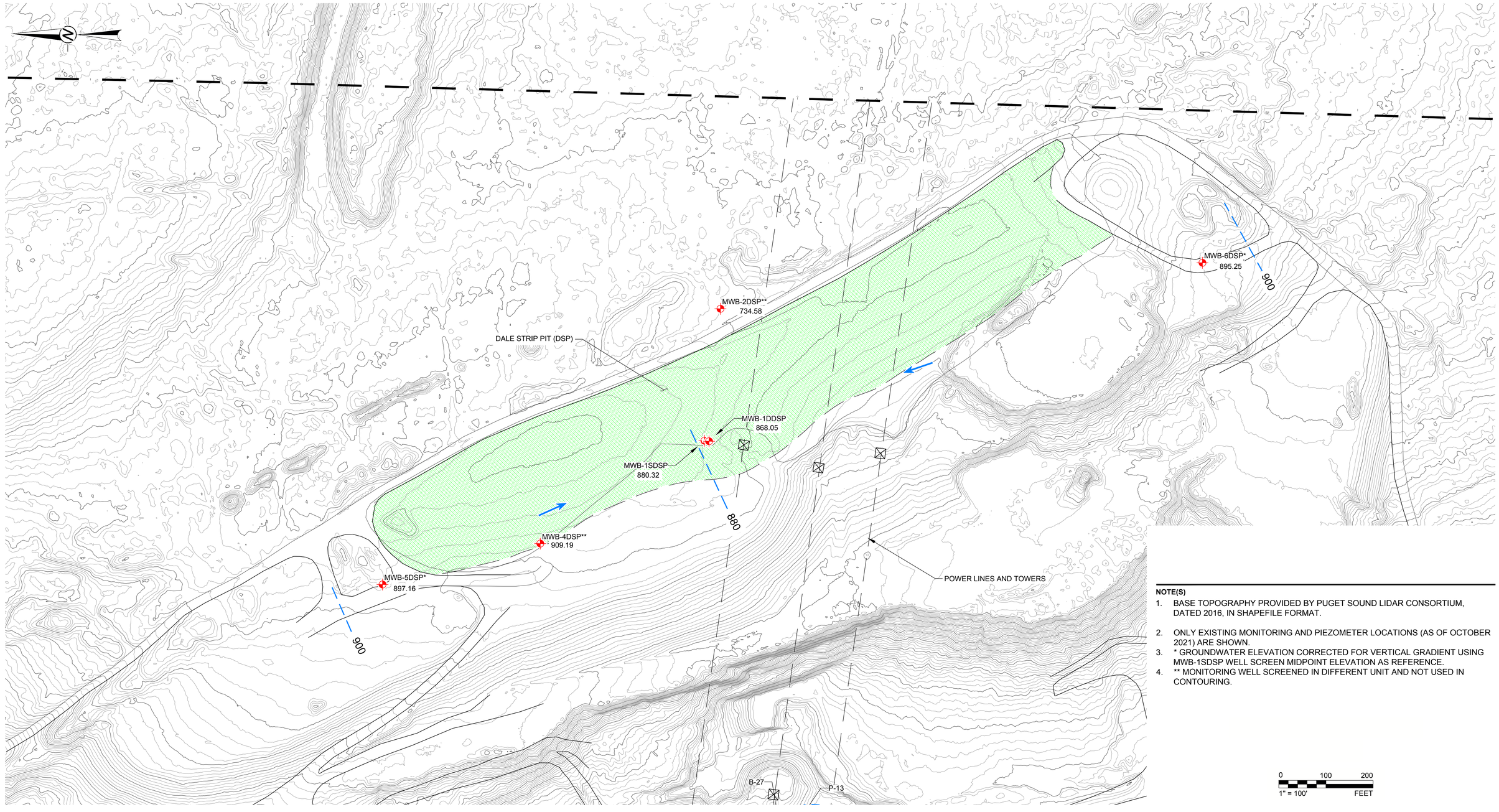
PROJECT
OCTOBER 29, 2021 GROUNDWATER ELEVATIONS
RAVENSDALE, WA

TITLE
GROUNDWATER MONITORING LOCATIONS

PROJECT NO.	PHASE	REV.	FIGURE
152030402	004	A	2A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1in



NOTE(S)

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2. ONLY EXISTING MONITORING AND PIEZOMETER LOCATIONS (AS OF OCTOBER 2021) ARE SHOWN.
3. * GROUNDWATER ELEVATION CORRECTED FOR VERTICAL GRADIENT USING MWB-1SDSP WELL SCREEN MIDPOINT ELEVATION AS REFERENCE.
4. ** MONITORING WELL SCREENED IN DIFFERENT UNIT AND NOT USED IN CONTOURING.

0 100 200
1" = 100' FEET

LEGEND

	COVER AREA	P-1	GOLDER PIEZOMETER
MW-1A	ALLUVIAL MONITORING WELL		LDA SURFACE WATER SAMPLING LOCATION
MWB-1DDSP	BEDROCK MONITORING WELL		DSP BEDROCK SAMPLING LOCATION (PORTAL)
P-14	LDA MONITORING WELL		INTERCEPTOR TRENCH SAMPLING LOCATION
AMW-1	PLANT SITE MONITORING WELLS	x x	FENCE LINE

CLIENT
HOLCIM

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-12-01
DESIGNED	JX
PREPARED	REDMOND
REVIEWED	JX
APPROVED	GZ

PROJECT
OCTOBER 29, 2021 GROUNDWATER ELEVATIONS
RAVENSDALE, WA

TITLE
DSP BEDROCK GROUNDWATER ELEVATIONS

PROJECT NO.	PHASE	REV.	FIGURE
152030402	004	A	2B

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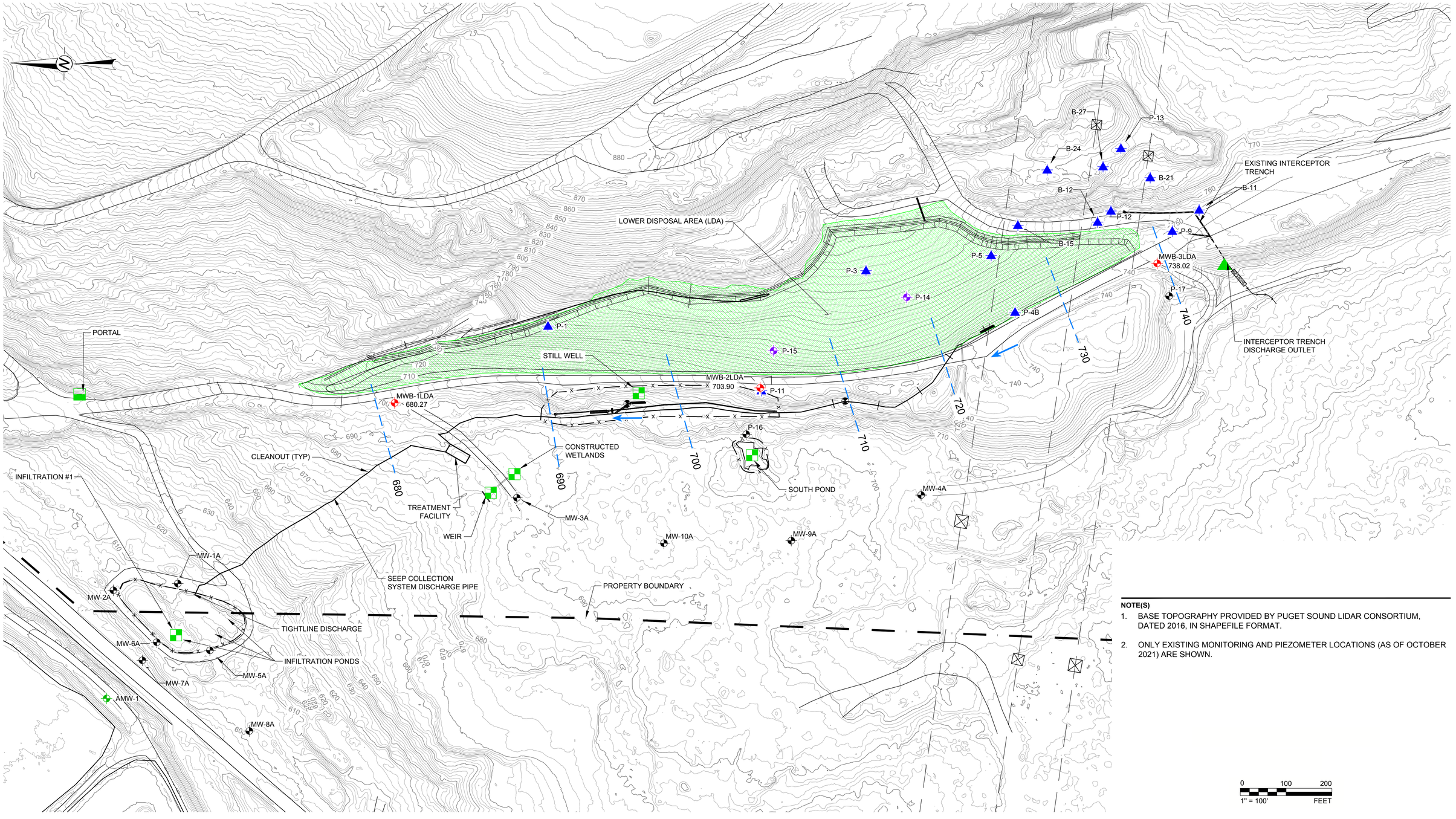

NOTE(S)

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2. ONLY EXISTING MONITORING AND PIEZOMETER LOCATIONS (AS OF OCTOBER 2021) ARE SHOWN.

0 100 200
1" = 100' FEET

LEGEND

	COVER AREA	P-1	GOLDER PIEZOMETER
MW-1A	ALLUVIAL MONITORING WELL		LDA SURFACE WATER SAMPLING LOCATION
MWB-1DDSP	BEDROCK MONITORING WELL		DSP BEDROCK SAMPLING LOCATION (PORTAL)
P-14	LDA MONITORING WELL		INTERCEPTOR TRENCH SAMPLING LOCATION
AMW-1	PLANT SITE MONITORING WELLS	— x — x —	FENCE LINE

CLIENT
HOLCIM

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-12-01
DESIGNED	JX
PREPARED	REDMOND
REVIEWED	JX
APPROVED	GZ

PROJECT
OCTOBER 29, 2021 GROUNDWATER ELEVATIONS
RAVENSDALE, WA

TITLE
LDA BEDROCK GROUNDWATER ELEVATIONS

PROJECT NO.	PHASE	REV.	FIGURE
152030402	004	A	2C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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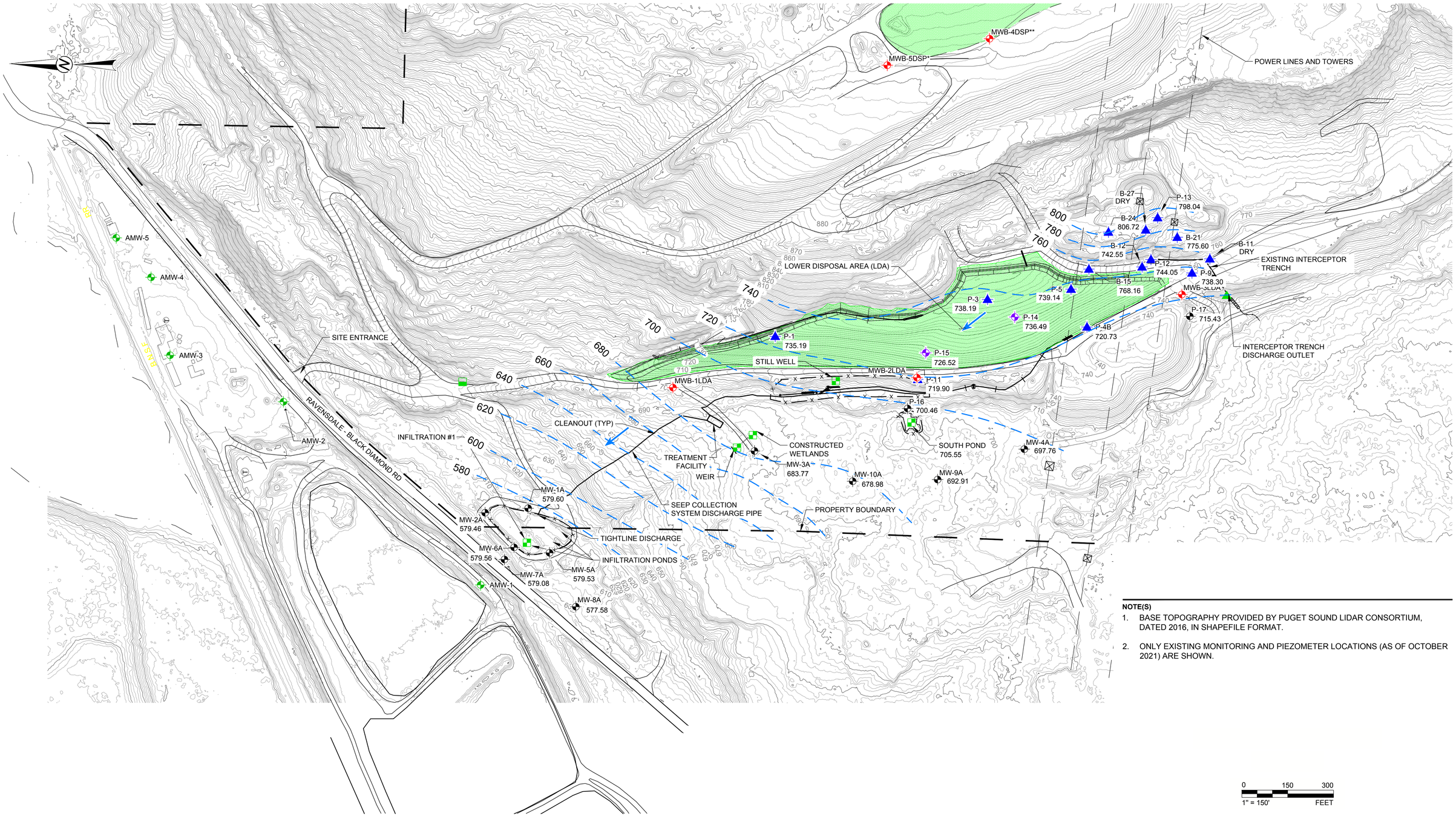

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0 150 300
1" = 150' FEET

LEGEND

	COVER AREA	P-1	GOLDER PIEZOMETER
MW-1A	ALLUVIAL MONITORING WELL		LDA SURFACE WATER SAMPLING LOCATION
MWB-1DDSP	BEDROCK MONITORING WELL		DSP BEDROCK SAMPLING LOCATION (PORTAL)
P-14	LDA MONITORING WELL		INTERCEPTOR TRENCH SAMPLING LOCATION
AMW-1	PLANT SITE MONITORING WELLS	— x — x —	FENCE LINE

CLIENT
HOLCIM

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-12-01
DESIGNED	JX
PREPARED	REDMOND
REVIEWED	JX
APPROVED	GZ

PROJECT
OCTOBER 29, 2021 GROUNDWATER ELEVATIONS
RAVENSDALE, WA

TITLE
ALLUVIAL/SHALLOW GROUNDWATER ELEVATIONS

PROJECT NO.	PHASE	REV.	FIGURE
152030402	004	A	2D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

ATTACHMENT 1

Borehole and Monitoring Well Construction Logs

RECORD OF BOREHOLE: G-AB-1

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA
DATE: September 22, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade
ELEVATION: 739.9 ft (Ground)
COORDINATES: N: 127080.1 ft E: 1352891.6 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: East of MWB-2LDA on Haul Road

DEPTH (ft)	DESCRIPTION	USCS	ELEV. DEPTH (ft)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	GRAVEL	SAND	FINES	ORGANIC CONTENT %	CONSTRUCTION AND INSTALLATION DETAILS
0	(ML) CLAYEY SILT; black and dark gray, mottled, soft, dry; trace pieces of coal, no sheen. (FILL)	ML	0.0										0.0 - 1.0 ft bgs: surface cuttings backfill
1	- 1.0 ft: soil pH: 7		738.6										
1	(ML) CLAYEY SILT; olive gray, soft, dry; coal mine spoils. (FILL)	ML	1.2										
2			737.4	1	SC	100							
2	(SW) SAND; yellowish orange, compact, homogeneous, medium, uniformly graded, dry; 1-3" pieces of slag. (FILL)	SW	2.5										
3			736.1										
3	(ML) SILT; light gray to olive gray, compact, homogeneous, uniformly graded, dry. (FILL)	ML	3.8										
4			734.9										
4	- 4.5 ft: soil pH: 7		5.0										
5	(SM) SILTY SAND; olive gray, loose, heterogeneous, poorly graded, dry; trace coal, sandstone, and siltstone fragments; mine spoils. (FILL)	SM	733.4										
6			6.5	2	SC	100							
7	(SM) SILTY SAND; olive gray to yellowish orange to greenish gray, loose, heterogeneous, poorly graded, dry; trace coal, sandstone, and siltstone fragments, mine spoils. (FILL)												
8	- 9.0 ft: soil pH: 7												
9													
10													
11				3	SC	100							
12													
13													
14	- 14.0 ft: soil pH: 7												
15													
16													
17				4	SC	50							
18			721.9										
18	(ML) SILT; black to olive gray to light brown, mottled, soft, moist; trace coal and woody debris. (FILL)		18.0										
19	- 19.0 ft: soil pH: 10 - 11												
20			719.9										
20	(SM) SILTY SAND; black to olive gray to light brown, fine, mottled, soft, moist; trace coal and woody debris. (FILL)		20.0										1.0 - 40.0 ft bgs: hydrated medium bentonite chips
21													
22													
23	- 22.5 ft: very soft			5	SC	100							
24													
25													

DRILL RIG: 100cc Compact Crawler
DRILL METHOD: Sonic

WATER CONTENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic
GRADATION %
ADDITIONAL LAB TESTING
SPT N Value: PENETRATION RESISTANCE BLOWS/FT
GROUNDWATER OBSERVATIONS
SAMPLES: Hammer: ASTM D1586, Blows per 6 in 140-lb hammer, 30-in drop

Continued on Next Page

HAMMER TYPE:

REV:

LOGGED: T. Dogget
DATE: Sep 22, 2021
CHECKED: J. Johnson
DATE: Sep 29, 2021

RECORD OF BOREHOLE: G-AB-1

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 22, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 739.9 ft (Ground)
COORDINATES: N: 127080.1 ft E: 1352891.6 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: East of MWB-2LDA on Haul Road

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION % GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	100cc Compact Crawler	Sonic	(SM) SILTY SAND; black to olive gray to light brown, fine, mottled, soft, moist; trace coal and woody debris. (FILL)	SM		711.9	6	SC	100											
27																				
28			(SM) SILTY SAND; greenish gray to light gray, fine, mottled, soft, moist; trace coal. (FILL)			28.0														
29																				
30			(SM) SILTY SAND and little gravel; dark gray to olive gray, fine, loose, well-rounded, wet; trace coal. (FILL)			709.9 30.0														
31							7	SC	50											
32																				
33			- 33.0 ft: soil pH: 12 - 13																	
34																				
35			(SM-ML) SILTY SAND; olive gray to dark gray, fine, mottled, loose, homogeneous, uniformly graded, moist; trace weathered sandstone. (WEATHERED SANDSTONE)	SM-ML		704.9 35.0														
36																				
37							8	SC	100											
38																				
39																				
40			End of hole at 40.00 ft.			699.9														
41																				
42																				
43																				
44																				
45																				
46																				
47																				
48																				
49																				
50																				

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 22, 2021
CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-7A

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 22, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 592.2 ft (Ground)
COORDINATES: N: 128440.2 ft E: 1352282.3 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: North of Infiltration Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION % GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Vegetated topsoil.			0.0 / 590.7														0.0 - 1.0 ft bgs: flush-mount monument set with concrete with locked well cap
1			(SM) SILTY SAND and coarse subangular to rounded gravels, trace cobbles; reddish brown, loose, damp. (SUBSOIL)	SM		1.5 / 587.2	1	SC	100											0.0 - 10.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
2			(SM) SILTY SAND and coarse subrounded gravels, trace cobbles; light gray, loose, dry. (RECESSIONAL OUTWASH)			5.0 / 582.2	2	SC	100											1.0 - 7.0 ft bgs: hydrated medium bentonite chips
3			(SM) SILTY SAND and coarse subrounded gravels, trace cobbles; light brown, loose, dry. (RECESSIONAL OUTWASH)			10.0 / 579.7	3	SC	100											10.0 - 20.0 ft bgs: 2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill
4			(SM) SILTY SAND and coarse subrounded gravels; brown, loose, wet. (RECESSIONAL OUTWASH)			12.5 / 570.2	4	SC	100											7.0 - 22.0 ft bgs: #2/12 silica sand
5								SC	0											
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																			▼	18.2 ft bgs: groundwater level observed at time of drilling
19																				
20																				
21																				
22			End of hole at 22.00 ft.																	
23																				
24																				
25																				

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 22, 2021
CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-8A

CLIENT:	Holcim Inc	DATE:	September 22, 2021	ELEVATION:	601.1 ft (Ground)
PROJECT:	Ravensdale RI Drilling			COORDINATES:	N: 128207.1 ft E: 1352128.9 ft
PROJECT NO:	152030402	INCLINATION:	90.0°	COORD SYS:	SP WA North FIPS 4601 Ft
LOCATION:	Ravensdale, WA	CONTRACTOR:	Cascade	HORZ DATUM:	NAD83
				HOLE LOC:	Northwest of Infiltration Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Topsoil; roots. - 0.1 ft: top layer loose and pushed out of core			0.0 599.6														0.0 - 1.0 ft bgs: flush-mount monument set with concrete with locked well cap 0.0 - 16.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
1.5			(SM) SILTY SAND and coarse subrounded gravels; light brown, loose, dry; trace subangular gravels. (FILL)	SM		1.5 597.6	1	SC	20											
3.5			(SM) SILTY SAND and coarse subrounded gravels and trace cobbles; light gray, loose, dry; trace subangular gravels. (FILL)			3.5 591.1	2	SC	100											1.0 - 13.0 ft bgs: hydrated medium bentonite chips
10.0			(SM) SILTY SAND and coarse subrounded gravels and trace cobbles; greenish gray, loose, moist; trace subangular gravels. (RECESSIONAL OUTWASH) - 14.0 to 15.0 ft: trace iron oxide staining			10.0 586.1	3	SC	100											
15.0			(SM) SILTY SAND and coarse subrounded gravels and trace cobbles; greenish gray, loose, dry; trace subangular gravels. (RECESSIONAL OUTWASH) - 17.0 to 18.0 ft: trace iron oxide staining			15.0 583.1														16.0 - 26.0 ft bgs: 2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill
18.0			(SM) SILTY SAND and coarse subrounded gravels and trace cobbles; greenish gray, loose, wet; trace subangular gravels. (RECESSIONAL OUTWASH) - 22.0 ft: trace iron oxide staining - 24.0 to 25.0 ft: trace iron oxide staining			18.0 576.1	4	SC	100											13.0 - 29.0 ft bgs: #2/12 silica sand
25.0			Continued on Next Page			25.0														

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 22, 2021

CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-8A

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 22, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 601.1 ft (Ground)
COORDINATES: N: 128207.1 ft E: 1352128.9 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: Northwest of Infiltration Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION % GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	100cc Compact Crawler	Sonic	(SM) SILTY SAND and coarse subrounded gravels and trace cobbles; greenish gray, loose, dry; trace subangular gravels. (RECESSIONAL OUTWASH)	SM			5	SC	100											
27																				
28																				
29																				29.0 - 30.0 ft bgs: hydrated medium bentonite chips backfill
30						571.1														
			End of hole at 30.00 ft.																	
31																				
32																				
33																				
34																				
35																				
36																				
37																				
38																				
39																				
40																				
41																				
42																				
43																				
44																				
45																				
46																				
47																				
48																				
49																				
50																				

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 22, 2021
CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-9A

CLIENT:	Holcim Inc	DATE:	September 24, 2021	ELEVATION:	695.2 ft (Ground)
PROJECT:	Ravensdale RI Drilling			COORDINATES:	N: 127021.9 ft E: 1352544.2 ft
PROJECT NO:	152030402	INCLINATION:	90.0°	COORD SYS:	SP WA North FIPS 4601 Ft
LOCATION:	Ravensdale, WA	CONTRACTOR:	Cascade	HORZ DATUM:	NAD83
				HOLE LOC:	Southeast of South Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION % GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Topsoil.			0.0 / 693.7														0.0 - 1.0 ft bgs: above ground locking monument set in concrete
1																				
2			(ML) SILT and coarse subrounded gravels and trace gravel and cobbles; yellowish orange to light brown, loose, dry. (TILL)	ML		1.5	1	SC	100											0.0 - 8.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
3																				
4						691.2														
4			(ML) SILT and coarse subrounded gravels and trace gravel and cobbles; yellowish orange to light brown, loose, damp. (TILL)			4.0 / 689.2														1.0 - 5.0 ft bgs: hydrated medium bentonite chips
6			(ML) SILT and coarse subrounded gravels and trace gravel and cobbles; yellowish orange to light brown, loose, dry. (TILL)			6.0 / 688.2														
7			(ML) SILT and coarse subrounded gravels; olive gray to light gray, compact, moist; minor socketing. (TILL)			7.0	2	SC	100											8.0 - 13.0 ft bgs: 2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill
8																				
9																				
10																				
11						684.2														5.0 - 15.0 ft bgs: #2/12 silica sand
11			(ML) SILT and coarse subrounded gravels; light gray, compact, damp. (RECESSIONAL OUTWASH)			11.0	3	SC	100											
12																				
13																				
14						681.2														
14			(ML) SILT and coarse subrounded gravels; light gray, compact, dry. (RECESSIONAL OUTWASH)			14.0 / 680.2														
15			(ML) SILT and coarse subrounded gravels and trace cobbles; light gray, compact, dry. (RECESSIONAL OUTWASH) - 15.0 ft: drilling became difficult - 15.5 ft: wet slough			15.0	4	SC	50											15.0 - 18.0 ft bgs: hydrated medium bentonite chips
16																				
17						677.2														
18			End of hole at 18.00 ft.																	backfill
19																				
20																				
21																				
22																				
23																				
24																				
25																				

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 24, 2021

CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-10A

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 21, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 695.5 ft (Ground)
COORDINATES: N: 127299.3 ft E: 1352539.5 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: Southwest of South Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Topsoil.			0.0 / 694.5														0.0 - 1.0 ft bgs: above ground locking monument set in concrete
1			(SM) SILTY SAND; reddish brown; trace roots. (TOPSOIL)			1.0 / 694.0														
2			(SM) SILTY SAND with trace coarse subrounded gravels; yellowish orange to tan, very loose, dry. (TILL)	SM		1.5	1	SC	100											0.0 - 9.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
3																				
4						691.5														
5			(SM) SILTY SAND with trace coarse subrounded gravels; yellowish orange to tan, compact, dry. (TILL)			4.0 / 690.5														1.0 - 6.0 ft bgs: hydrated medium bentonite chips
6			(SM) SILTY SAND with trace coarse gravels; light brown, compact, dry. (TILL)			5.0	2	SC	100											
7																				
8																				
9						686.5														
10			(SM) SILTY SAND with some coarse subrounded gravels and trace cobbles; greenish gray, compact, dry. (TILL)			9.0 / 685.5														9.0 - 29.0 ft bgs: 2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe pipe set in #2/12 silica sand backfill
11			(SM) SILTY SAND with some coarse subrounded gravels; greenish gray, compact, dry. (TILL)			10.0	3	SC	100											
12																				
13																				
14																				
15						680.5														
16			(SM) SILTY SAND with some coarse subrounded gravels; olive gray, compact, damp. (TILL)			15.0 / 678.5	4	SC	100											
17			(SM) SILTY SAND with some coarse subrounded gravels; olive gray, compact, dry. (TILL)			17.0														6.0 - 30.0 ft bgs: #2/12 silica sand
18																				
19																				
20							5	SC	100											
21																				
22						672.5														
23			(SM) SILTY SAND with some coarse subrounded gravels; olive gray, compact, damp. (TILL)			23.0	6	SC	100											
24																				
25																				

Continued on Next Page

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 21, 2021
CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: MW-10A

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 21, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 695.5 ft (Ground)
COORDINATES: N: 127299.3 ft E: 1352539.5 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: Southwest of South Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	100cc Compact Crawler	Sonic	(SM) SILTY SAND with some coarse subrounded gravels; olive gray, compact, damp. (TILL)	SM		665.5	7	SC	100											
30			(SM) SILTY SAND with some coarse subrounded gravels; olive gray, compact, dry. (TILL)			30.0	8	SC	100											30.0 - 31.0 ft bgs: hydrated medium bentonite chips 31.0 - 35.0 ft bgs: slough
35			End of hole at 35.00 ft.			660.5														

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 21, 2021
CHECKED: J. Johnson DATE: Sep 29, 2021

WELL NUMBER P-14

GOLDER

CLIENT Holcim
PROJECT NAME Reserve Silica Reclamation Site
PROJECT NUMBER 152030402
PROJECT LOCATION Ravensdale, WA
DATE STARTED 11/20/20 **COMPLETED** 11/20/20
GROUND ELEVATION Not Surveyed **HOLE SIZE** 6-inch
DRILLING CONTRACTOR Cascade Drilling
GROUND WATER LEVELS:
DRILLING METHOD Sonic
▽ **DURING DRILLING** 40.0 feet bgs
LOGGED BY T. Haskins, LG **CHECKED BY** G. Zimmerman
▼ **AFTER DRILLING** 31.09 feet bgs
NOTES Ecology Well ID: BLZ447

DEPTH (ft)	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0			Topsoil and Clay Cap	Flush-mount monument and concrete surface seal
2			Light gray CLAY, stiff, high plasticity, moist [MINE WASTE SOIL]	
5			Dry	
10				
14			Light gray powder/SILT, dry [Cement Kiln Dust (CKD)]	
15			Moist	3/8" hydrated bentonite chips
20			Wet, perched groundwater	
25				
30			▼ Clayey SILT/CKD, moist	
35	pH 13 when soil mixed with water			
36			CKD with gravel, moist	
40			▽ Gray SILT with gravel, moist [CKD]	12/20 Colorado silica sand filter pack around 0.010" slotted PVC screen from 40 to 50 ft bgs
42			Mottled brown and gray, GRAVEL with silt and sand, dry to moist [MINE WASTE GRAVEL]	
45	pH 13 when soil mixed with water		Red and brown, SILT and gravel, oxidized, moist to wet [MINE WASTE SILT and CKD]	
50			Dry to moist	End cap
51			Mottled gray, SILT and clay, with sand and gravel, moist [MINE WASTE SILT and CKD]	
55			Glass fragments/paper present	
60	pH 13 when soil mixed with water		Color changes to dull gray, cobbles present	
61			Highly weathered SANDSTONE, white, grades to orange at 61.5ft, oxidized, thinly laminated, dry to moist [SANDSTONE BEDROCK]	3/8" hydrated bentonite chips
65	pH neutral when soil mixed with water			
70				
70			Bottom of borehole at 70.0 feet.	

RECORD OF BOREHOLE: P-15

CLIENT:	Holcim Inc	DATE:	September 23, 2021	ELEVATION:	756.0 ft (Ground)
PROJECT:	Ravensdale RI Drilling			COORDINATES:	N: 127062.5 ft E: 1352957.0 ft
PROJECT NO:	152030402	INCLINATION:	90.0°	COORD SYS:	SP WA North FIPS 4601 Ft
LOCATION:	Ravensdale, WA	CONTRACTOR:	Cascade	HORZ DATUM:	NAD83
				HOLE LOC:	North of Haul Road and P-11

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Topsoil and clay cap.			0.0 / 754.5														0.0 - 1.0 ft bgs: flush-mount monument set with concrete with locked well cap
1																				
2			(ML) SILT and some coarse subangular gravels; light brown, loose, dry. (FILL)	ML		1.5 / 752.0	1	SC	100											0.0 - 24.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
3																				
4			(SM) SILTY SAND and some coarse angular gravels; black to dark gray, loose, heterogeneous, dry; trace coal fragments; mine spoils. (FILL)	SM		4.0 / 749.5														
5																				
6																				
7			(ML) SILT; light gray, soft, homogeneous, uniformly graded, dry; metal debris fragments. (FILL)	ML		6.5 / 748.5	2	SC	100											
8			(SP) SAND; yellowish orange, fine, loose, uniformly graded, damp; metal debris fragments. (FILL)	SP		7.5 / 746.0														
9																				
10			(ML) SILT; light gray, uniformly graded, homogeneous, loose, damp; cement kiln dust. (FILL, CKD)			10.0 / 744.0														1.0 - 20.0 ft bgs: hydrated medium bentonite chips
11																				
12			(ML) SILT; light gray, uniformly graded, homogeneous, loose, moist; cement kiln dust. (FILL, CKD) - 13.0 ft: CKD pH: 12			12.0 / 740.0	3	SC	100											
13																				
14																				
15																				
16			(ML) SILT; light gray, uniformly graded, homogeneous, loose, wet; cement kiln dust. (FILL, CKD)	ML		16.0 / 735.0	4	SC	100											
17																				
18			- 18.0 ft: CKD pH: 13																	
19			- 18.5 ft: 1 - 2" pocket of CLAYEY SILT, brown to black																	
20																				
21			(ML) SILT; light gray, uniformly graded, homogeneous, dense to compact, moist; cement kiln dust. (FILL, CKD)			21.0														
22			- 21.0 ft: perched water				5	SC	100											
23			- 23.0 ft: CKD pH: 12																	
24																				24.0 - 34.0 ft bgs: 2-inch nominal
25																				

Continued on Next Page

HAMMER TYPE:

REV:

LOGGED: T. Dogget DATE: Sep 23, 2021

CHECKED: J. Johnson DATE: Sep 29, 2021

RECORD OF BOREHOLE: P-15

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 23, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 756.0 ft (Ground)
COORDINATES: N: 127062.5 ft E: 1352957.0 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: North of Haul Road and P-11

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION % GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
26	100cc Compact Crawler	Sonic	(ML) SILT; light gray, uniformly graded, homogeneous, dense to compact, moist; cement kiln dust. (FILL, CKD)	ML		730.0 / 26.0														diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill
27			(ML) SILT; light gray, uniformly graded, homogeneous, dense to compact, wet; cement kiln dust. (FILL, CKD)					SC	100											
28																				20.0 - 36.0 ft bgs: #2/12 silica sand
29																				
30																				
31																				
32																				
33																				
34																				
35			(ML) SILT and coarse subrounded to subangular gravel; light gray, loose, dry; coal fragments. (FILL, MINE SPOILS)			721.0 / 35.0	6	SC	100											
36			(ML) SILT and coarse subrounded gravels and trace cobbles; brown, loose, moist. (FILL, MINE SPOILS) ▼ 36.0 ft: soil pH: 10	SP		720.0 / 36.0														
37						719.0 / 37.0														
38			(SP) SAND and coarse to fine rounded gravels; yellowish orange to orange oxidation of fine homogeneous, uniform sand and sandstone fragments, loose, moist. (FILL, MINE SPOILS)	MH		718.0 / 38.0														
39																				
40						716.0 / 40.0														
41			(MH) CLAYEY SILT and some fine sand with trace sand fragments; loose, moist; red iron oxide inclusions. (WEATHERED SANDSTONE)																	
42			Saturated, partially weathered, yellowish orange SANDSTONE. (WEATHERED SANDSTONE) ▼ 40.0 ft: soil pH: 7			714.0 / 42.0														
43			Unsaturated, unweathered, yellowish orange to orange and oxidized with a white center, hard, compact, fine sand, SANDSTONE. (BEDROCK)																	36.0 - 50.0 ft bgs: hydrated medium bentonite chips
44																				
45							7	SC	100											
46																				
47																				
48																				
49																				
50			End of hole at 50.00 ft.			706.0														

HAMMER TYPE:

REV:

LOGGED: T. Dogget
CHECKED: J. Johnson

DATE: Sep 23, 2021
DATE: Sep 29, 2021

RECORD OF BOREHOLE: P-16

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 21, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 700.8 ft (Ground)
COORDINATES: N: 127120.4 ft E: 1352776.9 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: North of South Pond

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT: Plastic & Liquid Limits (%), Water Content (%), NP Nonplastic	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %	ADDITIONAL LAB TESTING	SPT N Value: PENETRATION RESISTANCE BLOWS/FT	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	100cc Compact Crawler	Sonic	Topsoil			0.0														0.0 - 1.0 ft bgs: above ground locking monument set in concrete 0.0 - 5.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips 1.0 - 3.0 ft bgs: hydrated medium bentonite chips 5.0 - 10.0 ft bgs: 2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill 3.0 - 12.0 ft bgs: #2/12 silica sand 8.95 ft bgs: groundwater level observed at pipe installation 12.0 - 15.0 ft bgs: slough
						698.3														
3			(SM) SILTY SAND with trace roots, light brown, very soft, moist. (TOPSOIL) - 3.0 ft: vadose zone; soil pH: 12	SM		2.5 696.8	1	SC	100											
4			(SM) SILTY SAND with trace roots, light brown, very soft, moist to wet. (SUBSOIL)			4.0 695.8														
5			(SM-GP) SILTY SAND with fine to coarse rounded GRAVELS and trace rounded cobbles; greenish gray, wet, saturated, firm. (WEATHERED TILL) - 5.0 to 7.0 ft: drilling became difficult - 6.0 ft: soil pH: 7 - 8			5.0 693.8														
7			(SM-GP) SILTY SAND with fine to coarse rounded GRAVELS and trace rounded cobbles; greenish gray to yellowish orange, pocketed, very stiff, moist. (TILL)	SM-GP		7.0 690.8														
10			(SM-GP) SILTY SAND with coarse subrounded gravels; greenish gray, poorly graded, loose, dry, unsaturated. (TILL)			10.0	2	SC	100											
15			End of hole at 15.00 ft.			685.8														

HAMMER TYPE:

REV:

LOGGED: T. Dogget
CHECKED: J. Johnson

DATE: Sep 21, 2021
DATE: Sep 29, 2021

RECORD OF BOREHOLE: P-17

CLIENT: Holcim Inc
PROJECT: Ravensdale RI Drilling
PROJECT NO: 152030402
LOCATION: Ravensdale, WA

DATE: September 24, 2021
INCLINATION: 90.0°
CONTRACTOR: Cascade

ELEVATION: 718.3 ft (Ground)
COORDINATES: N: 126190.2 ft E: 1353033.9 ft
COORD SYS: SP WA North FIPS 4601 Ft
HORZ DATUM: NAD83
HOLE LOC: West of MW-3LDA

DRILL RIG: 100cc Compact Crawler
DRILL METHOD: Sonic

DEPTH (ft)	MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	GRADATION %: GRAVEL	SAND	FINES	ORGANIC CONTENT %
0	Topsoil.		0.0									
			715.8	1	SC	100						
3	(SM) SILTY SAND and coarse grained sand and sub-rounded coarse gravels; trace brick debris, brown, loose, moist. (FILL)	SM	2.5									
6	(SW) SAND fine sand and sub-angular gravels; yellowish orange to orange, loose, mottled, moist. (FILL)	SW	6.0									
			711.8									
		OH	6.5									
	(CL-ML) CLAYEY SILT and coarse sub-rounded gravels; dark gray and some wood debris, high plasticity, firm, moist. (NATIVE ORGANIC SOIL)		710.8	3	SC	100						
9	(ML) SILT and coarse sand, some subrounded gravel and trace cobbles; light gray with some brown flecks, abundant iron oxide staining, compact, wet. (TILL)		7.5									
12	- 11.0 ft: soil pH: 7	ML		4	SC	100						
14			704.3									
	(ML) SILT and compact sand and some fine sub-rounded gravels and trace cobbles; brownish gray, compact, damp; pocketed. (TILL)		14.0									
15			703.3									
	(GW) Coarse sub-rounded well-graded GRAVEL and coarse sand with some silt; gray, compact, dry. (TILL)	GW	15.0									
17			700.8	5	SC	100						
18	(ML) SILT with some sub-rounded gravel and trace sand and cobbles; dark brown to gray, friable, compact, damp. (TILL)	ML	17.5									
20			698.3									
	End of hole at 20.00 ft.											

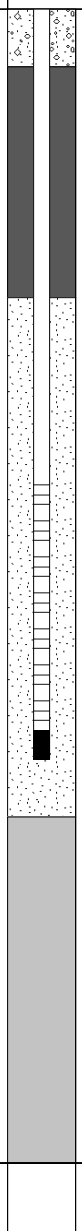
WATER CONTENT: Plastic & Liquid Limits (%); Water Content (%); NP Nonplastic; scale 0, 25, 50, 75, 100, 125, 150

ADDITIONAL LAB TESTING

SPT N Value: PENETRATION RESISTANCE BLOWS/FT; scale 20, 40, 60, 80

GROUNDWATER OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS



0.0 - 1.0 ft bgs: above ground locking monument set in concrete
0.0 - 8.0 ft bgs: 2-inch diameter solid schedule 40 PVC pipe set in medium bentonite chips
1.0 - 5.0 ft bgs: hydrated medium bentonite chips
8.0 - 13.0 ft bgs:2-inch nominal diameter 0.020-inch slotted schedule 40 PVC pipe set in #2/12 silica sand backfill
5.0 - 14.0 ft bgs: #2/12 silica sand backfill
10.5 ft bgs: groundwater level observed at time of drilling
14.0 - 20.0 ft bgs: hydrated medium bentonite chips

HAMMER TYPE:

REV:

LOGGED: T. Dogget
DATE: Sep 24, 2021
CHECKED: J. Johnson
DATE: Sep 29, 2021